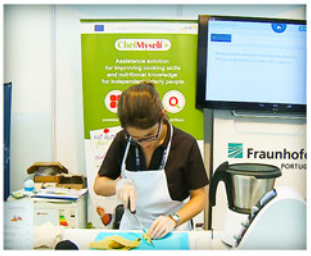
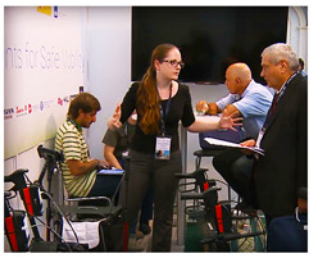
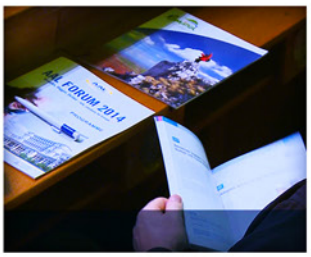
AAL PROGRAMME

AAL FORUM 2014

Broader, Bigger, Better – AAL solutions for Europe







Palace of Parliament
Bucharest, Romania
9 - 12 September 2014
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Executive Agency for Higher Education, Research, Development and Innovation Funding

UEFISCDI

Adrian Curaj, Ioana Trif (editors)

BROADER, BIGGER, BETTER
AAL SOLUTIONS FOR EUROPE

PROCEEDINGS OF THE AAL FORUM 2014
BUCHAREST, ROMANIA
9-12 SEPTEMBER 2014

Bucharest, 2015

On the cover: *Photo from AAL Forum 2014*

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FOREWORD

As the co-chairman of the 2014 AAL Forum Programme Committee I would like to introduce the proceedings with session summaries and the programme with high quality content and visionary speakers. The key words chosen for 2014 Forum were "Broader, Bigger and Better" – How to contribute to broader, bigger and better AAL solutions, taking ageing as an opportunity for socio-economic development and not as a threat by strengthening the European cohesion. These key words can be easily associated with the topic of 2013 Forum, "Impact", going forward in making a real impact with the developed AAL initiatives and solutions in Europe and all over the world.

The discussions that took place during AAL Forum regarding the deployment of AAL solutions (track A), broadening AAL (track B), supporting projects to market (track C) and social innovation (track D) will contribute to new ideas and actions towards ageing well and social inclusion and also to the sustainability of health and social care systems across Europe.

All these issues are equally important and ask for integrated approach by AAL initiatives.

I highly appreciate the outstanding participation at the 2014 AAL Forum, in Bucharest.

A special thanks go to all the contributors.

Prof. Univ. Dr. Adrian CURAJ

Chairman of the AAL Forum 2014 Programme Committee
General Director, Executive Agency for Higher Education, Research, Development and Innovation Funding, Bucharest, Romania
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WELCOME NOTE

Dear Participants,

The AAL Forum 2014 in Bucharest, Romania, was co-organized by the AAL Association jointly with the Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) and Ministry of National Education (MEN).

For the first time, the Forum was held in a new EU Member State – a demand we are tackling as a sign of our will to strengthen the European Research Area for ageing well and contribute to the European cohesion.

To cope with the big societal and economic challenges of the demographic change in Europe, the current AAL has the aim to tackle the whole value and so contributing to the social inclusion and empowerment of the elderly, as well as to the support and sustainability of health and social care systems across Europe, taking ageing not as a threat but as a huge opportunity of socio-economic and ethical values.

The AAL Forum continues to provide floor for policy makers, end-users, business partners, researchers, media, and students to interact with each other and discuss about the main topics in the field.

The theme of this year is cooperation and innovation for ageing well: care solution development, user driven innovation, industrial and business leadership. An important aspect is the diversity of actors and stakeholders participating to the annual flagship event, which is certainly an asset of our programme.

Therefore the focus on cooperation is at different levels:

- The cooperation between EU and associated member states.
- The cooperation with neighbouring areas such as Western Balkans, Turkey, Republic of Moldavia, in view of the enlargement.
- Cooperation between universities, research performing institutes and companies with innovative results or end-users organization.
- Cooperation between peoples of all ages-for intergenerational solidarity in the demographic change.

- Multi–disciplinarity.
- The involvement of students in creative and interactive exposure of AAL projects and solutions, in the participation to the exhibition and to the presentations. Students represent active actors for the coming future and their involvement in the field of AAL contributes to their understanding of the societal challenge of ageing and demographic change, their training and education in associated AAL concepts and technologies.

In an holistic vision coping with ageing, technology and usability are complemented explicitly by a third dimension: the market entrance and investments in AAL for social innovation. I believe that this Forum was an excellent platform to reflect on the concrete issues that we all face on a daily basis and the ideal place to share thoughts for innovative projects or to build on existing partnership.

Several projects came to an end since the start of the first phase. Some of them started to commercialize and others are moving in the same direction. With this in mind, I trust that always more and more of our consortia will find their way to the market. I am sure that our Forum represented the ideal place to boost innovation in the field of ICT for ageing. We will continue working in the future for it too.

The Forum was an excellent opportunity to network with stakeholders and colleagues:

- 5 Plenary sessions;
- 20 sessions in 4 tracks;
- 17 side events;
- an exhibition where our projects showcased their results
- the AAL award, which this year we decided to entitle to the memory of Jeroen Wals, former member of the Advisory Board that died in the plane crash in the Skies of Ukraine, last July.
- the Young Researchers' Workshop, organized by the League of Romanian Students Abroad (LSRS) and the Center for Accessing the Expertise of Students and Alumni from Romania (CAESAR). This year's theme addressed the role of entrepreneurship in the development of technological innovation for elderly.

On behalf of the organizers, the AAL Forum 2014 Committee and myself, we were pleased to host at this event the distinguished guests, including over 120 brilliant speakers who addressed the important topics contained in the programme of the AAL Forum 2014.

We were delighted and thankful to welcome sponsors and business and our supporting partners to our exhibition. Your support and collaboration helped us to annually recreate the AAL Forum for a greater AAL community of an even greater AAL ecosystem. We are also grateful for the opportunity to work together so closely and actively with the media, end-users (as the Age Platform Europe), ECHAlliance and the Joint Programing Initiatives (i.e. More Years Better Life).

I deeply appreciate the commitment by the European Commission with the Digital Agenda, and for the support to enact the current AAL (Active and Assisted R&D Programme 2014 - 2020) by the decision of the European Parliament and the Council of last May 15th.

I am also honoured to see the commitment of the national Authorities.

I have to especially give my warmest thanks and congratulations to all who have worked so hard to prepare for this event, in particular the transnational and active AAL Forum 2014 Committee, the Romanian co-organizers with the AAL Association (General Assembly, Executive Board, Advisory Board, National Contact Persons and Central Management Unit). I am deeply grateful to the Authorities of Romania not just because they were hosting us, but also to have them and their staff actively contributing with their resources to this sixth AAL Forum 2014.

Rafael De ANDRES MEDINA

Chairman of the 2014 AAL Forum Programme Committee

President, AAL Association

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ACKNOWLEDGEMENTS

The Ministry of National Education (MEN) and The Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) from Romania would want to thank the AAL Association President, Mr. Rafael de Andres Medina, Forum Programme Committe Members, as well as to all the AAL Association members, European Commission, The League of Romanian Students Abroad (LSRS), Center for Accessing the Expertise of Students and Alumni from Romania (C.A.E.S.A.R.) and Romanian authorities for the good collaboration and all the support provided for the organization of the AAL Forum, 9-12 September 2014, in Bucharest, Romania.

Special thanks go to all AAL Forum organizers, attendees, speakers, contributors, volunteers for collaborating in the AAL Forum and for sharing their wide knowledge during the sessions. Their involvement during the AAL Forum was very important and provided an added value to the event. More than 500 participants attended the event and shared their experiences regarding the present and, more important, future actions in making ageing well.

The 6th edition of the AAL Forum offered the opportunity to meet outstanding speakers, to promote products and/or services to the potential beneficiaries, to open new collaboration and discover new markets.

INTRODUCTION

The Ambient Assisted Living Joint Programme (AAL JP) is an initiative involving 22 countries and its main objectives are to improve the living conditions of older adults through the use and development of AAL solutions and to strengthen the competitiveness of European industry in the AAL domain. The AAL Joint Programme was initially set up for a 5 years period between 2008 and 2013 but now will continue under the Horizon 2020 Program. The programmes planned total budget is 700 M€, of which approximately 50% is public funding – from the AAL Partner States and the European Commission – and approximately 50% is private funding from participating private organizations. The AAL JP projects are underpinned by the principle of 'independence'. 'Independence' is not only defined in terms of physical non-reliance on a career or health care professional. It also encompasses the far more important psycho-social principles of choice, autonomy and control that the person and careers are assigned for their lives' management.

The AAL Forum is the annual showcase event for the people involved in the AAL JP's projects and the AAL community. It is the core connection of the joint programme to the AAL Community. This community includes policy makers, ICT developers, manufacturers, health professionals, commissioners, businesses, venture companies, technologists, academics, designers, careers and of course older adults. Its purpose is to exhibit and demonstrate existing or developing ICT solutions (products and services), promote networking within the community, foster the interest of other sectors in the field of AAL, provoke debate and discussion on various topics and highlight new or emerging developments in the area to inform the AAL community.

The AAL Forum is the annual event, with an AALA partner state as the local host, for the increasing European AAL community to meet and discuss several topics, relevant for improving the AAL JP as well as the adoption of AAL solutions in the market. During the lifetime of the AAL JP the rotation principle through all AALA partner states stands at the AAL Forum organizing basis.

The former AAL Forums were organized by Austria, Denmark, Italy, Netherlands and Sweden as follows:

Year	Date and Location	Field
2009	29 September – 1 October 2009, Vienna, Austria	Innovative ICT Solutions for Older Persons: a New Understanding
2010	14 - 17 September 2010,Odense, Danemark	Active Ageing: Smart Solutions, New Markets
2011	25-28 September 2011, Lecce, Italy	Ambient Assisted Living
2012	24-27 September, 2012, Eindhoven, Netherlands	EU, and National Policies;AAL Projects: outcomes and future;From research to business: delivering innovations;Cutting edge ideas
2013	24- 26, September 2013,Norrkoping, Sweden	Ambient Assisted Living – Inclusion, Independence and Impact

The 2014 AAL Forum was co-organized by the AAL Association in collaboration with Ministry of National Education (MEN) and Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) from Romania between 9-12 September 2014 in Bucharest, Romania, at the Palace of the Parliament.

Organizing the 2014 AAL Forum in Romania under the title of Broader, Bigger, Better offered a good platform for innovation in ICT-related services for health, well-being and care and represents a good promoter of AAL concepts and research strategies within Eastern-European region and Balkans countries.

FORUM PROGRAMME COMMITTEE

The members of the Forum Program Committee whom have been involved in developing the technical and scientific activities of the forum and guiding the forum's programme, tracks and sessions are presented below:

Chairmans:

Rafael De ANDRES MEDINA, AAL Association President

Rafael De ANDRES MEDINA is the Head of the EU and Internationalization Division at the National Institute of Health Carlos III (ISCIII), Madrid (Spain) and the president of the AAL Association (November 2013 - November 2015), that manages the TFEU art 185 "Active and Assisted Living" R&D Programme 2014-2010. He is the chair of the Assembly of Member [countries] of ECRIN-ERIC (European Clinical Research Infrastructures Network) from January 2014 until January 2016 and he coordinates the EU-LAC Health ("Defining a Roadmap for Cooperative Health research between the EU and Latin America-Caribbean countries: a Policy Oriented Approach") that is mandated to provide the scientific support to the SOM Working Group of Health of the CELAC Joint initiative in Research and Innovation (JIRI). From 1987 until 1990 he was the secretary General of the National Plan for AIDS of Spain (Ministry of Health and Consumers Welfare, Madrid).

Adrian CURAJ, General Director UEFISCDI

Adrian Curaj is a professor of Research Management and the Director of the Centre for Startegic Management and Quality Assurance in Higher Education at the POLITEHNICA University of Bucharest. He is the Chair holder - UNESCO Chair on Science and Innovation Policies at the National School of Political Studies and Public Administration. He has a PhD in Control Engineering from the POLITEHNICA University of Bucharest, graduated the EMBA program of the ASEBUSS Bucharest and University of Washington in Seattle-Business School and the Global Management Program –Kennesaw State University. Adrian Curaj is the General Director of the Executive Agency for Higher Education, Research, Development and Innovation since 2010. He has been working as a consultant with World Bank, UNESCO, UNIDO and EC for studies in Tertiary Education, Science and Innovation, and Foresight. He is a member of the Board of Directors of the U.S. Fulbright Commission in Romania, and a member of RISE-Research, Innovation and Science Policy Experts at the EC.

Members:

PhD. Ir. Ann Ackaert received her Master in Physics in 1984, and her Master in Engineering Physics at the Ghent University in 1986. She obtained her PhD in Electronic Engineering at the same University in 1990.
From 1990 until 1995 she worked in the research department of Alcatel, Belgium. Her domain of expertise being hardware equipment for broadband switches. Since 1995 she works at the Internet Based Communication and Services (IBCN) research group at the Ghent University. Until 2003 she initiated and coordinated EU projects in the area of Optical Networking. Since the foundation in 2004 of the iMinds Strategic Research Center in Flanders for ICT innovation she is active in the domain of interdisciplinary e(Home)Care projects. She initiated / co-ordinated over 10 national projects since then, has been involved in national and regional study and advisor groups concerning eCare policies and she currently co-ordinates the AAL call5 Care4Balance project.

Anders Carlsson is a well experienced project manager with industrial as well as research and tech transfer experience in the domains of ICT, medtech and healthtech. He is regarded as the founder of New Tools for Health, while employed at the Tech Transfer Office of Linköping University. He is a well-experienced lecturer in the area of healthy ageing and independent living from an ICT perspective. Recently he took the initiative to establish the municipality of Norrköping as a national pilot and reference site in terms of technology for older adults, in connection with a national governmental initiative in Sweden. Among his international merits is a role as science and technology analyst at the Swedish Embassy to United States and coordinator in several EU funded projects. He was the chairman of the AAL Forum 2013 Programme Committee and responsible for the entire event, which took place in the city of Norrköping, Sweden.

Teresa Chavarría Giménez (PhD, Executive Master of R&D&I) is currently Program Director at the National Institute of Health "Carlos III" (ISCIII-Spain-), a public biomedical research and funding institution where she is Head Secretariat of the Alliance for Health Research and Innovation (ALINNSA), Head of "ISCIII's Outreach Program of Biomedical Research and Innovation" and National Contact Point of the AAL Program for Spain. In the same organization she has been responsible for the management and coordination of research programs driven by the Directorate General of ISCIII, both at the national and international level. Previously Dr. Chavarría worked as an Assistant Professor at the University of Extremadura. She has developed her research studies in the fields of Neuroscience, Programmed Cell Death and Cancer.

Ophelie Durand holds a Master's Degree in Political Science and European Affairs. She started working at the European Parliament in 2011 and joined in April 2012 AGE Platform Europe, the European largest network of organisations of and for older persons. She is responsible for the liaison with the European Parliament, coordinating inputs to legislations, liaising with the Intergroup on Ageing, and managing AGE campaigns towards MEPs. She is also following several health and ICT-related projects (Home Sweet Home, Aaliance2, Prosperity4All, JamToday, ENGAGED, etc.) and looks after communication and dissemination activities within the AFE-INNOVNET Thematic Network on age-friendly environments. Since 2012, she is AGE contact point for the AAL FPC.

Ioana Fagarasanu is working as Programme Officer for Joint Technologies Initiatives and Ambient Assisting Living Programmes at Executive Agency for Higher Education, Research, Development and Innovation, International Relations and Project Implementation Unit, Bucharest, Romania. She has experience in monitoring and coordination of projects and programmes in the field of innovation, communication and technology. Since 2004 Ioana Fagarasanu acts as associate professor at University "Politehnica" of Bucharest, Faculty of Automatic Control and Computers, Department of Automation and Industrial Informatics. She has published over 30 articles in journals, 50 papers in international conferences and 16 books. She has coordinated 3 research projects and 2 academic development projects. She is active as an expert of the European Commission (2007-2013).

Nicola Filizola holds a master degree in international relations and a degree in political science. He is the responsible of all the communication of the AAL Programme and since 2011 he is overviewing the Forum's format and organization. With a personal interest in old and new media, Nicola previously was the Media Manager at the United Nations Institute of Justice and Crime where he started and was the editor in chief of the Freedom From Fear Magazine. He worked also as production manager in the TV industry in the UK for British and Middle Eastern broadcast channels as well as in one of the major media NGO in London. He reported from Israel and UK for the Italian state owned radio over a couple of years.

Raquel Fernández Horcajada is the Programme Officer of the AAL JP. Her main responsibilities include the central management of a portfolio of AAL transnational research and innovation projects focusing on ICT for ageing, and improving the AAL JP's socioeconomic impact. Prior to joining AAL JP, Fernández spent five years as Project Officer at the EC Executive Agency for the Competitiveness and Innovation, developing innovation support instruments for SMEs. She also has extensive experience in the technological innovation sector, having spent 10 years working as Head of Sector of the Innovation Division of the Instituto Tecnológico de Canarias, S.A., a public-private research institute in Spain. Fernández gained her Master degree in European Economic Integration from the College of Europe in Bruges, Belgium. She holds a First Class (Honours) Bachelor degree in Economics and Business Administration from the University of Catalonia and an MBA from the Instituto de Empresa Business School, Spain.

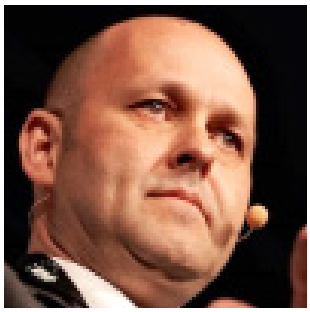
Urs Guggenbühl has earned a BSc. in Environmental Health from Leeds Polytechnic (UK), a MSc. in Applied Acoustics from the University of London and a PhD in Human Factors from the Swiss Federal Institute of Technology in Zurich (ETHZ). Professionally, he has gained experiences in Environmental Acoustics at the Swiss Federal Laboratories for Materials Science and Technology (EMPA) and in the research of Human Factors as a senior assistant leading a research group at the Swiss Federal Institute of Technology in Zurich. Moreover, he is experienced at entrepreneurship as founder, member of the board and CEO of a couple of start-ups in Simulation & Training and Health & Safety; his occupational career furthermore included the headship of the Centre of Innovation at the University of Applied Sciences FHS St. Gallen in the field of innovation management and AAL and working as a business coach supporting high-tech start-ups. Today he leads BaseCamp4HighTech, an incubator domiciled in Berne for high-tech start-ups and co-leads the Competence Centre AAL of the University of Applied Sciences St. Gallen. He supports Switzerland in AAL-JP as a member of the AAL-CWG and the AAL-Forum Committee.

Geja Langerveld is currently working at ZonMw, the Netherlands Organisation for Health Research and Innovation. Geja is the NL national coordinator for the Active & Assisted Living Joint Programme (AAL JP). On the national level she is active in the area of implementation of eHealth and ICT based solutions in the long term care. From 2001 – 2007 Geja worked for the ZonMw national programme Transparency & Consumer information about quality of healthcare providers. From 1984 until 2001 Geja worked as a coordinator of several projects in the field of education & welfare for children and teenagers in disadvantaged socio-economic urban area's. Education: Master's in psychology from the University of Utrecht, The Netherlands.

Karina Marcus has a degree in Computer Sciences and a PhD in Combinatorial Optimisation. She has spent several years in the public and private sector in the telecommunications area, working in Brazil, France, Canada and Belgium. From 2008 to 2010 she worked at the European Commission as a Research Programme Manager in the areas of Information Communication Technologies (ICT) for Environment and e-Health, contributing to policy implementation and strategy development in these fields. Since October 2011 she is the Director of the Central Management Unit of the Ambient Assisted Living (AAL) Association, responsible for the AAL Programme, which funds European projects in the area of ICT for Ageing Well.

Jackie Marshall-Balloch was born in Trinidad and Tobago where she qualified as an RGN in 1987 and began her nursing career in the UK in 1999. Jackie holds a Science Degree in Public Health, a First Class Honours BSc in Nursing (Older Adults) and a Masters in Nursing Education. She previously held posts at Brent PCT as a Ward Manager on a 60 bed Intermediate Care/Rehabilitation Unit, where she received commendations for leading on the Essence of Care and development of clinical training and education exchange programmes across acute and intermediate care settings. She was appointed Senior Lecturer in Pre-Registration Adult Nursing at Buckinghamshire New University in 2006 where she developed and led modules on Nursing Older Adults. In 2008 Jackie joined the Technology Strategy Board as Lead Specialist on the Assisted Living Innovation Platform, and plays a pivotal role in ensuring that humanistic and societal principles feature significantly in business and technological innovation for population ageing. She sits on the UK Age Research Forum and the editorial board of the Journal of Assistive Technologies. Her research interests are the sexuality and sexual health of older adults, as well as trans-cultural nursing education and practice.

Jerome Boudy is professor in Signal processing at Télécom SudParis taking part of the Institut Mines-Télécom. His research area is on medical, actimetric signal processing and data fusion process for health distress detection and prevention. For the last 10 years he has co-directed five PhD thesis on Biomedical and Health distress detection processing and is co-directing presently two thesis on speech-driven dialog system for Elderly and ADL signal time series classification with PIR sensors. He is presently partner in the AAL-vAssist project. He is co-animator of the Digital Health network at Institut Mines-Télécom and has published more than 60 papers or communications in specialised international or national conferences.



Claus B. Nielsen works with Health & care Technologies at DELTA, a Danish Research & Technology organisation. He has a long track record of working at the national level in politics, focusing mainly on ICT & innovation. He has been in charge of large national projects in the public sector within the elderly and health care sector, developing and implementing nation-wide ICT & mobile solutions. He has been the Local Government's member of the steering committee of MedCom (Danish health data network), the National Health Portal and contributed to the Danish national ICT strategies for eHealth. He is currently appointed as special adviser for the Danish government's Council for Telemedicine. He is involved in several international advisory boards, Programme committees and been part of several major EU R&D projects within the field of eHealth, Telemedicine and Ambient Assisted Living (AAL). He is a thought speaker at many conferences around the world.

Javier Valero (degree in Telecommunication Engineering and Bioengineering specialization) is currently member of the R&D&I Department in AMETIC, the Spanish Association of Electronics, ICT, Telecommunications and Digital Content companies. He is carrying out his labor as Technical Coordinator and Head Secretariat of eVIA Platform, the Spanish National Technology Platform for Health, Wellbeing and Social Inclusion. Mr. Valero has been involved in R&D&I projects for nearly ten years assuming the role of project manager and project coordinator in the private and public sector, primarily in the areas of mobile technologies and services innovation and ICT technologies applied to health and wellness area. He has been involved to the AAL Joint Programme, not only as a member of the AAL Forum Committee, but also has participated in several AAL funded projects during the last years as part of the technical management team in the Consortia.

Peter Saraga currently chairs the Advisory Board of AAL, and undertakes a portfolio of advisory activities in science policy and higher education. He formerly worked at Philips Research in areas including robotics, HDTV, and artificial intelligence. He then became Director of Philips Research Laboratories UK responsible for major programmes in displays, wireless communications, and interactive digital television. He was also a member of the international management team of Philips Research. He is a past President of the Institute of Physics, and was a Vice President and Honorary International Secretary of the Royal Academy of Engineering. He has been a Board member of the Higher Education Funding Council for England and Vice Chair of Sussex University Council. He is a visiting professor at Imperial College London, and also chairs advisory boards at the Surrey University, where he was awarded an Honorary Doctorate.

Dr. Pietro Siciliano is currently a Director of Research at the Institute for Microelectronics and Microsystems (IMM-CNR) at CNR in Lecce, where he has been working from many years in the field of Sensors, MEMS, Microsystems, being in charge of the Sensors and Microsystems group. He is author of about 360 scientific papers. Dr. Siciliano is referee and member of the advisory board of international journals. He has been responsible for several national and international projects at IMM-CNR. He is member of the Steering Committee of AISEM, the Italian Association on Sensors and Microsystems. He is Director of the Section in Lecce of IMM-CNR. He is President of the Italian Association on "Ambient Assisted Living" (AitAAL) and Responsible of "INNOVAAL", the Public-Private Partnership on Active & Assisted Living. He acted as chair of the JP art. 185 AAL Forum in 2011 in Lecce (Italy).

Dr. Reiner Wichert is head of the Fraunhofer Alliance Ambient Assisted Living and coordinating 11 Fraunhofer Institutes in this area. He is very active in the Action Group on Independent Living of the European Innovation Partnership on Active & Healthy Ageing of the European Commission. Additionally he is coordinator of the large scale pilot project ReAAL which will enable the Roll-out for Active & Independent Living applications on top of the open service platform universAAL with 7000 users in real life. Wichert got his PhD in 2004 at Technical University of Darmstadt. He is editor of 18 books and associate editor of the journals ACM Computers in Entertainment (CiE), Journal of Ambient Intelligence and Smart Environments (JAISE) and International Journal of Ambient Computing and Intelligence (IJACI) and was organizer of more than 30 conferences.

PLENARY SESSIONS

The plenary sessions gave us all a chance to come toghether to discuss, learn more and find new perspectives.

P1: Plenary session

Get together and grand opening of the Forum

This plenary session was dedicated to the opening of the event, including welcome presentations from the officials, focusing on the last achievements in the AAL field. The format brought together official opinion and technical ones in an interactive and pleasant environment. The plenary included the message of Neelie KROES -EU Commissioner for Digital Agenda, Vice-President EC.

Invited speakers:

Sorin Oprescu, Mayor of Bucharest
Remus Pricopie, Minister of National Education
Mihnea Costoiu, Minister Delegate for Higher Education, Scientific Research and Technological Development
Valeriu Zgonea, Chamber of Deputies President, Romanian Parliament
Peter Wintlev-Jensen, Deputy Head of Unit, DG Connect, European Commission
Rafael de Andres Medina, AAL Association President

P2: Plenary session

Local and regional authorities: Key actors for large scale deployment of AAL solutions

Many innovative solutions supporting active and healthy ageing have been developed as pilots across the EU, but they often remain isolated and do not get scaled up, not even in their own country. This means that their impact on addressing challenges of demographic change in Europe is limited. More and more the need to involve local and regional authorities and other stakeholders interested in promoting and supporting ICT for ageing well is recognized as being a key leverage to facilitate scale up of existing solutions and ensure significant economic and societal impact. Numerous local and regional authorities have launched in the past years ambitious initiatives to boost

ICT innovation for active and healthy ageing and their role is increasingly valued in AAL JP projects. The Plenary underlined the role of regional and local authorities play in support of active and assisted living, present existing regional strategies and discussed best ways to better integrate them in innovation.

Speakers:

Mr. Paul Timmers, Director of the Sustainable & Secure Society Directorate,DG CONNECT, Belgium
Mr. Casimiro Dias,Technical Officer,WHO,Denmark
Mr. Josep Oliva i Santiveri, Deputy President of the Social Welfare, Public Health and Consumers, Diputació de Barcelona, Spain
Mr. Liviu Dragnea,Vice Prime-minister, Minister of Regional Development and Public Administration, Romania
Mr. Rafael de Andres Medina,President, AAL JP, Spain
Ms. Anne-Sophie Parent, Secretary General, AGE Platform Europe, Belgium

P3: Plenary session

Award pitching

In this plenary session the best presenter of the selected projects was pitched in front of the panel and of the audience. The audience was invited to vote for the best pitch.
Two prizes were result from the voting of the audience and of the evaluation panel. In the evaluation panel experts from different area of expertise was invited, including, Business, Users and Industry.

The three finalists of this 2014 AAL Award were:

Assam (http://www.aal-europe.eu/projects/assam/) -The project was presented by Jeannine Budelmann and Bernd Krieg-Brückner
Confidence (http://www.aal-europe.eu/projects/confidence/) -The project was presented by Rolf Kistler and Cornelia Schneider
Ageing in Balance (http://www.aal-europe.eu/projects/aib/)- The project was presented by Milla Immonen

The winner was **Confidence** project.

P4: Plenary session

Epidemiology of innovation

This plenary session was focused on Innovation. Innovation is widely cited as a requirement for growth, but no-one ever seems satisfied with how much innovation we have. Direct support can be effective but is currently at a scale that does not deliver the required growth. What we need is a new way to look at, and support, innovation, and how it spreads within a business community. There are many parallels with the spread of a disease – the susceptibility of the community, the speed and vigour of the carrier and the effectiveness of the treatment (which in this case would be bad!).

Invited speaker:

Dr. David Bott, Independent Consultant, United Kingdom

After 26 years with BP, Courtaulds and ICI, spent in both their corporate centres and business units, David moved into start-ups 10 years ago, but was then diverted into 7 years setting up and directing the programmes of the Technology Strategy Board, the UK's innovation agency. He is now a non-executive Chairman of Flute Office and Oxford Biomaterials, a non-executive director of Oxford Advanced Surfaces, a Principal Fellow of WMG at Warwick University and has engaged in a wide variety of activities involving materials, design, sustainability and innovation.

P5: Plenary session

Closing

The closing session summarized the most important features of the Forum: what were the expectations, what was the reality. The future vision of the AAL Programme was outlined. During this session took place also the awarding ceremony for the AAL Project Award 2014 and Young Researchers Workshop Award.

Invited speakers:

Prof. Paolo Maria Rossini, University Hospital Agostino Gemelli
Rafael de Andres Medina, AAL Association President
Adrian Curaj, General Director UEFISCDI

PARALLEL SESSIONS

TRACK A

TRACK A
DEPLOYMENT OF AAL SOLUTIONS

The “Silver economy” is the notion that an ageing population is creating a demand for new services and products ranging from personalized care to age-friendly technologies, environments and other solutions that enable them to maintain healthy independent lives. Innovative ICT-based products, services and systems have a strong empowerment potential among older adults, creating better conditions of life as well as fostering industrial and business opportunities.

In spite of this capacity, often new initiatives fall short on their potential to deliver. Thus, one of the actual challenges is to ensure effective large scale deployment supported by a strong user integration of these solutions, bringing products and services to the European and global market and creating age-friendly societies.

This track presented ways for reaching out new markets, the benefits of creating appropriate alliances bringing together commercial, academic and healthcare stakeholders and involving end users and citizens in the design and development of solutions.

The track had 5 sessions:

A1. Reaching out new markets
A2. Gamification
A3. ECHAlliance Ecosystem
A4. Living labs
A5. IPR

A1. Reaching out new market

Session Chair: *Luiza Spiru, FAAI, Romania*
Session Responsible: *Ioana Fagarasan, UEFISCDI, Romania*

Ambient Assisted Living (AAL) comprises interoperable concepts, products and services that combine new information and communication technologies (ICT) and social environments with the aim to improve and increase the quality of life for people in all stages of the life cycle. Several regional and national initiatives are emerging around Europe to support public and private investment, several providers are developing innovative AAL solutions, end-users are considered but new markets and opportunities must be addressed.

New markets as east European countries associated EU states or even non – EU members' states must be considered. Knowing potential of the market, adapting to their needs and collaborating with possible stakeholders in the countries could be a good opportunity to reach out new markets.

Contributions:

A1.1. Commercialization strategies for an assistance service for people with dementia in Eastern and Western Europe Viktoria Willner, Cornelia Schneider – Salzburg Research Forschungsgesellschaft m.b.H. (Austria), Andrea Paprotta - Switzerlandcom Participations (Switzerland) Cornelia Sicher - ilogs mobile software GmbH, Rolf Kistler - iHomeLab – Hochschule Luzern, Omar Esli Jimenez Villarreal -YOOOM (The Netherlands), Alexandru Sterea - Ana Aslan International Foundation (Romania)

A1.2. Fitting adaptive real-time technology to the population and regional resources across the EU Stefan Carmien, Ainara Garzo – Tecnalia (Spain)

A1.3. Testing Innovative E-Health Solutions in Romania Luiza Spiru, Ileana Turcu, Ligia Prisaca Manesi – Ana Aslan Internatonal Foundation (Romania)

A1.4. Business opportunities for ICT systems in AAL field related to Romanian market Dr. Monica FLOREA – SC SIVECO Romania SA (Romania)

A1.1. Commercialization strategies for an assistance service for people with dementia in Eastern and Western Europe

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ABSTRACT

Due to the aging society, dementia is a rising problem all over Europe. People become more and more reliant on care and gradually lose their independence and mobility, and as a consequence costs for public health will increase. Therefore, within the Confidence project, services for assisting people with dementia as well as their informal and formal carers are being developed. In addition to the development, the commercialization of such a service throughout Europe is a demanding task. Cultural, economic and health care related differences of several countries have to be considered when distributing Confidence services. In this paper, three different approaches based on field trial results in Austria, Romania and Switzerland are presented.

Keywords: assistive technology, dementia, commercialization strategies

1. Introduction

Changing mortality patterns in Europe lead to a growing number of older people suffering from various age-related ailments. One of the challenges in this context is the rising number of people suffering from dementia [*1*]. Dementia subsumes a group of diseases which have various effects on the daily life of people concerned. Symptoms like memory loss, disorientation or inappropriate social behavior make it difficult to cope with everyday activities. As dementia can affect a person in different ways (its progression depends upon the impact of the disease itself as well as the person's personality and state of health) it also poses enormous challenges for informal carers [*2*].

Thus, in recent years, people recognized that the possibilities of information and communication technologies (ICT) might support both the elderly people concerned as well as their carers in dealing with difficulties caused by the disease [*14*]. Current assistance services for people with dementia are often limited to actively raising an alert or location tracking. Consequently, they are poorly accepted by the target group. Moreover, existing services are often tailored to specific sales markets. As a result, they are typically not adaptable to the varying models of elderly care in different European countries [*15*]. For this reason the Confidence project aims at providing mobility safeguarding assistance services which are adaptable to the individual needs of people with dementia and to different European markets. Therefore, Confidence combines assistive technologies with personal help. On the one hand it supports patients (the primary end users) in being more independent and active as long as possible and on the other hand it

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provides a safety net which helps to decrease the burdens on their carers (the secondary end users). In its current state, the system is able to integrate volunteers and manage care communities in order to relieve carers and health care organizations. Functions and design of the system have been developed together with end-users in order to meet their needs and wishes. An individually configurable smartphone application for people with dementia and their carers offers the following basic functions (cf. Figure 1)

Assistance: If a primary end user needs help in dealing with specific challenges that may arise in his/her daily routine he/she has the possibility to get in contact personally with a carer via a voice or video connection.

Emergency: In case of an emergency the SOS button can be pressed by the primary end user. The alerting chain is processed in the background and the responsible carer gets informed automatically.

Environmental service: Current weather conditions and tips for suitable clothing are provided to the primary end user on demand.

Daily schedule/reminder: This service provides information about tasks and appointments. Reminders for tasks and appointments appear automatically and are read out loud at a pre-defined time.

Navigation: If the primary end user needs help on his/her way home, he/she can use the service to be guided home.

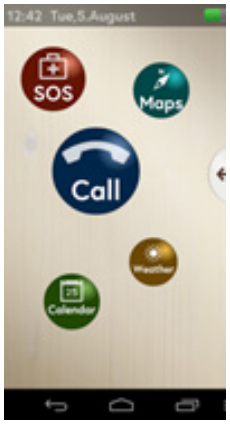

Figure 1: Confidence - mobile application

Within the current project phase, business and end user partners have developed first concepts to commercialize the project results. In the remainder of this paper, first findings will be presented.

2. Market perspective

Alzheimer Europe estimates that currently 8.7 million people in Europe (EU-28) live with dementia [*13*]. As many more people, especially in the state of mild to moderate dementia, have not been diagnose yet. This number could also be much higher. Due to the demographic change in industrialized countries, people are getting older and consequently the prevalence of dementia is increasing exponentially. The number of people with dementia is expected to almost double every 20 years [*3*]. As a result, costs for public health will increase, because people

become more and more reliant on care. In 2008 it was estimated that the average costs per dementia case were about € 22.000 in Europe [*4*]. These costs are dependent on the type of care (informal or formal care), stage of the disease (mild, moderate or severe) and living situation (at home or institutionalized) [*5*]. Moreover, costs vary from region to region and are more than twice as high in Western European countries than in Eastern Europe [*6*]. For the individual health care systems in Europe it will be a big challenge to meet the costs of dementia in future. More cost-efficient alternatives to existing care measures have to be found. For people in early stages of dementia or even with mild cognitive impairments as well as their informal carers, the Confidence system might be a complementary, relieving care measure.

3. Trial regions

Confidence intends to implement a system applicable to almost all European countries. Thus different cultural and socio-economic backgrounds and specific care system characteristics had to be considered during the implementation phase. In order to guarantee a stable and well-accepted system when entering the market, Confidence is tested by end users in daily use in two field trials in three different European countries (Austria, Romania and Switzerland).

Austria is situated in the German-speaking center of Europe and consists of nine provinces. Health and social care are regulated differently – health is subject to federal and social care to provincial regulation. There are many social and health care service providers operating in Austria [*9*]. Cash benefits, which depend on a threshold level of care needs, are provided for care-dependent persons. It is up to the recipients to decide whether to buy services or to use the amount to pay informal carers [*10*]. As in other European countries, the number of people suffering from dementia is increasing. In 2012 the number of affected persons was 145.432 which was 1.73 % of the total population – a little higher than the EU average which was 1.55 % [*16*].

Romania is situated in South-Eastern Europe. The country is divided into 41 counties or districts, plus Bucharest. The county and municipal authorities are involved in the management of care for the elderly. Currently there is a shortage of institutionalized services and home care is the most commonly used option for dependent elderly people. However, family care is ensured mainly in rural areas [*11*]. The number of people suffering from dementia was lower than the EU average in 2012. 1.26 % of the Romanian population and 270.304 persons in total were affected by the disease. [*16*].

Switzerland is situated in the Middle of Western Europe. It is divided into 26 cantons, each with its own specific health care system. The municipalities and cantons organize and provide care for the elderly. Parts of long term care expenditures are covered by the mandatory health insurance or other benefits. Home-based care activities are an important component of the health system. However, there is no public care support for informal carers. The so-called Spitex employs formal care givers that provide domestic aid and professional care services especially to disabled and frail elderly people. About half of these costs are met by public sources [*12*], whereas only the basic health care services are covered. Services such as domestic aid, supervision, etc. need to be paid privately. Alzheimer Europe estimates the number of people with dementia in Switzerland in 2012 as being 133.722 which represents 1.73 % of the total population [*16*].

4. Commercialization strategies

Based on a market analysis and findings from a first field trial in Austria, Romania and Switzerland, three approaches

for bringing Confidence to the European market have been proposed.

The first approach presented is called "**care organization based model**". Within this model, Confidence is hosted by a service provider and distributed by a social care organization. Primary and secondary end users can buy Confidence as additional service from the social care organization (service only or service and smartphone). User administration and support is done by the social care organization. Formal carers are trained to use the system and are able to support primary and secondary end users in getting familiar with it. Thus social care organizations are able to extend their service portfolio. Additionally, care organizations have the possibility to enlarge their care potential by involving volunteers via the Confidence community portal. Volunteers earn credits for performing Confidence tasks, which will be rewarded (e.g. money, reduced service fee, coupons, etc.) by the social care organization. This model will be applied to distribute Confidence in Austria, where many social service providers operate. The concept was already deployed within the first field trial in two regions of the province of Salzburg. Employees of a care organization who were in direct contact with end users were responsible for distributing Confidence. The field trial showed that this concept worked well in a rural and urban area and will therefore be used after the project to enter the market in Austria.

The second approach presented is called "**community portal based model**". The difference between the two approaches is that the system is not distributed by social care organizations, but by municipalities or similar institutions, and that service only will be available. Furthermore, it is their decision whether they include professionals for emergency calls, e.g. the Red Cross. In principle this service model relays on family members and volunteers, who are organized in a care community. Organization and administration of users will be done by the community itself. No compensation for volunteers is planned for in this model. This model will be applied in regions where social service organizations are less common. In Romania a modification of the "care organization based model" was tested within the first trial. The distribution of the system was done by a private memory clinic. End users had to come to the clinic to get supported. In the upcoming second field trial a mixture of "community based model" and "care organization based model" will be tested. Volunteers will be involved in field trials.

The third commercialization strategy is called "**provider based model**", the most traditional way of distributing technical systems and services. Service providers such as local branches of the Red Cross – which already provides emergency calling systems or care aids for rent today – could sell the service. Another interesting business opportunity might open up for telecommunication providers, who distributes the Confidence services together with an appropriate smartphone over their distribution channels e.g. branch stores or online shops. User support is done via a help desk. The big difference to approaches presented above is that volunteers are not included here. Due to the fact that volunteers and also formal carers are not integrated, relatives or a call center provided by the telecommunication provider are needed to use the system. For market entry this model will be applied in Switzerland. Healthy elderly people or even people with mild cognitive impairments can purchase the system directly from a provider there. This user group already tested the system within the trial. One member of an association of healthy elderly people introduced and supported the primary end-users there. Technical support was provided by a technical project partner.

5. Conclusions

It is clear that assistive technologies are useful to support the increasing number of people suffering from various age-related diseases in Europe. The market is huge and different conditions demand diverse commercialization strategies. Therefore, three approaches (care organization based model, community based model and provider

based model) were presented to address different characteristics. The care organization based model has been successfully applied within a field trial in Austria. Care professionals directly distributed Confidence among their clients and trained them to use it. It showed that this model is suitable in countries where social care organizations are well established. In Romania and Switzerland a modification of this model was tested in the first field trial. Further community and provider based models have been developed. A second field trial will show if these models are more likely to fit for those two countries and will help to improve them. Market strategies will always have to be adapted to particular conditions in order to be able to commercialize specific technologies. However, further studies to identify these specifics should result in more suitable business models and better market possibilities.

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A1.2. Fitting adaptive real-time technology to the population and regional resources across the EU

Stefan Carmien[1] , Ainara Garzo[2] – Tecnalia (Spain)

ABSTRACT

The ASSISTANT AAL project supports older adults using public transportation using real time location data and publicly available route and schedule information. ASSISTANT is targeted at those public transport agencies that do not have the resources to create such applications

Keywords: Assisted public transportation use, infrastructure re-use

1. Introduction

The AAL program is aimed to support 'the emergence of innovative ICT-based products, services and systems for ageing well' supported by 'developing common approaches and facilitating the localisation and adaptation of common solutions'. Part of aging well is being able to continue to be mobile in ones own community. While using public transportation can be daunting for elders, giving it up can have deleterious repercussions. Fortunately the current IT environment includes the availability of real-time location data as well as common file structures for storage of telemetric data. This situation, combined with widespread mobile data connectivity and ever cheaper smartphones with a plethora of sensors and powerful processors, has created a environment ready for creating systems that provide real-time travel support for elders continuing use of public transport.

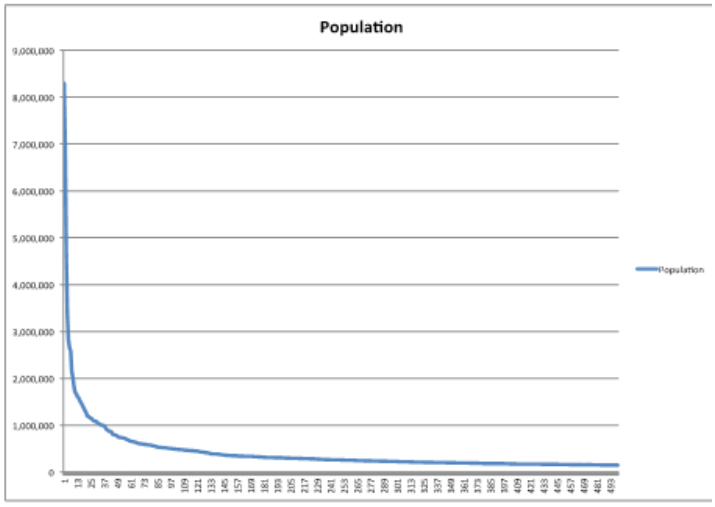

Figure 1 - Urban population in EU

However the creation of a system to incorporate all the available data and implement it on new hardware platforms is not a trivial task. Very large urban transit systems are already creating bespoke systems to do this, however for regions with populations below 150,000 the resources to design, implement and support such systems is too large a percentage of their available resources; and the significant percentage of the population of the EU live in such areas, which is often described as the long tail phenomenon [*1*]. The AAL ASSISTANT project [*2*] addresses this problem

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and is designed to fit into this specific economic niche, using open source software (Open Trip Planner [3]) and common file systems (General Transit Feed Specification [*3*]) which many mid sized European transport systems are already publishing (and doing on-going updates of) their transport data.

2. **Providing adaptive real-time technology with respect to geographic density and available resources in the EU**

An analysis of the distribution of EU urban size and population shows that in 2003 the EU population was 458 million [*4*] of this 497 cities are larger than 150,000 (see Figure 1) which accounts for 211.5 million, so in 2003, 54% of the population was in cities (and rural areas) of less than 150 thousand and 46% in the larger cities. This both shows the potential market share and the motivation to provide the Open Travel Planner approach. The commercial advantage of addressing the long tail, is that while the price of installation and upkeep may be (and is designed to be) relatively small and affordable, the number of urban areas below the 150 K population line is numerous (about 450 between 200,000 and 50,000[*5,6*]).

ASSISTANT involved final users and transport companies from different European countries, with the aim of generating solutions that fits with the real needs and requirements. In this project, researchers have put special attention into the design of the application to adapt it to elderly and also to create a final product that can reach the market. In ASSISTANT, stakeholders were involved in every phase of the project including co-designing and evaluation to ensure that the final product is adapted to future clients.

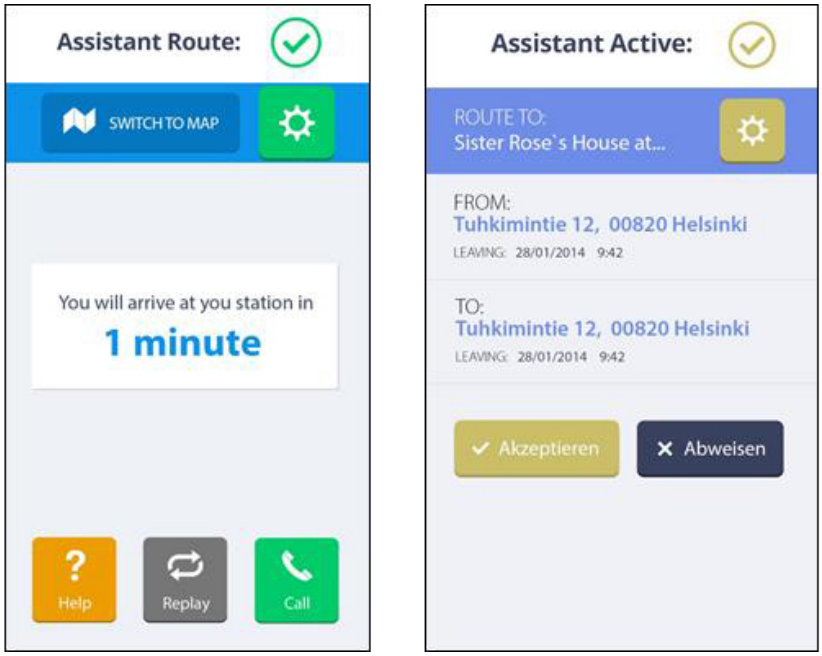

Figure 2 - (left) PND[1] travel prompt (right) PND route loading

1 A PND is a Personal Navigaiton Device, in this case an application on a smartphone

The interface and functionality are built to fit older adults specific needs and customisable to accommodate any special requirements that aging and fading abilities require. Additionally the system captures problems in the trip and has personalised mitigation strategies to apply that conform to the users requirements. Another unique offering of ASSISTANT is providing guidance to the user for the "last kilometre" of the trip – from the last transport stop to the voyage goal (as well as the first kilometre – from the starting place to the initial transport stop); ASSISTANT, like another AAL project (Name [*7*]), takes into account the realities of GPS reliability in urban 'canyon' environments and does not promise GPS guidance but rather a set of guidance tools that are reliable and work with the users ability rather than replace the end-users ability.

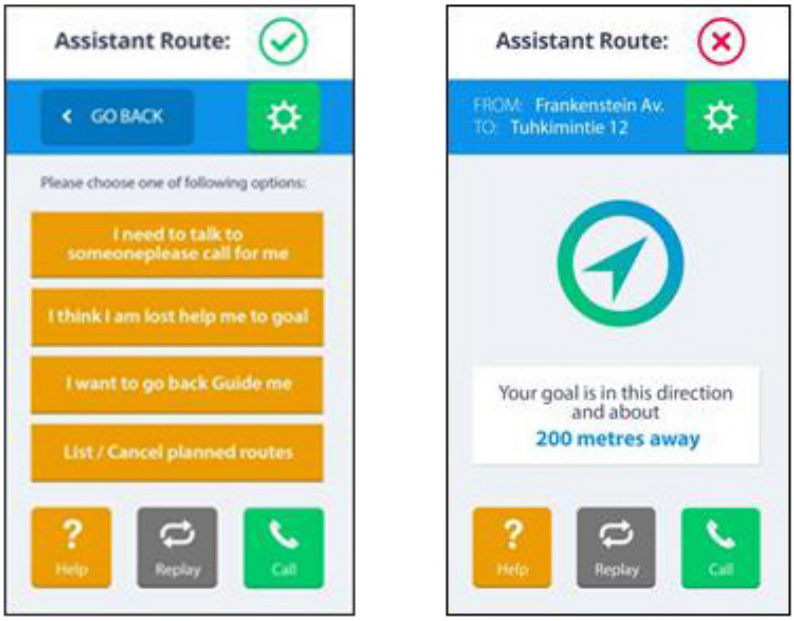

Figure 3 - (left) PND last kilometre instruction (right) PND asking for help

Expecting that there will be also large urban transport organizations that may not be ready or interested in creating their own system similar to ASSISTANT, especially with regards to the personalised user interface that will conform to atypical user needs and abilities as well as mitigation of 'lost' conditions and the unique last kilometre guidance from the last stop to the trips goal, ASSISTANT provides an alternative base system that can, with a small amount of customisation (which is part of the exploitation plan), utilise the API that these large systems typically provide for route planning an real-time tracking. Both of these base systems will be instantiated and undergo field trials in cities, the API in Vienna and Helsinki, the Open Trip Planner in San Sebastian (Spain).

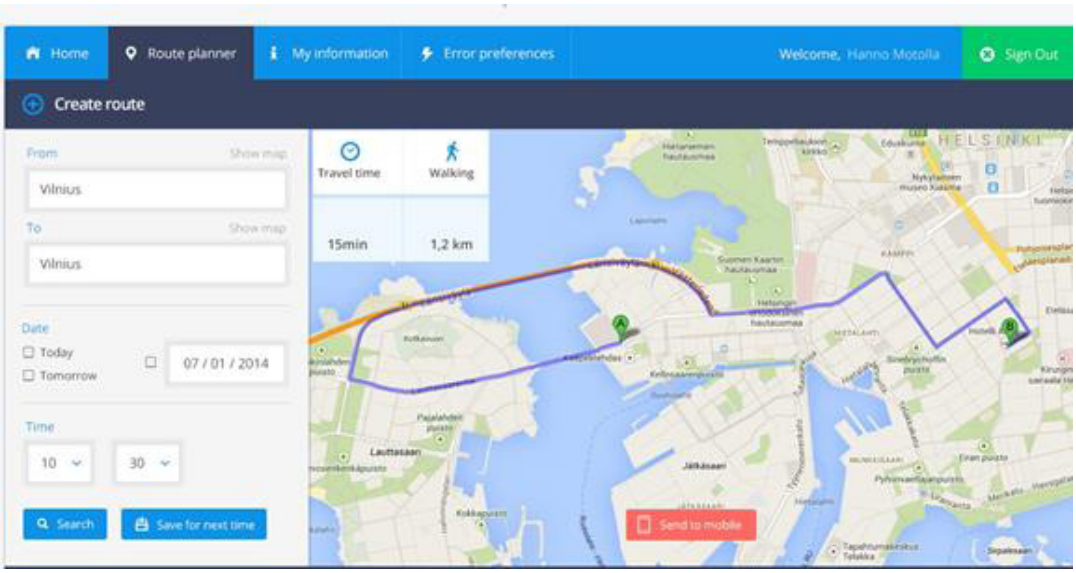

Figure 4 - Browser based route editor

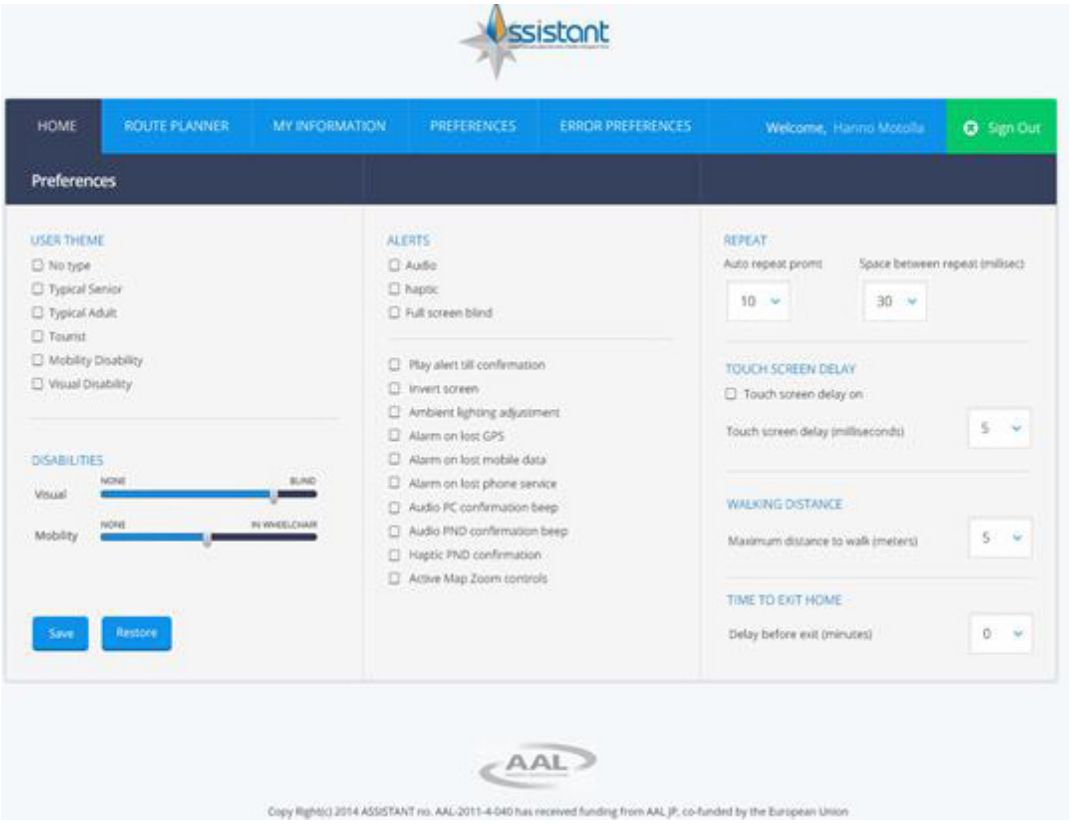

Figure 5 - Browser based user preferences editor.

3. Conclusions

ASSISTANT pulls together the fortunate confluence of cities public transport systems exporting their routes, schedules and stop location into common file formats and committing to updating them regularly allows our system to have current and near future data that matches the day by day in the case of schedules, i.e. weekend, holidays and seasons as well as reflecting new routes and stops which are not separate from the local system but the same data as the system uses. Similarly assistant is built so that localization of the interfaces language is a matter of dynamically choosing a new file to base the user interface on. The goal is that the base system and documentation will make the implementation of a new system easy and tying the support with a commence model similar to those of open source customizing and integration consultants.

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A2. Gamification

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Session Responsible: *Anders Carlsson, New Tools for Health, Sweden*

Using the technique of gamification is primarily not about making games, even not so called "serious games". It is rather about the use of game thinking and game mechanics in non-game contexts in order to engage users. It is applied in different domains to improve user engagement, data quality and learning. The key of gamification is the reward. Reward may be quantified and related to the completion of a task.

Gamification may be well suited in order to encourage older adults to start using assistive solutions well in advance of when they urgently need them. And, when they really need them they know how to use them.

The session explained the techniques of gamification and gave examples of well working solutions, preferably from the self-care field as well as from the field of stimulating physical activity in order to maintain health and mobility. Finally, a discussion was held regarding how further applications of gamification may boost increased independence and further exploitation of assistive solutions for older adults.

Some specific questions were brought up for the discussion:

- To what regard differs the design of gamification solutions for older adults from gamification solutions in general, i.e. for younger people or other age groups? Is there a guideline of best practice?
- Smartphones are obvious platforms for gamification, but what other existing and future platforms may be used?
- Good examples of where gamification has been applied in order to encourage the use of assistive solutions.
- Research made on best practice when applying the gamification technology to applications for older adults.

Invited Speakers:

Sebastian Deterding, Rochester Institute of Technology, USA – Key note introduction Pamela M. Kato, Coventry University, United Kingdom (TBC) – Teaching through gamification

Contributions:

A2.1. Are Serious Games Promoting Mobility an Attractive Alternative to Conventional Self-training for Elderly People? Viviane Hasselmann, Peter Oesch – Kliniken Valens (Switzerland)

A2.2. Gamification on Users Daily Activities, Pereira Jose, Bruno Aguiar - Fraunhofer Portugal – AICOS, Rossetti Rosaldo- LIACC-DEI/FEUP, Sousa Filipe – Fraunhofer Portugal – AICOS (Portugal)

A2.1. Are Serious Games Promoting Mobility an Attractive Alternative to Conventional Self-training for Elderly People?

Viviane Hasselmann[1] , Peter Oesch[2] – Kliniken Valens (Switzerland)

ABSTRACT

Maintaining mobility of elderly persons has become a primary goal within European healthcare services because reduces institutional placement and mortality. Mobility exercises are conventionally instructed by physiotherapists using handouts, allowing self-exercising. However compliance to self-training is low, since exercises are considered tedious, thus prematurely stopped.

This clinical trial aims to determine whether elderly inpatients show higher adherence to self-training when using serious games than when performing conventional exercises. Secondly, we explore patients' mobility development accordingly. Results will provide insight into the effectiveness of serious games promoting mobility and contribute to understand the motivational potential of serious games in this population.

Keywords: elderly; self-training exercises; serious games; Kinect®; FitBit®; adherence; mobility

1. Introduction

The European population is getting older [*1, 2*]. Due to these demographic changes the need for adapted medical services for this specific age group has become critical. From the international literature several studies have proven the effectiveness of rehabilitation programs for geriatric patients [*3, 4*]. A recently published systematic literature review and meta-analysis demonstrated that specific inpatient rehabilitative programs increase physical abilities of elderlies and reduce institutional placement and mortality [*5*]. However, unsufficient data enabled to properly define all the features of a successful and efficient rehabilitation program.

In order to improve cardiorespiratory and muscular functions, and to reduce the risk of non-communicable diseases, depression and cognitive decline, the WHO recommends that adults aged over 65 practice aerobic physical activity for at least 150 minutes of moderate intensity or 75 minutes of high intensity per week [*6*]. Moreover, elderly people should perform strengthening exercises minimum twice a week and balance exercises minimum thrice a week. In this manner, to increase therapy intensity and thus independence in activities of daily living, older patients admitted to rehabilitation are often instructed customized self-training exercises. These self-training programs, likewise therapist-assisted sessions, improve significantly physical capacities [*7*], and thus serve as a proven efficient and cost-effective mean for rehabilitation settings. However, the compliance of elderly people to execute self-exercise programs varies considerably. These programs are often considered as tedious and boring, hence prematurely stopped [*8,9,10,11*]. An alternative to increase patient's motivation for self-exercising is using serious games promoting mobility.

Nowadays computer games promoting mobility are commercially available in the leisure sector and for various

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video game consoles such as Nintendo Wii®, Xbox Kinect® or FitBit®. A feasibility study demonstrated that stroke patients were highly motivated to use Nintendo Wii® game console for training balance exercises [*12*]. However, some studies indicated constraints and difficulties during the manipulation of the commercial Nintendo Wii®: games are designed for the young and healthy audience and so older users need a lot of technical help [*13,14,15*], motions and interactions through a console make it more difficult to manipulate [*16, 17*], scores and progress measurements are too generic for rehabilitation use [*16*].

Although the use of serious games for exercising mobility and balance in rehabilitation settings has considerably expended in the past years, this research field is at an early stage and randomized controlled trials with sufficient subjects are still missing [*18,19,20,21*]. Furthermore, the law of attrition is a specific challenge in the evaluation of computer-based trials [*22*]. Therefore the primary objective of our clinical trial is to determine whether elderly people in rehabilitative settings show higher adherence to self-training when using serious learning games than when performing conventional exercises. Secondly it explores balance and mobility performances according to the mode of self-training. The purpose of this paper is to describe the study protocol and to present preliminary findings.

2. Methods

Study design The present study is part of the international GameUp project [*23*], focusing on game-based mobility training and motivation of senior citizen, and co-funded by the European research and development project "Ambient Assisted Living" (REF. AAL-2011-4-090). It consists of a double-site (Valens Rehabilitation Clinics and O'Berri Instituto Vasco de Innovacion Sanitaria), single blind, randomized controlled trial with two parallel-groups (conventional self-training exercises vs serious games exercises), two assessment periods (pre- and post-intervention) by an examiner and daily data collection in a logbook by the patient himself. Participants are randomly allocated to the intervention group or to the control group, with an allocation ratio of 1:1. This study was modeled following a feasibility study carried out in Valens Rehabilitation Clinics in 2012 [*5*] and designed to complement the knowledge gained via multiple qualitative research methods used in GameUp (i.e. focus groups, semi-structures interviews).

Requirements As the Kinect® game console seems to display an easier navigational structure (no console is needed), and thus facilitates its handling, this game equipment is used for this clinical trial. Due to their lack of computer skills, serious games intended for elderly people should reproduce as much as possible activities of daily living [*24*] with little simultaneous information and few options but with enough time for assimilation [*25*]. These requirements are usually not met by standard commercial serious games. Based on these considerations and as part of the GameUp project, new serious games promoting mobility are developed on Kinect® for Windows and focus on the WHO physical requirements of elderly people. The patient performs exercises to enhance his mobility, strength, balance and endurance performances by means of the Kinect® game console and the Fitbit® pedometer.

Inclusion criteria Patients above 65 years old, able to walk independently over 20 meters and for whom self-training has been prescribed are included in this study. Patients with cognitive impairment (Mini Mental State Examination < 26) and other limiting disorders are excluded.

Study flow Once included, study participants are stratified in four groups according to their balance capacities (Berg Balance Score ≤ 44 or ≥ 45) and according to their computer skills (computer experience or no computer experience). This stratification reduces the risk of bias in relation to the training adherence: on one side, it avoids that more computer experienced participants are included in the Kinect group and on the other hand, participants

with poor balanced capacities are equally distributed in both groups. Strata are then randomized in Microsoft Excel, so that participants are randomly assigned to one group. The examiner is not informed of the group allocation.

Intervention Participants are entitled to two time-slots à 30min per day, from Monday to Friday, dedicated to self-training in addition to the usual rehabilitation services, and this during the ten days of the intervention period. Self-training programs are instructed by a trained physiotherapist and appropriate balance exercises are selected according to the patient's balance capacities. The Berg Balance Scale (BBS) is used as a cutoff point. A BBS score < 45 indicates a risk of falling, and thus patients scoring less than 45 points perform the balance exercises in sitting position only. Patients scoring between 45 and 56 points perform the balance exercises in static standing position, whereas patients reaching the maximum score of 56 points perform exercises in dynamic standing position. During the instruction, patients are told the following: "From Monday to Friday, you can use every available free time to carry out the self-training program. Perform the self-training exercises as intensively as possible, and as often as you want." Additionally patients are encouraged to walk and climb stairs instead of using the lift, in order to improve their endurance.

Outcome measures The primary outcome measure is the intensity of the performed self-training. It is based on the frequency (quantity) and duration (time in minutes) of individual self-training sessions. The patient records daily the data in a logbook during the whole intervention phase (10 working days). Secondary outcomes are mobility and self-perceived fall efficacy assessed with the German and Spanish version of the Fall Efficacy Scale-International version (FES-I) [*26, 27*]. Mobility is assessed with Berg Balance Scale (BBS) [*28*], a widely used clinical test of a person's static and dynamic balance abilities and a tri-axial accelerometer measuring Local Dynamic Stability [*13*]. LSD is a non-linear gait stability index quantified by calculating Lyapunov exponent. It has been advocated as an early indicator of risk for falls [*29*].

3. Conclusions

To our knowledge this study is the first to compare conventional self-training programs with serious games among elderly persons. Previous studies have been focusing on qualitative issues and in a lesser extend looking into clinical outcomes. Results will provide insight into the effectiveness of serious games promoting mobility and contribute to our understanding of the motivational potential of serious games in elderly people. One of the main characteristics of this study is its focus on the patient self-training. We foresee that game technology can be of high importance to tackle the low adherence to self-training, so increasing the effectiveness of rehabilitation.

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A2.2. Gamification on Users Daily Activities

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ABSTRACT

Mobile applications increasingly play an essential role on people's lives, they help us to perform our daily tasks more efficiently. The ease of access for developing such applications has led to our disposal a wide range of applications that involve areas such as healthcare, leisure, education, etc. Gamification is the use of mechanical game design concepts applied in non-game contexts in order to make an activity more interesting. This technique has been adopted in recent years by a lot of services in order to increase the user involvement with the platform itself. This concept is applied in many non-game contexts and physical activity is no exception. Actually, this concept has obtained a lot of success in this area since users improve their health while challenging themselves or other users within the network. This work aims to prove how Gamification can be used in order to encourage the practice of physical activity. With this intention, a platform was developed which is constituted by a Web application that allows the creation of gamified elements that subsequently are sent to a mobile application which challenges and promotes their users to improve their levels of physical activity. Machine learning algorithms were integrated in the platform in order to adapt the application to different type of users.

Keywords: Activities of Daily Living, Gamification, Machine Learning

1. Introduction

Gamification applies elements associated with video games (game mechanics and game dynamics) in non-game applications. It aims to increase people's engagement and to promote certain behaviors. Although the concept has been explored primarily in the marketing area, the potential of its application has been extended to other areas such as Health, Environment, Government or Education [*1*].

Physical inactivity has been identified by the World Health Organization (WHO) as the fourth leading risk factor for global mortality [*2*]. An adequate physical activity level has been shown to help the prevention of several pathological conditions such as obesity, cardiovascular diseases, osteoporosis, cancer and depression [*3*]. Being so, physical activity promotion programs should target people of all ages [*4, 5*] and are becoming the focus of several studies [*6, 7*].

This current situation motivated the need to analyze the effect of Gamification techniques in people's behavior in order to motivate them to improve their level of physical activity. When performing more physical activities these people will be adopting a healthier life style improving their life quality. At the same time, it will encourage social interactions, decreasing loneliness, which can also be a major issue for inactive people.

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The presented project consists in developing a mobile application along with a web framework that aims to evaluate the effect of Gamification techniques on user's lifestyles. The project goals can be divided in three main development focuses:

- Development of an Android application which motivates their users to increase their physical activity (walking, running, etc.) through Gamification techniques;
- Development of a web application which works as a framework used by users who want to add new content to the system;
- Implementation of a machine learning algorithm which adapts the use of the application to each level of user physical activity;

2. MoverGami App and MoverGamiWeb

The proposed solution consists of a mobile application for Android named *MoverGami*, which is responsible for the gathering of activity data and all the interactions with the user, and the web application MoverGamiWeb, which operates as a framework to manage and add new contents to the platform.

Regarding the mobile application, the gathering of physical activity data is performed resorting to the *Mover* mobile application [*7*], which was previously developed at Fraunhofer AICOS. *Mover* resorts to machine learning techniques in order to keep track and monitor the user's physical activity, identifying the activity the user is performing (walking, running, sitting, standing, laying). Additionally, *Mover* also computes the total distance traveled, steps taken and calories burned. *MoverGami* mobile application reads all this data, building the user personal activity record. This record is then presented to the user as statistics and is also used to trigger the game elements.

The MoverGami mobile application will be aimed for common users with a simple and intuitive graphical user interface. This interface contains the gamified component of the platform, where users can access their information, view statistics, interact with other users, obtain new challenges and collect badges. The game elements included in the application are briefly described below:

- **Statistics:** through the data from *Mover, MoverGami* accumulates the information about values regarding distance traveled, number of steps given, calories burned and total time per activity. Therefore, users can consult their average walking or running speed, how much time they spend for in each activity, their current level and progress in experience points. Users earn XP (experience points) by burning calories (1kcal burned to gain 1 XP), and when they reach the upper limit of a level the user unlocks a new reward.
- **Badges**: representation of achievements. They are graphical and text representations that show the user has reached a certain level or accomplished some objective.
- **Leaderboards**: represents a ranking, telling exactly the player's position relative to other players in a list. They give feedback about competition, i.e., how well some player is doing relative to others and who play the game.
- **Points**: points or experience (XP) are earned through number of calories burned. The more calories burned more points the player will possess.
- **Facts**: *MoverGami* measures and analyze users features data (distance traveled, calories burned, number of steps, etc) and players receive statements through dialogs "Did you know?" relating the data from the features to facts linked to culture.
- **Content unlocking**: the content to be unlocked on *MoverGami* are rewards. These rewards are generally

cultural, motivational or funny images.

- **Challenges**: the player should perform a task within a certain range of time, with a defined lower and upper time limit. Challenges are proposed within a certain range of time and users must achieve something in order to earn points.
- **Social Graph**: is the possibility of seeing friends who are also in the game. Allowing the player to interact with them, making the game an extension of a social networking experience. Whenever a user unlocks a new badge this fulfillment may be shared on Facebook.

Figure 2 illustrates the simple and intuitive user interface developed for the mobile application, *MoverGami*.

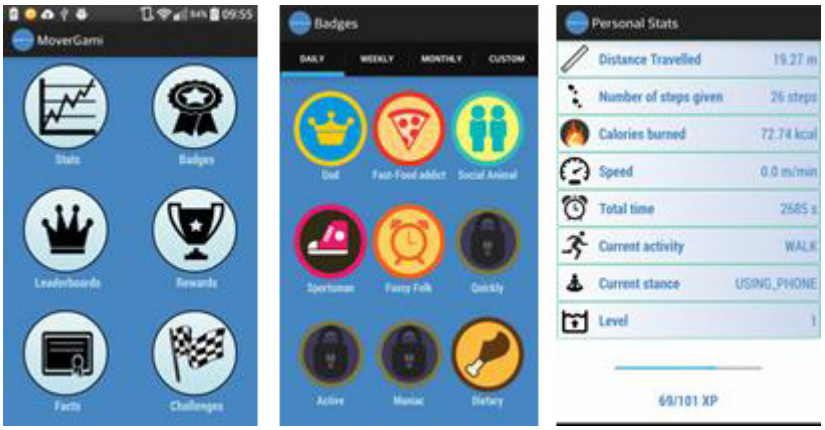

Figure 2: Mover Gami user interface

In the web application, *MoverGamiWeb*, administrator users are able to manage the system, reading, creating, editing or deleting the game elements previously described. Additionally, some statistics about the physical activity of the users in the *MoverGami* ecosystem are also presented in the web application, as illustrated in Figure 2. With these statistics administrator can better understand the capabilities of their population and therefore adapt the game elements in order to achieving maximum engagement to the system and therefore increasing the physical activity of the users.

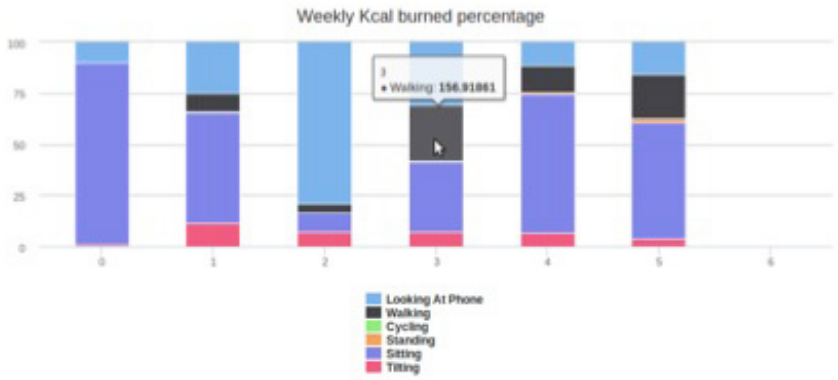

Figure 3: Expended energy in kcal during the week in mobile platform

In order to further adapt *MoverGami* to different levels of user's physical activity and to encourage inactive subjects to perform more physical activity, a reinforcement learning algorithm was implemented, namely the Q-Learning algorithm. The main goal of this implementation is the automatic creation of new challenges according to the quantity of activity perdormed by the user. For instance, if a user has been inactive through the day, *MoverGami* will trigger a new challenge, encouraging the user to reach healthy activity levels.

3. Conclusions

The main goal of this project was to study the effect of Gamification techniques on people's daily routine through the use of a mobile application implemented with several game elements. Although grasping the concept of Gamification is very simple, succeeding on engaging users through Gamification techniques is not a trivial task. Building a system that continuously engages users is a task that implies many observations and changes through time, in order to yield a perfect platform that appeals to players' interest. Regarding the evaluation phase it was not possible to obtain concrete results with tests in specific subjects, since a process for evaluating the efficiency of a gamified system is a task that can take several weeks until perceptible results can be obtained. Nevertheless, the application provides real-time feedback on users' activity and already presents potential to improve people's lifestyles.

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A3. ECHAlliance Ecosystem

Session Chair: *Brian O'Connor, European Connected Health Alliance (ECHAlliance), United Kingdom*
Session Responsible: *Julien Venne, European Connected Health Alliance (ECHAlliance), United Kingdom*

One of the main challenges for Active and Healthy Ageing sector in Europe is to implement and deploy innovative solutions. Numbers of projects have been develop, the industries (large and SMEs) are offering a large range of technological products and innovative services, but there only a few public and/or private purchasers who circulate tenders, and only a few companies having a clear view of its business model. This is necessary to develop a real opportunity for Europe, creating economic growth and jobs.

In Europe, the decision centres for AAL & Health & social products & services purchase are at the regional level, with some guidance at the national level. That's why the regional approach could be the good level to implement solutions. But each region has its own organisation, its own stakeholders, its own funding capacities. That's why the ECHAlliance has built a methodology to develop ecosystems and supports National and Regional Governments to build Connected Health Ecosystems. Those Ecosystems are linked through the International Network of Connected Health Ecosystems.

Invited Speakers:

Ben Ramsay, Care Innovations, United Kingdom – Vision and benefits of the ecosystems and their network for a large company

Mark Timoney, Northern Ireland Department of Health, Northern Ireland (TBC) – Example of pre-commercial procurement process supported by an ecosystem

Bleddyn Rees, Lawrence, Wragge, Lawrence Graham & Co, United Kingdom – Innovative contracts & public procurement for Health & Social care

A4. Living Labs

Session Chair: *Ann Ackaert, iMindsHealth, Belgium*
Session Responsible: *Jerome Boudy, Telecom-Sud, France and Pietro Siciliano, CNR, Italy*

In a living lab, a large number of users interact with new products and services in their daily life. This way the innovation process is pulled out of the lab and the demo context. A real-life setting is essential to find out whether a good idea or concept could form the basis of a successful product or service in the future. This allows for researchers to assemble user feedback and to systematically observe, monitor and analyze user behavior in a natural environment. This heavy user involvement distinguishes a living lab from traditional market and user research. It's important to ensure that these kinds of living lab activities are based on a scientific research methodology in order to collect and scale up evidence in view of the benefit of AAL solutions and services.

Building up common methodologies and gathering concise evidence is improved through international co-operation. The ENoLL network gathers best practices and living lab experience throughout EU (www.openlivinglabs.eu). How can the AAL community learn and interact with the ENoLL network? Where does Care Living Labs differ from other living lab approaches?

Good examples of Living Labs with concrete first results and field experiencing feedback were presented.

Invited Speakers:

Birgit Morlion, iMindsHealth, Belgium – Flemish Care Living Labs: a good recipe for innovation?

Contributions:

A4.1. A4-1 The CASALA Living Lab – 4 Years On Julie Doyle, Lorcan Walsh – CASALA, Dundalk Institute of Technology (Ireland)

A4.2. A4-2 Sound environnment analysis for ADL detection from Living Lab to Medical Nursing Home Dan Istrate, Jerome Boudy, Dan Ovidiu Andrei and Said Mammar (France)

A4.3. A4-3 Robot-Era Project:Preliminary results of robotic service in smart environments with elderly people Raffaele Esposito, Filippo Cavallo, Paolo Dario – The BioRobotics Institute, Scuola Superiore Sant'Anna (Italy), Fiorella Marcellini, Roberta Bevilacqua, Elisa Felici – National Institute of Health and Science on Aging – I.N.R.C.A, Dario Paolo - The BioRobotics Institute (Italy)

A4.4. A4-4 Deployment of AAL Solutions in Real Homes for a Living Lab Evaluation: Challenges and Lessons Learnt, Jan Bobeth, Stephanie Deutsch, Christopher Mayer, Martin Morandell, Markus Garschall, Manfred Tscheligi (Austria)

A4.2. Sound environnment analysis for ADL detection from Living Lab to Medical Nursing Home

Dan Istrate, Jérôme Boudy[1] , Dan-Ovidiu Andrei[2] and Said Mammar[3]

ABSTRACT

In this paper we present the application of sound environment analysis algorithms previously developed for ADL recognition on real recordings made in a medical nursing home. Initially the sound algorithms were tested in laboratory, secondly in a living lab in Grenoble and lastly in a nursing home (EHPAD). Several days of audio signal have been recorded, but for the moment only 24h are labelized and used for evaluation. The proposed system is based on a combination of Wavelets Transform, Gaussian Mixture Models (GMM) and Suport Vector Machines (SVM).

Keywords: ADL identification, Sound Recognition, Real-Time, Audio Processing, GMM

1. Introduction

In this paper we shall present the utilisation of the sound environment as an information source for activities of daily life (ADL) identification. In the intelligent ambient systems the use of the sound extracted information has been more or less limited to speech recognition and speaker identification. During recent years, other everyday life sounds started to be investigated [*1*], [*2*], [*3*]. The sounds can have different sources: human (such as snorring, cries, screams, coughs), human generated (door clapping, dishes, object fall etc.) or nature generated (bird chirping, wind, thunder etc.).

2. Sound environment analysis

The sound environment analysis is difficult because: a very large sound classes, distant analysis using omnidirectional microphones, noise presence, large variability of the same sound.

The already proposed architecture is composed by a real time step which continuously analyses the sound flow in order to detect the useful signals. This step is based on time-frequency analysis using Wavelet Transform.

Once a useful signal is detected, a hierarchical recognition stage is started. We first make the difference between speech and other sounds. Afterwards, if a sound has been identified, its membership to a sound class is analised; if speech was identified, a distress expression recognizer is started.

In this work the distress expressions recognition is not presented. The sound/speech classification and sound classification in the laboratory conditions and living lab was made using a combination between GMM and SVM [*5*] and the real recordings analysis is made using only GMM.

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The architecture is presented in Figure 1.

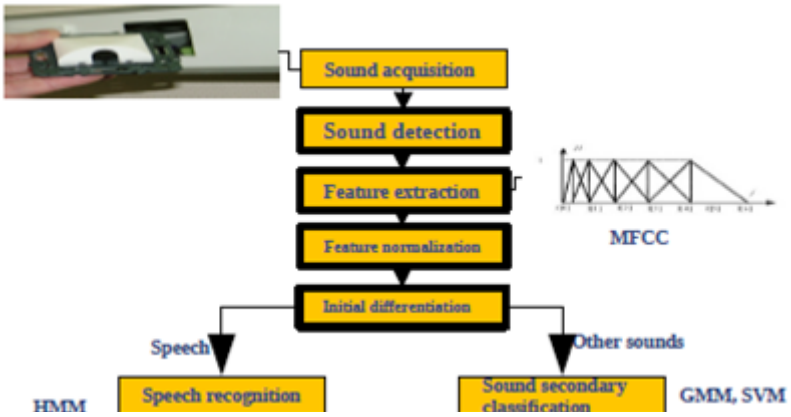

Figure 1: Sound environment analysis architecture

3. Sound database

The system evaluation was made initially using sounds from sound effects CDs, files from internet, and recordings in our laboratory; this step has allowed us to design the system architecture. In this step we have 18 sound classes with a total of 1049 files and a duration of 1 hour.

In a second step we have evaluated the system using recordings made in a Living Lab in Grenoble in the framework of SweetHome project. These recordings have been made by 21 persons and each scenario contains 2 hours of continuous recording using 7 microphones.

In the last step we have recorded files in a nursing home in the framework of EMonitor'age project.

We have recordings of 3 consecutive days. All recordings are in the format 16kHz/16 bits per sample/one channel (mono). For the moment only one day is used for evaluation.

The initial list of sound classes taken into consideration for the laboratory sounds and living lab recordings is presented in the Table 1.

Coughing	Person_Fall
Snoring	Brushing Teeth
Yawning	Object_Drop
Hands_Clapping	Radio_TV
Door_Clapping	Vacuum_Cleaner
Door_Opening	Kitchenware
Water	Window_Shutters
Ring	Speech
Paper	Unknown
Keys	

Table 1. List of sound classes used for laboratory and living lab recordings

In the framework of the 3 days continuous recordings in the nursing home, we have identified 13 sound classes and one unknown class, as presented in Table 2. The number of detected useful signals is about 6000. Newly added classes are presented in bold, the undetected classes were deleted.

Class no.	Sount class	Occurences	Class no.	Sount class	Occurences
1	Cough	22	8	Water flow	36
2	Snoring	4065	9	Object hit	376
3	Yawn	24	10	Kitchenware	171
4	Door clapping	92	11	Electric Razor	66
5	Door opening	50	12	Speech	709
6	Door knock	3	13	Sigh	52
7	Steps	16	14	Unknown	328

Table 2. List of detected sound classes

4. Gradual evaluation

The system was developed and optimized using a gradual approach: started with testing in our laboratory, continued with a real test in a living lab and currently dealing with recordings from a nursing home.

4.1. Laboratory Evaluation

The proposed sound environment system was primarly designed and tested on a sound data base recorded in our laboratory and completed with files from sound effects CDs and Internet files. All results are presented in [5]. The average sound recognition rate using GMM was about 71% and using SVM/GSL method it was about 75%.

4.2. Living Lab evaluation

Once the sound system optimized in laboratory, a large test on recorded files in a living lab in Grenoble was realized. The results are presented in [*4*]. The average sound recognition rate was about 70% using SVM-GSL method.

4.3. Real Data Evaluation

We are currently evaluating the system on the nursing home recordings.
Different tests have been conducted using MFCC and LFCC. Confusion matrices for several tests using only EMonitor'age sounds, as well as sounds from the laboratory sound data base combined with sounds from the EMonitor'age project are presented in tables 3 to 6 (all values in the tables represent good recognition rates – as percentages).

Rec. class Class	01	02	03	04	05	06	07	08	09	10	11	12	13
01	22.727	4.545	4.545	4.545	13.636	0	13.636	0	9.091	0	0	4.545	22.727
02	0.319	55.034	5.329	1.645	1.866	0.368	2.308	15.373	3.143	0.074	3.954	1.179	9.406
03	0	34.783	13.043	4.348	8.696	0	0	17.391	4.348	0	0	4.348	13.043
04	1.087	3.261	2.174	15.217	19.565	1.087	15.217	8.696	18.478	1.087	2.174	1.087	10.870
05	0	12.000	2.000	10.000	34.000	0	20.000	4.000	8.000	4.000	0	2.000	4.000
06	0	0	0	0	0	0.000	0	0	0	0	33.333	66.667	0
07	0	0	0	6.250	18.750	0	75.000	0	0	0	0	0	0
08	0	5.556	2.778	0	8.333	0	0	72.222	0	0	11.111	0	0
09	2.128	3.191	3.457	11.170	9.574	1.862	3.723	2.128	45.479	0.532	3.723	2.926	10.106
10	0	1.170	0	1.754	15.789	0	3.509	0	7.018	70.760	0	0	0
11	0	3.030	1.515	1.515	0	0	3.030	25.758	0	0	60.606	3.030	1.515
12	1.958	1.818	4.476	0.699	3.077	0.420	2.238	3.636	2.797	0.280	1.119	73.706	3.776
13	1.923	17.308	3.846	1.923	5.769	0	5.769	13.462	5.769	0	1.923	3.846	38.462
Overall Good Recognition Percentage: 56.147%													

Table 3. Confusion matrix for Leave-one-out method, GMM, MFCC, EMonitor'age only sounds

Rec. class Class	01	02	03	04	05	06	07	08	09	10	11	12	13
01	4.545	22.727	4.545	4.545	13.636	0	4.545	0	13.636	0	0	0	31.818
02	0.639	76.621	3.045	2.726	1.940	0.147	0.565	0.270	6.582	0.417	0.246	0.663	6.139
03	4.348	21.739	26.087	8.696	8.696	0	0	0	13.043	0	0	0	17.391
04	3.261	2.174	2.174	53.261	10.870	0	2.174	3.261	15.217	0	0	0	7.609
05	0	12.000	2.000	32.000	24.000	0	6.000	4.000	6.000	2.000	2.000	2.000	8.000
06	0	0	0	0	0	0.000	0	0	0	0	0	100.00	0
07	0	0	0	6.250	6.250	0	68.750	6.250	6.250	0	0	0	6.250
08	0	8.333	0	0	5.556	0	0	77.778	2.778	0	5.556	0	0
09	0.532	4.255	2.128	14.362	4.787	0.532	0.266	1.330	65.160	0.266	1.064	1.330	3.989
10	0	3.509	0.585	1.170	6.433	0	5.263	0	11.696	67.836	1.754	0	1.754
11	0	21.212	0	0	1.515	0	0	19.697	16.667	0	36.364	3.030	1.515
12	1.538	2.238	1.119	2.937	3.916	0.280	1.119	1.958	6.853	0.140	0.699	74.266	2.937
13	1.923	15.385	3.846	21.154	0	0	0	0	26.923	0	0	0	30.769
Overall Good Recognition Percentage: 73.042%													

Table 4. Confusion matrix for Leave-one-out method, GMM, LFCC, EMonitor'age only sounds

Rec. classClass	01	03	04	05	08	10	11	12
01	36.364	9.091	0	4.545	27.273	0	9.091	13.636
03	0	17.391	0	8.696	47.826	0	21.739	4.348
04	2.174	4.348	47.826	11.957	18.478	2.174	10.870	2.174
05	2.000	4.000	26.000	38.000	20.000	6.000	2.000	2.000
08	0	0	0	8.333	50.000	0	38.889	2.778
10	0	0	5.848	14.620	1.170	78.363	0	0
11	1.515	0	0	0	22.727	0	72.727	3.030
12	1.678	4.895	2.517	2.238	8.811	0.979	4.615	74.266
Overall Good Recognition Percentage: 68.596%								

Table 5. Confusion matrix for TrainWorld on living lab sounds, TrainTarget on 80% Emonitor'age sounds, Tests on 20% EMonitor'age sounds, GMM, MFCC

Rec. classClass	01	03	04	05	08	10	11	12
01	9.091	4.545	63.636	0	4.545	0	0	18.182
03	0	8.696	82.609	0	0	4.348	0	4.348
04	0	0	93.478	0	0	1.087	1.087	4.348
05	0	0	86.000	0.000	2.000	8.000	2.000	2.000
08	0	2.778	22.222	0	58.333	0	11.111	5.556
10	0.585	0.585	25.146	0	0.585	71.930	0.585	0.585
11	0	0	39.394	0	12.121	4.545	34.848	9.091
12	0.420	0.420	12.028	0	0.280	0.979	0	85.874
Overall Good Recognition Percentage: 74.128%								

Table 6. Confusion matrix for TrainWorld on living lab sounds, TrainTarget on 80% Emonitor'age sounds, Tests on 20% EMonitor'age sounds, GMM, LFCC

In case of the "Leave-one-out" method, one sound is used for testing and all the others are used in the training set. Sounds in the training set are used to generate the GMM models for the classes they belong to. The extracted sound is then tested for membership against every class. The process is repeated for each and every sound available.

In case of the method used for obtaining results in tables 5 and 6, TrainWorld and TrainTarget are used for modelling data and for producing a GMM. TrainWorld is a generic application capable to obtain a GMM World Model using the Expectation-maximization (EM) algorithm. TrainTarget is used for modelling data using the MAP (maximum a posteriori) and EM methods. Both TrainWorld and TrainTarget are part of the LIA-RAL software from the University of Avignon and are described in [*6*].

5. Conclusions

The sound environment is very rich in information, but the noise presence and the distant recording create difficulties for the analysis.

The best results so far have been obtained by creating the models from laboratory sound data base, by adapting all models using 80% of the sounds recorded in the nursing home (EMonitor'age project), all with LFCC coefficients.

The recognition rate is comparable with the one obtained in [*5*] using only sounds recorded in controlled conditions.

The work is in progress in order to obtain a more reliable system.

6. Acknowledgement

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A4.3. Robot-Era Project: Preliminary results of robotic service in smart environments with elderly people

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ABSTRACT

The technological advances in the robotic and ICT fields represent an effective solution to address specific societal problems to support ageing and independent life. The design and implementation of Robot-Era system was sustained by a multidisciplinary team in which technology developers, designers and end-user representatives collaborated using a user-centered-design approach. The key point of this chapter is to demonstrate the usability and acceptability of proposed solution conceived to provide useful services to elderly people after an experimentation in indoor and outdoor environments.

Keywords: Ageing well, Multi-Robot services

1. Introduction

In the last decades low birth rates and higher life expectancy are changing the structure of European society. According to the current statistics, the share of the population aged over 65 years will increase from 18.2% in 2013 to 28.7% by 2080 [*1*] and the persons in working age (15-64) will decrease from 66.2% to 56.2% by 2080 [*1*].

Due to this demographic trend and to higher risk in old age to get ill or have a disability, there will be a significant surge in a demand for elderly cares and in particular for Nurse Practitioners (+94% in 2025) [*2*] and Physician Assistants (+72% in 2025) [*3*]. However the decrease of worker population and the reduction of funds for social-medical services couldn't fulfill this demand for care. So a new sustainable economic and welfare systems should be developed in order to maintain independent older persons in their living environment as long as possible. Taking in consideration these aspects, the new technologies could be a valid solution for an aging well in place model. The technological approach would s4atisfy the demand for elderly cares against the reduction of funds and decrease of worker people; also it would create a widespread network of services on the territory, both on urban and rural areas. In confirmation of that, the society is rife with the rapid increase of "smart" technologies, promoted by their economic accessibility among common people. In particular the medical electronics equipment production will increase from the $91Bn in 2011 to the $119Bn in 2017 with an average rate of 4.6% per year [*4*]. Furthermore the EU smart home market is estimated to grow from $1,544.3 million in 2010 to $3,267 million in 2015[*5*]. In the last years many research projects were funded in order to develop robotics and ICT technologies as a sustainability solution to manage and deliver socio-medical services. Some examples of these projects are KSERA [*6*], SRS [*7*],

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FLORENCE [*8*], COMPANIONABLE [*9*], Care-O-Bot [*10*] and ASTROMOBILE [*11*].

Considering this context the Robot-Era project [*12*], (FP7/2007-2013), aims to develop, implement and demonstrate the technical feasibility, usability and acceptability by end-users of a plurality of complete advanced robotic services, integrated in smart environments. This document reports the preliminary results of the first Robot-Era experimental loop in which elderly volunteers were invited to interact with robots and test the Robot-Era robotic service. The provided feedbacks, collected by means of questionnaires, interviews and video analysis, were used to evaluate the usability and the acceptability of Robot-Era services and improve the performance of the system in view of the second experimental loop.

2. Methods

In Robot-Era project an User-Centered-Design approach was applied. A multidisciplinary team, composed by technical and no technical researchers, and end-users exponents collaborated together in order to identify the end-users' requirements and develop the most suitable technological solution. The Robot-Era project consisted of three phases.

Phase I - Analysis of end-users needs and service definition

39 older people were involved in focus groups in Italy, Germany and Sweden in order to understand the possible needs that can be satisfied by Robot-Era system. The aim of this phase was to confirm the scenarios already designed at the beginning of the project, with the support of the final users.

After the analysis of the results, a new design of the scenarios was conducted, driven by the prioritization given by the older people as well as by their explored needs, whishes and preferences.

Phase II - Robot-Era System

The Robot-Era architecture integrates three robots, Domestic, Condominium and Outdoor one, able to work in different smart environments such as indoor and outdoor according to 3D service paradigms [*13*]. The overall Robot-Era system works in three different environments:

- **domestic:** the DomoCasaLab, a domotic house in Peccioli (Italy), and a residential facility in Ängen (Sweden)
- **condominium**: common area, as hall, corridors and elevator, of the buildings where the DomoCasa Lab and the residential facility are located
- **urban**: the surrounding outdoor pedestrian area near the DomoCasaLab

Phase III - First experimental loop in Italy and Sweden

Materials - The first experimental loop aimed to evaluate the usability and acceptability of the Robot-Era system.

Usability can be defined as the degree of a product's fitting to the characteristics of a person or of a group of people. In robotics it is strongly influenced by interactions that are executed by hardware and software.

Also the user's degree of satisfaction and preferences influence the usability of Robot-Era system. For this reason, it was decided to use the System Usability Scale (SUS) in order to have comparable results. This simple evaluation method uses a standardized form with ten questions.

Acceptability is defined as "the demonstrable willingness within a user group to employ technology for the tasks it is designed to support". For acceptability evaluation, the most used model is the Unified Theory of Acceptance Use of Technology (UTAUT). Inside this model, the acceptance of any technology is the result of the interaction of different dimensions. For the purpose of the Robot-Era first experimental loop, a proper method was developed and applied in order to evaluate the acceptance Robot-Era system. Starting from UTAUT constructions, an ad-hoc questionnaire, based on a 5-point Likert scale, investigated some aspects as the attitude, the perceived enjoyment, the anxiety, the trust, human-robot interaction (HRI) modalities and the quality of life.

Participants - At the beginning of the study a recruitment questionnaire, based on IADL and SPMSQ, was administered. According to the recruitment criteria, 67 elderly persons (28 male and 39 female), aged 63-83 years (73.51±5.68), were involved among Peccioli and Ängen. 58% of participants lived with own partner, while 42% lived alone and the sample was fairly divided into low educational level (51.5%) and high one (48.5%). About attitude towards technology, they were familiar with home appliance and electronic devices for everyday use. Surprisingly 56.72% of involved elderly used PC and Internet without problems for information or entertainment. However only 20.90% and 14.93% were able to use a smartphone and a tablet. All participants signed an informed consent.

Procedure - The first Robot-Era experimental loop was conducted both in Peccioli (Italy) and Ängen (Sweden)

First of all in order to be more familiar with Robot-Era platforms, the old volunteer was introduced to the three robots and he/she could touch them and ask any elucidated questions. Then the user completed a questionnaires about the aesthetics of three robots. After that an instructive video about the potentiality of the Robot-Era system was shown in order to arouse impressions about it. The user was reassured about the safety of the robots and the prospect to stop the test anytime.

Then, the elderly participant was asked to perform the tasks of each service after introducing it. During this phase the old volunteers performed alone the tasks and the researcher helped him/her only if necessary. Finally, the questionnaires about Robot-Era system usability and acceptability were administered.

3. Results

The outcomes of the surveys were elaborated in order to get an Usability and Acceptance Score range from 0 to 100 (see Table I).

Robot-Era services	Usability*		Acceptance*	
	Peccioli	Ängen	Peccioli	Ängen
Shopping and drug delivery	80,86 ± 15,81		87,69 ± 8,23	
Communication	85,57 ± 14,09	71,04 ± 20,30	88,54 ± 7,94	72,74 ± 7,86
Garbage collection	90,14 ± 14,76		89,97 ± 8,33	
Reminding	75,28 ± 23,12	56,09 ± 28,85	87,26 ± 12,32	84,36 ± 14,31

Robot-Era services	Usability*		Acceptance*	
Indoor walking support	89,70 ± 9,29		88,70 ± 7,12	
Escort at night		75,17 ± 24,92		88,56 ± 14,31
Outdoor walking support	83,44 ± 12,51		89,01 ± 8,06	
Food delivery		77,34 ± 20,24		86,84 ± 11,20
Laundry delivery		76,72 ± 21,70		89,68 ± 11,02
Object transportation	91,63 ± 11,11	81,48 ± 13,19	92,46 ± 5,43	86,67 ± 10,78

Table 1 Usability and Acceptance Score of Robot-Era services

Many feedbacks were provided by elderly persons for all the services, but in this paper only the results about the Shopping and drug delivery and Reminding services are shown.

Shopping and drug delivery service

Investigating the usability, 71.43% (54.29% 5 point and 17.14% 4 point) of participants reported the service was easy to use, in fact only 8.57% of them thought that they needed the support of a technical person to be able to use the system. However only 51.43% (28.57% 5 point and 22.86% 4 point) said that the tablet was simple to use, while 92.86% found easier to speak to the robot to perform the task. As said before, not many elderly used a tablet in everyday life. In confirmation of the usability, the various functions in this Robot-Era service were well integrated for 82.86% of elderly (62.86% 5 point and 20.00% 4 point). Furthermore 80% of the sample felt very confident using the Robot-Era system.

About the attitude towards this service, only 28.57% (5 point) and 20.00% (4 point) of the sample would like to use this system frequently, but shares increased if they should use it in case of need (85.71% 5 point). At the present, data showed that there was not a very clear propensity to use this service because elderly people asserted that doing the shopping was a funny task and it was an opportunity to socialize. Regarding the trust in the robot ability to perform the service, the participants replied 4 point, 28.57% and 5 point, 62.86%. Furthermore the majority of people enjoyed using the robot. Finally 65.72% of volunteers (42.86%, 5 point and 22.86% 4 point) thought their independence would be improved by the use of the robots for shopping, particularly in the future when functional limitations could restrict their ability to perform routine daily activities.

Reminding service

Evaluating the usability of the service only 56.86% (37.25% 5 point and 19.61% 4 point) of participants reported the service was easy to use. This result was due to the difficulties encountered by elderly persons to set the reminding agenda using the GUI on tablet. For this reason 23.53% of them thought to need the support of a technical person to perform the task and 39.90% of the sample whished for an improvement of the GUI. However 68.63% of the participants felt very confident using the Robot-Era system for the reminding service. Furthermore the actions performed by the robot were evaluated well integrated and usable by 78.00% of elderly (58.00% 5 point and 20.00% 4 point).

About the attitude towards this service, 56.86% (5 point) and 13.73% (4 point) of the sample would like to use

this system frequently because the reminding service was very useful for them. Also 71.15% (5 point) and 13.46% (4 point) would use this Robot-Era service in case of need. Regarding the trust in the robot ability to perform the service, the participants replied 4 point, 23.08% and 5 point, 63.46%. Furthermore 88.46% of elderly persons didn't find the domestic robot intrusive for their privacy while remembering events and localizing them inside home.

Finally 70.59% of volunteers (56.86%, 5 point and 13.73% 4 point) thought their independence would be improved by the use of the robot for the reminding service, particularly in the future when cognitive limitations could restrict their memory ability.

4. Conclusions

In this paper, the preliminary results of the first experimental loop conducted with elderly people were showed; in particular the results of shopping and reminding services, provided at home by Robot-Era system. Looking at the proposed scenarios interesting outcomes rose up. In general, the scenarios were considered easy to use and well integrated by the most of the elderly persons, demonstrating the usability of Robot-Era system. Furthermore in consideration of a positive attitude towards the services and a high trust in Robot-Era system, the acceptability was goodly estimated by old volunteers.

Future work will focus on the improvement of the Robot-Era dialog manager in order to get a natural language to allow a higher interaction between user and the robot. In fact elderly persons preferred the speech interaction than the tablet one, because the first was considered more simple to use.

Finally, according to all aspects discussed in this work and basing on the preliminary feedbacks given by end users, the Robot-Era system has all the potentialities to be developed as a socially acceptable and believable provider of robotic services to elderly people.

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A4.4. Deployment of AAL Solutions in Real Homes for a Living Lab Evaluation: Challenges and Lessons Learnt

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ABSTRACT

To get evidence about acceptance and usage of AAL solutions in real world, the accordant systems must be deployed outside of lab environments. We installed a TV- and tablet-based interactive system in the homes of 23 older olds in need of care services to provide wellbeing inquiries, activation prompts, and various reminders. In this article, we present challenges and lessons learnt from setting up ad hoc living labs for the evaluation of these care services in real homes. Implications reach from conducting extensive system tests in real world to intensive training and supervision for the participants during the study runtime.

Keywords: AAL, living labs, care services, TV, tablet, AALuis

1. Introduction

AAL solutions that have been developed together with end users and stakeholders following a user-centered design process have high chances to be helpful for their target groups. To get evidence about acceptance and usage of such AAL solutions in real world, it is necessary to deploy the accordant systems to real-life settings outside lab environments. For this reason, various living labs have been established in the last years, e.g. for co-creation, for user-driven experiments and for evaluation. Although the term living lab has been used widely there exists no agreed upon definition of this concept [*7*]. When working with older olds in need of care whose health status tends to be more unstable, continuous and innovative working conditions can hardly be achieved. To investigate long-term effects of interactive care approaches on older olds and their caregivers though, we set up ad hoc living labs in the homes of 23 clients of a big Austrian care provider that were time restricted to respect the unstable health conditions but still took place in real-world settings and empowered the participants in the design process. In these ad hoc living labs we evaluated three care services: wellbeing inquiries, activation prompts, and various reminders provided on a TV and a tablet (see section Living Labs in AALuis). The objective behind these basic services was twofold: (i) they shall enable older olds in need of care to live longer and independently at home, (ii) they shall support care givers in providing care in a more efficient way by reducing organizational efforts.

In the following section we describe the ad hoc living labs and the used prototypes in more detail. In section 3, we summarize the implications in the form of challenges and the lessons learnt probably helpful for other projects to avoid pitfalls and plan their studies carefully, before we conclude this article.

2. Living Labs in AALuis: Setup, Services and Procedure

In AALuis, an open middleware layer has been developed which can be used for different platforms to connect

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user interfaces and AAL services. With a strict separation of service description and design AALuis allows to offer an optimized user interface for each device presenting the service content adapted appropriately to the end user's needs [3]. AALuis comprises two aspects that are especially relevant for our study. The first one is its ability to provide convergent interfaces across various devices (e.g., TV, PC, tablet, smartphone). This means that all user interfaces are presented in a similar way to support recognition of interactions while at the same time respecting the specific interaction characteristics of each device. Another particularity of AALuis is the integration of a speaking avatar presenting content to the users.

Controlling the *AALuis system*: We decided to present the services mainly on TV to our target group of older olds in need of care services. Older adults are used to this device and a TV is present in almost all homes. Nevertheless, the remote control is often regarded as complex and only a limited amount of buttons is used [*6*]. For this reason, we kept the navigation as simple as possible by limiting the needed buttons to the four arrow keys and OK. To emphasize this simplicity we provided an additional remote only containing these buttons. To align the technical setup in all households we provided a new TV to each participant which was used as remuneration for participation in the study. We installed the TV sets two weeks before data collection started. So, participants could already get used to it by using them for watching their favorite channels. Since TVs are stationary, we also gave tablets to the participants for a more flexible usage. Due to the aforementioned convergence of content we hoped for a reduced barrier to use this new device. For the same reason, we did not provide both devices at the same time but handed out the tablets three weeks after the start of the field phase when the users already got used to the AALuis services on the TV.

Three interactive care services: The first service was called *My Day*: participants were asked about their wellbeing every day. The interface offered the possibility to answer to the question by navigating to one of three predefined answers with the arrows keys on the remote control. Following a predefined decision tree, the system could identify whether the assisted person was in a good mood, felt physically and psychically well or not. In case of a user signalizing his or her bad health condition, the system sent a notification to the care giving institution, where a care giver could immediately react on the user's answer.

The second service *My Appointments* notified the older user of upcoming events and appointments. In the course of the recruitment the health care provider visited every participant to conduct an anamnesis and to elaborate an accordant care plan. The plan contained the essential health procedures to follow including, but not limited to, drinking water reminders, physical exercises, doctoral appointments that should not be missed.

The third service named *My Activities* should support a more active life by suggesting various activities to the users. Based on the anamnesis session held together with the older user, suggestions for specific activities, such as doing a riddle, calling a friend, going for a walk, watching TV, were provided.

The presentation of all services was consistent using the same look and feel. From the perspective of the end users there was only one service asking or informing about different aspects.

Participants: We involved 23 participants (17 women, 6 men) aged between 71 and 99 years (M=84.7, SD=8.1). All of them were clients of a large Austrian care provider. The formal caregivers usually visit their clients between once or three times a week. Some participants lived alone or with their partners in a residential home, while the majority lived alone or with relatives in their own home. All of them watched TV frequently.

Two weeks before the beginning of the field phase the new TV set was installed in the homes of the participants. A few days before we started with the data collection the AALuis system was set up (a mini PC with Wi-Fi capabilities connected to the TV). In parallel, a researcher visited each participant together with a representative of the care provider who was familiar to the participants in order to minimize trust and safety concerns. In the course of a pre-interview, a questionnaire on subjectively perceived satisfaction with life (SWLS scale [*5*]), a questionnaire for the self-assessment of personal technology affinity (TA-EG [1]), and some questions about technology usage and demographics should be completed by participants. If needed, the researcher supported the participants in case of them having troubles with the completion of the questionnaires.

During the six-week field phase formal caregivers kept sending notifications to the TV of the participants several times a week, i.e., depending on the participants' individual care plans using a Wizard of Oz approach. No notification was sent automatically but all triggered by the caregivers. From the beginning of the field phase participants received activity prompts, reminders and wellbeing inquiries through the AALuis interface on their TV. At the end of every week, all participants should reflect their experiences with the system and answer some questions about technology acceptance by filling a diary checklist together with their caregiver. After three weeks the participants received a tablet which worked synchronously with the TV application showing the same notifications as before.

At the end of the field phase a researcher visited all participants again for a post-interview and collecting the tablet. To assess the user experience we used the questionnaire UEQ [*2*]. To assess usage frequency all interactions (reaction to notifications, provided answers to the *My Day* service) were logged automatically by the system.

3. Challenges and Lessons Learnt for ad hoc Living Labs

In this section, we present lessons learnt which might help other projects to get aware of avoidable problems and prepare trials with ad hoc living labs carefully. We do not present detailed results as this is not scope of this article.

Technical planning and setup: Before potential end users are approached for study recruitment, the technical team has to make sure that the test conditions meet the requirements for the successful technical setup and the system performance can be guaranteed in terms of (i) stability of the integrated system and functionality of all components, which has to be tested under controlled lab conditions in the forehand, and at the time (ii) suitability of the external conditions such as network coverage for sufficient connection quality (e.g. dead spots, surfaces and walls in buildings, influence of other architectonical obstacles).

Briefing of involved stakeholders: Caregivers have a key role in many AAL study designs as they are continuously in personal contact with end users. They are familiar with their routines, capacities and health conditions. In our study caregivers also filled a diary on a weekly basis together with the older end users. Motivation and commitment to the purpose of the project are a driving factor for the study success and the quality of the resulting data material. They need to be accurately briefed, their commitment must be ensured, while at the same time their opinion has to be considered and reflected during the whole duration of the field phase.

Getting to know each other: Creating an atmosphere of trust and safety is essential for the successful work with older adults. For this reason, the first contact between researchers and participants should be mediated by a known caregiver. Ideally the same persons visit the participants each time. Furthermore, relatives (informal caregivers) should be involved or at least informed. To relieve the participants, they could provide additional information or complement gathered data.

Introducing technologies to older olds: It is crucial that you demonstrate all features to the participants and other household members because older adults often don't dare to try it using trial-and-error [8]. Thus, make sure that the technical setup works after installation. Also make sure that existing technology like the TV still works without problems and does not affect the normal TV watching experience. If problems occur, relatives and caregivers lose motivation immediately and might quit the study. The abilities to learn new things declines with advanced age [*4*]. Thus, training on interacting with new technology should be intensive and take place repeatedly until participants can handle it without help.

Data collection materials: Beside automatically generated data logs on participants´ usage activity, self-reporting or interview techniques are often used to collect subjective impressions of the involved users. However, fully structured interviews and questionnaires are not the appropriate means for collecting user feedback of older olds. A less structured interview setting leading to open conversation about the personal experience and perceived benefits may provide much more useful insights than abstract answering formats. Nevertheless, in our study the use of the UEQ, a standardized questionnaire containing 26 pairs of semantically opposite adverbs turned out to be advantageous. Participants reflected aloud on these adverbs by associating small episodes they had experienced in relation with the system. Also filling the diary together with caregivers worked well.

Data collection and loss: Research should focus on qualitative data. Older olds´ health condition might vary along the duration of the study. In these cases (e.g. pain, hospitalization) they will not interact with the system and not give any feedback to be analyzed. Researchers should reckon on a high risk of data loss. The data collection progress has to be documented conscientiously over the whole duration of the field phase, especially when multiple collaborating instances (i.e., caregivers, researchers, technicians) are involved over a longer period. Only then loss of data can be avoided and effects on the results can be minimized.

Content and providence: Avoid generic content for ad hoc living labs, participants should benefit from the services (e.g., it does not make sense to provide general activity recommendations to people who do not leave home anymore). Content has to be personalized as older olds´ acceptance towards the system might decrease rapidly, if they do not perceive a personal benefit of using it.

4. Conclusions

For evaluating the acceptance and user experience of TV- and tablet-based activation prompts, wellbeing inquiries and various reminders, we installed the AALuis system in individual and residential households for a period of six weeks. In total, we involved 23 older olds between 83 and 99 years in need of care services and collaborated with their formal (large care organization) and informal caregivers (relatives). With the help of the ad hoc living labs, we wanted to apply and evaluate the services and their interfaces in a realistic and real world setting with older olds. In this article, we present the challenges and lessons learnt out of this study. Due to the frailty and the age of our participants we needed to be very flexible in the recruitment and evaluation process. In these uncontrolled settings we faced several expected and unexpected challenges, e.g., changing health conditions of participants, unstable technical infrastructures and the special influence of caregivers. We present an analysis of these challenges and explain their implications on the evaluation process. These implications might help other projects to get aware of avoidable problems and prepare trials with ad hoc living labs carefully.

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A4.5. How to manage adequately IPR in AAL projects to get return on investment?

Session Chair: *Raquel Fernandez Horcajada, AAL JP Central management Unit, Belgium*
Session Responsible: *Raquel Fernandez Horcajada, AAL JP Central management Unit, Belgium*

This session observed the role of IPR in the course of the overall R&D project period, with a particular market-oriented focus. The rationale is that a higher degree of awareness concerning IPR coupled with advance planning of commercialisation targets through a market-oriented focus is expected to maximise a given project's impact, leverage its commercial potential and facilitate successful transfer of technologies to the market.

Invited Speakers:

Huseyin Kebapci, CX6 Ltd, United Kingdom – IPR in collaborative research and innovation Projects

Stephen Von Rump, Giraff Technologies, Sweden – How we managed IPR in our AAL & FP7 projects

Thorhallur Gudmundsson, Hospital Organiser AS, Norway – IPR case study in the commercialisation process of the project AAL Inclusion Society

PARALLEL SESSIONS

TRACK B

TRACK B
BROADENING AAL

The European Union is experiencing a demographic change which is of high relevance for socioeconomic development and the livelihood in broadest sense. The demographic change with all its implications has been addressed by competent governing bodies at all levels. Action has been taken in many ways: by strengthening the health care sector through cluster cooperation initiatives that allow widespread of integrated, innovative and transferable health care models and solutions for healthy ageing and independent living, by improving urban life through more sustainable integrated solutions, by fostering policies that are thought to scale up the bridge gap between seller and buyer, producer and user of ICT solutions for ageing well.

This Track presented, in the context of ICT based solutions for active and assisted living, the landscape of present and future ideas and ways to broaden the horizon of the AAL Program across Europe and beyond its borders.

These issues have been discussed in 5 different sessions:

B1. Integration policies
B2. Connecting AAL solutions
B3. Europe Health Cluster
B4. Smart Cities and AAL
B5. Future call challenges

B1. Integration policies

Session Chair: *Adolfo Muñoz, Telemedicine Unit ISCIII, Spain*
Session Responsible: *Teresa Chavarria, Istituto Carlos III, Spain and Javier Valero, Ametic (Spain)*

Across Europe, the number of people who have health problems or need assistance requiring both health and social care is increasing. This number will continue to rise in the next 20 years, meaning that a larger amount of people will require a combination of health and social services. On the other hand, ageing societies will bring higher public costs such as public pensions, social care and health services provision.

Frequently social and health care services don't work in an integrated and coordinated manner. Patients are sent to hospitals or stay there too long when they could have been cared for at home, they receive the same service twice (from social care and National Health System) etc.

Integration of health and social care is an ambitious reform that many European countries are facing to ensure that health and social care provision is joined-up and seamless, especially for people with long term conditions and disabilities, many of whom are older people.

This session presented different policy integration approaches that by adding ICT based solutions are able to create a coordinated patient-centered care system.

Specific attention must be put on the policy on the European level, both in terms of implementation policy and strategy in a global context, but also on national programs reflecting European policy and the regional approach of European cohesion policy.

Contributions:

B1.1. Working Together for Healthy Growth in Europe AndreaPavlickova – Scottish Centre for Telehealth and Telecare, Scotland, (UK)

B1.2. Pilot MiAvizor. Social Community Teleprevention. Jesus Marcial MENDEZ MAGAN, Regional Government of Galicia – Xunta de Galicia (Spain)

B1.3. System Dynamics in AAL Christian Haberfellner, Red Cross Innsbruck (Austria)

B1.4. Connecting AAL devices and systems to improve service delivery Paul Panek, Christian Beck, Georg Edelmayer, Peter Mayer, Marjo Rauhala, Wolfgang L Zagler, Vienna University of Technology (Austria)

B1.2. Pilot MiAvizor. Social Community Teleprevention.

Jesus Marcial MENDEZ MAGAN, Regional Government of Galicia – Xunta de Galicia (Spain)

Mi AVIZOR Project

USC Universidade de Santiago de Compostela PsiCom Unidad de Psicología del Consumidor y Usuario

Xunta de Galicia Consellería de Traballo e Benestar

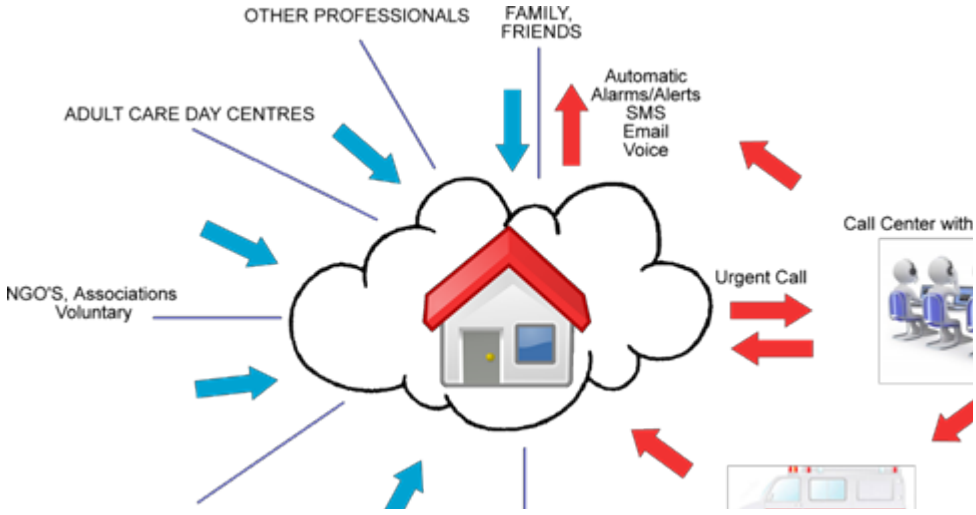
www.miavizor.es

Who are the actors?

Currently Telecare is frequently limited to two direct actors: the call center (formatted by social services staffs who take decisions about what medical services must be activated) and emergency assistance.

MiAvizor is a proactive system that integrates classic telecare with latest ICT advances. This service involves new actors in decision-making with the aim of improving the Quality of elderly' Service.

The integration of the organizational cultures of social and health assistance is as important as complicated. Actors are often unaware of each other roles because of mentioned differences. *MiAvizor* pretends to save those problems of communication putting the professionals in contact through an easy web platform. We pretend they can help us to have a global vision of elder's assistance because we know that risk perception and evaluation change according the actor.



Actors List: It is important to mention that beneficiaries of MiAvizor have generally between two and five actors associated. One of them is always a close relative, but the rest of the actors can change depending on each elder.

Call Center: The first difference with other Telecare Systems is the Call Center. For this mission, MiAvizor is collaborating with a public emergency foundation (Fundación de Urgencias Sanitarias de Galicia 061). The staff of this organization has real-time information about the medical history of beneficiaries. This information allows them to make faster decisions and optimizing their attention (telephone assistance, sending appropriate medical resources, etc.). At the same time, family or main contacts are quickly informed about the situation.

Family: Family or friends are especially important for this project. For example, we always request that the main contact (or someone they trust) be present at elder's home during the installation. All the members who want it (with the signed consent of the elder) can have access to web platform and visualize the behavioral reports, button press , alarms and alerts, agenda, etc. In addition, the main contact will be able to configure parameters of the different alarms and alerts for having a fully customized service.

Social Workers: They are vital in this project, because as prescribers, they should be aware of the service and all its potential.

Until this moment, social workers only had an administrative role (soliciting the service) and they weren't informed about results or emergency call impact.

Thanks to this project, they can access to all the system's information through the website. The web platform is created for working like a professionals' tool where they can consult mobility ratios, emergency calls, etc. and using it for facilitating they make- decisions process.

Private Assistant: People employed by the beneficiary can also use MiAvizor web platform like a tool for making easier their daily task.

NGO's, Associations, etc.: Older people associations have shown their concern about this project. For example, Ategal (one of them) have participated with us from the beginning. This association uses our platform for getting information about their members and sharing information and experiences.

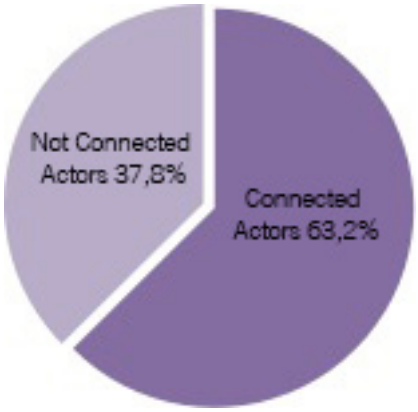
Adult Care Day Centres, Gerontology Centre, etc.: These kinds of centers have shown their interest about Miavizor too. They can provide a very interesting remote service. MiAvizor is currently working in this possibility, but this service is not yet available.

Other professionals: Other professionals collaborate with us too. They are connected to the system for giving us their experience and knowledge like doctors, nurses, psychologists, physiotherapists, etc.

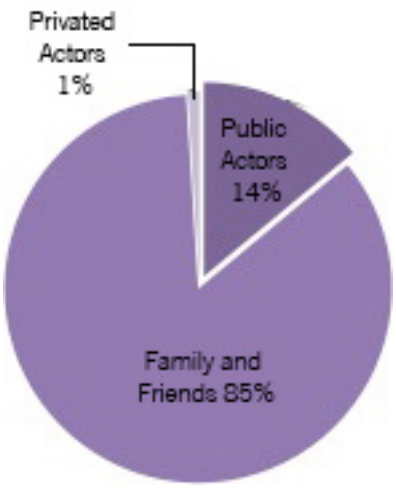
Moreover, some telecom companies are very interest about this project and have done an economic effort for installing the mobile data service with a lower price during the project stills on.

Percentages:

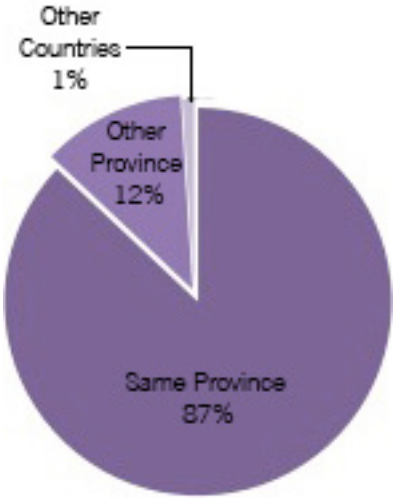
Following, percentages related to the use and implication of actors is showed.



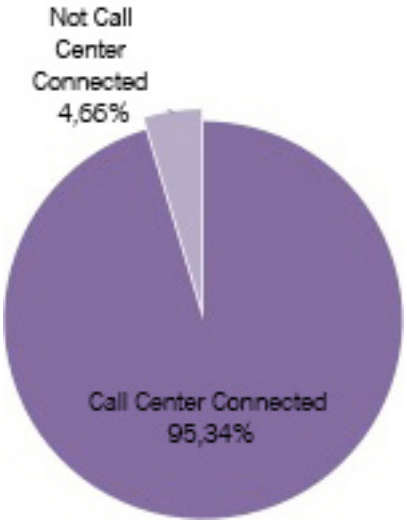
Actors connected to Web Platform



Type actors connected to Web Platform



Relatives connected from other regions to Web Platform



Beneficiaries connected to Emergency Call Center

"Not Call Center Connected" corresponds to people who suffer physical or behavioral problems that could result in an incorrect use of the panic button. In these cases, the alarm is receipt by family or a private caregiver.

The project is based on the installation of MiAvizor solution in 500 homes at the rural area of Galicia between 2012 and 2015.

The demographic condition of Galician rural area (with a higher geographic dispersion) have made hard the establishment and private actors implication (associations, day care centers, etc.). It is possible that the proportions below would change if we installed MiAvizor in urban areas.

Anyway, we are talking about an innovative solution and unknown telecare's model, so we are very satisfied with its reception. All the actors implicated have the commitment of support the project until its end on 2015.

What are the conditions?

The actors implicated in *MiAvizor* made the commitment of supporting and collaborating actively with us. For doing that, they can connect with us by phone or email for any question and consulting the Web Platform wherever they want (24 hours per day and 365 days per year). We pretend that each of them found through our system a new way of doing their daily tasks (related to elders) faster, easier and/or more comfortable.

Besides that, they are going to participate in the evaluation of the system providing us not only their opinion, but also qualitative and quantitative information about our specific strengths and weakness. Thanks to this, they will help us to improve our service.

B1.4. Connecting AAL devices and systems to improve service delivery

Paul Panek[1], Christian Beck[1], Georg Edelmayer[1], Peter Mayer[1], Marjo Rauhala[1], Wolfgang L. Zagler[1]

ABSTRACT

Nowadays many AAL systems and devices are available but most often they cannot be interconnected easily. This paper outlines some work which was done to connect different AAL systems in order to increase the impact, versatility and flexibility. Examples describe an integrated fall recognition system, a touch screen communication device for audio/video calls and for social networking, and an assistive robot connected to a smart AAL environment. Despite some progress still the outcome of successful research projects not always can be transferred into a commercial product. Market penetration of AAL systems is still in the beginning in Austria.

Keywords: AAL, assistive technology, service provision, touch screen, HCI, interoperability, ethics.

1. Introduction

Many current Ambient Assisted Living (AAL) solutions offer useful services which aim at increasing the quality of life and the level of active life of older citizens living at home in their specific way [*1*] [*2*]. Unfortunately, most of these devices, systems and services are based on different architectures and deploy different interfaces with state of the art technology. These differences reduce the solutions' flexibility to adapt to concrete user requirements and make it difficult to integrate such solutions.

While some standards and open architectures are emerging for AAL and health related systems and services are being specified (e.g. EU projects SOPRANO, UniversAAL [*3*] and ISO/IEEE 11073-10471 - Independent living activity hub, ISO 13482 – Personal Care Robots), there are only few systems actually installed and they lack common and flexible interfaces.

This paper describes previous and current research efforts carried out in our research group in order to interconnect different solutions in a flexible and modular way.

2. Connecting complementary fall recognition technology

One practical example of connecting systems to increase the degree of user-benefits is the chosen approach of integrating two complementary AAL solutions for fall recognition developed in Austria [*4*]. While the "eHome" system [*5*] applies an ambient sensor approach measuring mechanical vibrations of the floor [*6*] the "vivid" system is based on a totally complementary approach, namely the wearable sensor concept. By creating a middleware using DDS [http://portals.omg.org/dds/] interface technology the two systems have been combined with a versatile touch screen user interface. Additionally, concepts for interoperability with other 3rd party devices and systems (e.g. enOcean, FS20, plugwise, Konnex) were elaborated [*4*].

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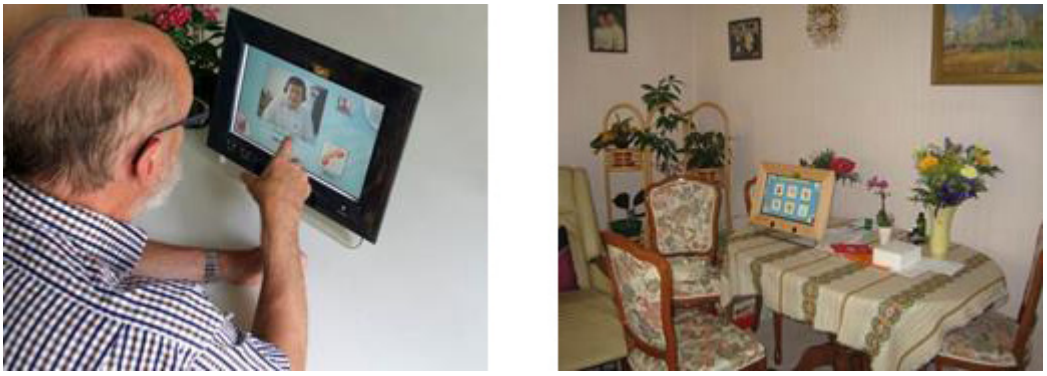
Part of this integrated system is also used in the signAAL project which focuses specifically on supporting primary users and care persons during night time [*7*].

3. Connecting users via a dedicated touch screen device

Another endeavor is carried out to apply video telephony technology for connecting different user groups, in particular to support older persons in maintaining their social contacts and to support formal and informal care persons to deliver expertise and support via audio/video links [*8*]. In this case not only proprietary protocols like Skype but also open and interoperable protocols like SIP are used to support better care at home and in the community.



Touchscreen during video call (left) and in a real life trial (right)

A further example is the interfacing of a simple to use touch screen device with state of the art social networks which allow the target group of computer illiterate older users to benefit from social networks (e.g. Facebook, Twitter, Picasa) which are usually accessed via PC/Laptop or handheld devices. Friends and family members can easily share photographs and text messages via different social networks with users of one versatile AAL touch screen device.

4. Connecting an AAL environment with an assistive robot

The assistive robot developed in the FP7 HOBBIT project provides autonomous navigation, a manipulator with a gripper and a multi-modal user interface allowing interaction via speech, gesture and touch screen [*9*]. The touch screen based user interface integrated via ROS [http://www.ros.org/] provides easy access to information in the web, video phone service, serious games, control of robot functions (e.g. the manipulator), emergency call features and access to the AAL environment in an accessible and consistent way [*10*]. Additionally a small display on top of the robot presents visualizations of emotions by expression of eye and mouth.

The autonomous robot as the mobile element of HOBBIT is additionally supplied with information from the intelligent environment in which it is operating in order to establish enriched context awareness and can make use of actuators in the environment to extend its capabilities [*11*].

Fig. 2: A service robot for older persons in a smart environment [*11*] [*12*].

The AAL (Ambient Assisted Living) Framework is the link to an (already installed or HOBBIT supplied) intelligent home environment ("smart environment" or any pre-installed automation, health or security system) which interacts with the user and HOBBIT. It allows HOBBIT to identify smart objects and control devices in the environment [*13*].

5. Conclusions

The experience from our research projects shows that connecting different solutions helps to establish modular, useful and marketable AAL systems fitting to user needs.

Another crucial aspect is the involvement of users which is necessary to be done right from the beginning of a project [*14*] something that often is considered too resource consuming (time, manpower, money). Additionally, the more complex and capable the AAL solutions get, handling all the ethical and legal aspects in a sound way must be done with great care right from the beginning of the development [*15, 16, 17, 18*].

All this can explain why still the market penetration is only at the beginning and still a significant challenge in Austria. New eco systems are coming up but there also is a lack of willingness and knowledge among the big players in the social system to take up the challenge and make AAL fly in daily life by taking advantage of the indirect profitability.

6. Acknowledgements

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B2. Connecting AAL solutions

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Session Responsible: *Teresa Chavarria, Istituto Carlos III, Spain and Javier Valero, Ametic (Spain)*

There is a growing offer of AAL devices, systems and services aiming to enhance older adults' quality of life. It is expected that private market for consumers coexist with the formal healthcare and social care services provision, all following the major trend of integrated and connected care.
Connecting solutions address networking capabilities to bring together people, services, community assets, and information to help different stakeholders achieve AAL challenges. This implies dealing with increasingly complex socio-technical AAL ecosystems. Concerned issues include scale up, interoperability, security and older adult's safety.

This session explored current requirements, took knowledge of activities covering different approaches and experiences on how interoperability solutions can support the shift towards better care at home and in the community, and on ways to integrate existing AAL technological developments to allow services to be delivered more efficiently and affordably in a digitally connected society.

Contributions:

B2.1. Integration Profiles: an Approach for Cracking the Interoperability Challenge in AAL Marco Eichelberg, Axel Helmer, Lars Rölker-Denker – OFFIS-Institute for Information Technology (Germany)

B2.2. What do we need assistive technologies for? Riitta Hellman, Karde AS (Norway)

B2.3. AAL services: From Interoperability to Platform Requirements of Large-Scale Pilots. Bruno Jean-Bart- TRIALOG (France)

B2.4. One Year of VictoryaHome J. Artur Serrano – Norwegian Centre for Telemedicine, University Hospital of North Norway. Department of Clinical Medicine, UiT Arctic University of Norway (Norway), Herjan van den Heuvel – Smart Homes (Netherlands), Patrik Bjorkman, Stephen von Rump – Giraff Technologies (Sweden), Ilse Bierhoff, Smart Homes (Netherlands)

B2.5. DIET4ELDERS: A Service-Oriented Architecture for the Prevention and Self-Management of Malnutrition, Taweel Adel, Miles Simon, Barakat Lina, Ioan Salomie, Tudor Cioara, Ionut Anghel, Sanders Thomas, Jim Charvill, Victor Sanchez

B2.1. Integration Profiles: an Approach for Cracking the Interoperability Challenge in AAL

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ABSTRACT

A key requirement for the success of AAL systems is that they can be extended and maintained over time, growing and adapting to the changing needs of the user. This can only be achieved with modular solutions, where components can be combined in a flexible manner. The AAL-JP support action on standards and interoperability in the field of AAL has designed a number of "Integration Profiles" to demonstrate how this interoperability challenge in AAL can be addressed successfully. Integration profiles start from an end-user perspective, describe systems and components, interfaces and interactions and provide a mapping to communication standards.

Keywords: standards, interoperability, integration profiles

1. Introduction

Ambient Assisted Living (AAL) can be described as concepts, products and services that combine new technologies and social environment to improve the quality of life for people in all phases of life. AAL uses assistive technology to keep people at work productive and healthy, to keep people at home healthy, independent and integrated, and to improve the delivery of care where and when needed. AAL systems consist of a combination of products and components from various industrial sectors, and their operation requires an "ecosystem" of service providers for planning, installation, maintenance, operation and service provision. Furthermore, it is of key importance that AAL systems are "future-proof", i.e. can be extended and maintained over a longer period of time, growing and adapting to the changing needs of the user. This can only be achieved with modular solutions, where components can be combined in a flexible manner. This requires standardized interfaces between systems and system components, a property called "interoperability", i.e. the ability of components to work together in a seamless manner. It can be argued that interoperability is a key requirement for the success of AAL solutions on the market.

This article summarizes the results of the AAL Joint Programme "Support Action Aimed at Promoting Standards and Interoperability in the Field of AAL" [*1*], which has been running from July 2013 to July 2014. The goals of this support action were to make existing standards more easily accessible by identifying use-cases covering the topics of all six calls of the AAL JP published to date and by mapping technical standards to these use-cases such that the result provides guidance on the use of standards for the AAL community; and, to raise the awareness of existing standards in the field of AAL.

2. Use cases and integration profiles

The conceptual approach followed in this project is derived from the approach successfully used by the Integrating the Healthcare Initiative [*2*] in the eHealth sector: we collected, and then selected the most important use cases, formalized them by identifying actors, transactions, process and data flow, and then mapped transactions to communication standards, and options where necessary. The resulting integration profiles were documented in a structure similar to that of IHE integration profiles. For each call topic of the AAL Joint Programme, at least one high-

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level integration profile (i.e. an integration profile without a mapping of the transactions to standards) was devised, and for four of them the transactions were also defined in detail.

Many AAL projects have tried to describe their vision of ambient assisted living in the form of a "use case" or "storyboard", i.e. the story of a fictitious user of the AAL system to be developed. These storyboards form the starting point for the development of integration profiles. More than 300 of such use cases have been collected from deliverables of AAL Joint Programme projects, public deliverables of FP6/FP7 AAL research projects, the "ICT & Ageing Scenarios published by the BRAID project [*3*], the AALIANCE roadmap [*4*], and the eHealth European Interoperability Framework use cases [*5*]. The use cases were documented in a structured manner using a template devised by IEC Strategic Group 5 "Ambient Assisted Living". The public part of this collection of use case texts has been published in [*6*].

In order to systematise and analyse the collection of storyboards (or use cases), a number of keywords were assigned to each use case to describe the main purpose of the AAL system described there, the stakeholders involved in the scenario, and key enabling technologies used. For this purpose, a multi-dimensional, hierarchical taxonomy for indexing the texts was developed, using the following dimensions: body function addressed by the AAL system; activities and participation supported by the AAL system; functionality of AAL systems addressing the workplace; stakeholders appearing in the use case; purpose of the system (other than supporting body function or activities/participation); key enabling technologies used. The full set of keywords can be found in [*7*].

For each of the six call topics of the AAL Joint Programme, a list of keywords matching the respective call topic were identified, and the number of use cases that had been assigned to each keyword was determined. Keywords appearing in many use cases thus represent system functions or body functions/activities supported by many of the AAL systems described in the use cases, and, therefore, are arguably a good basis for work towards a standardization of use cases as they cover the most frequent themes and project goals. Therefore, for each call topic the most frequently used keywords were chosen, and all use case texts related to these keywords were re-examined with the goal of condensing them into a new, "representative" use case. For this purpose, the individual assistive functions appearing in the use case texts, such as for example "behaviour monitoring", "fall detection", "indoor localization", "intelligent calendar", "outdoor pedestrian navigation" etc. were identified and also sorted by frequency of appearance, to identify the most common ideas on assistive functions for each call topic. These were then used as a basis for the selection of the key topic of each representative use case. The titles of the representative use cases are: "Behaviour Monitoring", "Calendar Service", "Social Interaction with Smart TV", "Shopping and Nutrition Planner", "Mobility Assistant", "Personal Trainer", and "Environmental Health Monitoring and Alarms at Work". The full texts of these use cases can be found in [*7*].

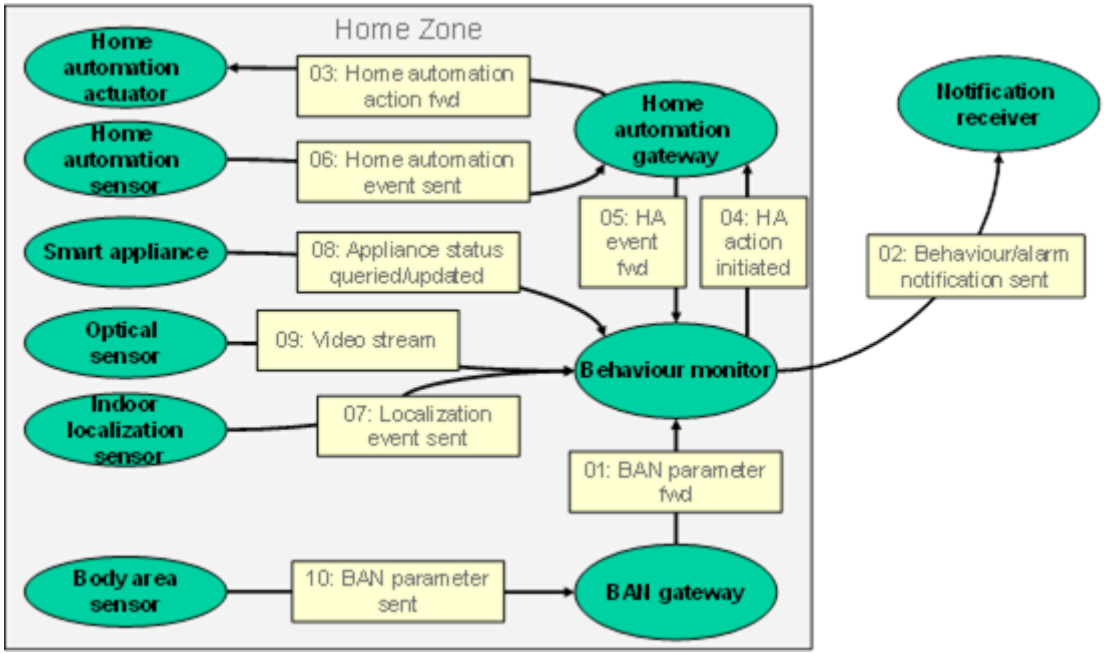

Figure 4: Actors and Transactions of the Behaviour Monitoring Integration Profile

The next phase of the project comprised the process of defining "high-level integration profiles" for all representative use cases. In this phase, a semi-formal description showing systems and system components ("actors") and interactions between these components ("transactions") was derived from the representative use cases. The idea of modelling an integration profile is to only identify system components by the specific function that they contribute to the overall system (functional/role view). Only components that could be implemented as a separate product (software or hardware) are considered in an integration profile. The internal functionality (e. g. algorithms, user interface concept) of an actor is not considered in an integration profile. An actor is considered as a "black box", only the interfaces of which are defined. Once the actors and transactions are defined, the high-level process and data flows are defined as a series of UML sequence diagrams showing alternative sequences of events and the involved process and data flows. As a rule of thumb, not all possible sequences of events can be described, but the most important – both regular and irregular – sequences should be described, including the expected behaviour of the actors. The results of this phase are seven "high level integration profiles" corresponding to the seven representative use cases. The complete specifications can be found in [*7*]. In Figure 4, only a single actor-transaction diagram for the first integration profile is reproduced as an example.

In the final phase of the technical work, a mapping to communication protocol standards was defined for each transaction of four of the integration profiles. The profiles were chosen such that components of the major domains of relevance for AAL (medical devices, home automation, communication with external parties outside the user's home) are involved. This mapping follows the structure of transaction definitions in the IHE Technical Frameworks. The following transactions were modelled in detail:

- T01: BAN parameter forwarded, based on the Continua design guidelines [*8*]
- T02: Behaviour/alarm notification sent, based on SCAIP [*9*]
- T03: Home automation action fwd., based on KNX (EN 50090) or ZigBee [*10*]
- T04: Home automation action initiated, based on Universal Plug and Play [*11*]

- T05: Home automation event forwarded, based on Universal Plug and Play
- T06: Home automation event sent, based on KNX or ZigBee
- T07: Localization event sent, Web service using the GPS Exchange Format [*12*]
- T08: Appliance status queried/updated, based on EN 50523:2009
- T09: Video stream, based on ONVIF specifications [*13*]
- T10: BAN parameter sent, based on the Continua design guidelines
- T25: PHR extract exported, based on HL7 PHMR [*14*]

The critical part in the definition of transactions is the choice of communication protocol and content standards that together cover all seven layers of the ISO/OSI reference model. There is no simple way of guaranteeing that the best choice has been made, and the example of IHE shows that only implementation experience tells – often after a few years – whether or not a choice was appropriate. Furthermore it is well possible that for certain transactions no existing standard can be identified. In the transactions listed above, this affects transaction T07 "Localization event sent": no standard for the communication of indoor localization information could be identified during the work in this support action, instead a proposal for a simple protocol based on web services and a well-known specification for representing GPS coordinates was developed. For many of the transactions that were not modelled in detail in this support action, it is rather doubtful whether suitable standards exist, e.g. for shopping lists, the placement of shopping orders, whether forecast queries, reporting on activities of daily living recognized etc.

A final issue to be considered in the definition of transactions is the prevalence of competing, incompatible standards in fields where it may not be acceptable to choose a single standard and exclude all others. Examples for this problem include field buses for home automation, where at least three standards (KNX, LON, BACnet) cover large parts of the market and various newer competitors are also of relevance since they focus on wireless retrofittable technology (e. h. EnOcean, Zigbee, Z-Wave). In Transactions T03 and T06 this has been modelled by offering two alternative implementation paths (profile options): either a cable-based network (KNX) or a wireless network (ZigBee), where only implementations of the same option can be expected to interoperate. A similar choice must be made by implementers of Transaction T10, which is based on the Continua design guidelines. These offer different, incompatible options for connecting a sensor worn on the body to a mobile device: "conventional" Bluetooth based on the Health Device Profile, "low energy Bluetooth, which is arguably superior because of its lower energy consumption, but supports much fewer types of sensors and is not compatible, and cable-based connection using USB.

Finally, the integration between IT systems in the profiles has always been modelled in two alternative ways: Once using "conventional" syntactic interoperability standards such as UPnP or IHE transactions, and once using the universAAL middleware platform, which implements "semantic" interoperability based on the use of common ontologies, and offers interoperability at a different layer (API instead of wire protocol).

3. Conclusions

The concepts developed by the AAL-JP support action on standards and interoperability comprise a significant step towards supporting standards-based interoperability in AAL. The analysis of the use case collection has for the first time provided suggestions for use cases suitable for standardization as an integration profile based on a quantitative analysis of the ideas ventilated in the use-case scenario texts written by AAL project participants across Europe. Furthermore, the work performed in this support action is – to the knowledge of the authors – the first attempt to really develop a set of comprehensive integration profiles for AAL use cases. The availability of a tangible set of integration

profile proposals makes it much easier to promote the general idea behind this approach. However, it is clear that these results can only be a first step in achieving interoperability in AAL. The most important steps that need to be taken in the future are on one hand further development, improvement and eventually formal standardisation of the integration profiles, and on the other hand the provision of implementation support: reference implementations (preferably open source), test tools, and cross-vendor testing events such as the IHE Connectathon. Finally, a certification programme might help customers to make better informed choices when selecting products, based on an independent validation of the product properties. However, for AAL such a certification programme is certainly rather a long-term goal.

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B2.4. One Year of Victorya Home

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ABSTRACT

VictoryaHome aims to help and enable older adults to live their lives the way they want and to support their caregivers. To all users it brings peace of mind, pleasure, never being alone, being safe and secure, feeling connected, sharing feelings and experiences, help to the helpers and making caring popular. This paper presents the main achievements of the VictoryaHome project after its first year.

Keywords: Informal Care, Peace of Mind, Telepresence, Care Robots, mHealth, Home Care, Aged Care, Welfare Technology, Ambient assisted Living

1. Introduction

More and more people have certain dependencies, multiple chronic diseases and advanced stage incurable conditions that are in need of new approaches from the point of view of social and health care.

Next to this, missed or doubled medication is high on the list of causes of hospitalization or even death [*1*], and falling is a huge problem. Very frequently the older adult is unable to move and ask for help; and only to be found when someone comes to the house. A study showed that in 54% of the falls, the participant was found on the floor and that 82% of falls occurred when the person was alone [*2*].

Today many ICT solutions for older adult care at home, designated as tele-care technologies, are already available in the market. Tele-care is a pressing topic and more and more services are offered and implemented. However, how much are these technologies supporting older adults at home in their daily activities? What about their informal carers like family and friends? Are such technologies giving them peace of mind and lightening their burden? There is a large gap separating real needs and the promoted products.

VictoryaHome aims to address these health, wellbeing and safety issues by offering services that empower informal carers like family and friends to keep an eye on their beloved ones – providing both the care givers and the care takers a feeling of safety and peace of mind.

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2. VictoryaHome

VictoryaHome is both a system and a set of services that monitors health and safety, and facilitates social contact. The VictoryaHome services support care for the older adults at home – the primary users - and empower their families, friends and professional caregivers- the secondary users - bringing immediate human presence when needed. Therefore, it includes smart devices like an activity monitor, fall detector and an automatic medication dispenser, a smartphone app for family and friends, an online dashboard for response centres, and a mobile telepresence device called Giraff [*3*], which functions as an avatar of the secondary users and that stays with the older adult.

The mobile Serenity App gives family, friends and other caregivers an overview of the older adult's wellbeing, by showing for example missed medication, falls and visit me requests sent by the older adult via the Giraff. In response these caregivers can use the Giraff to make a virtual visit. In case of emergency professional care can be included using the dashboard and the Giraff for instant presence.

Our mission is to support people in taking care for each other, and to bring peace of mind for all users. Therefore, we develop the VictoryaHome system and services in a user-centred design approach, we test these services with a large group of end-users in long-term trials in their own homes, and we include end-users, family, friends and professionals in four European countries. Also, we are developing a solid business strategy that fits within existing care processes, with the aim that the services will be continued after the project's end in 2016.

3. Results so far

The VictoryaHome project has been active for over a year. During its first year, two full cycles of user-centred design have been organized, shaping the system and services. Also country-specific information on current care processes has been analysed and the first version of the complete system has been developed and deployed. An initial business strategy has also been created [*4*], and the project team has been present at many conferences, exhibitions, and events to inform future users and care organisations about the VictoryaHome services.

The first half of year 1 has been dedicated to understanding people's context of use, gathering user needs and perspectives on assistive technology, determining user requirements and criteria for acceptability, investigating potential barriers and constraints, thinking of services, creating usage scenarios, and making concept designs. Early prototypes have been used to run co-design workshops and do the first user evaluations of these VictoryaHome services with older adults, family and caregivers. In these design phases 16 focus groups have been organised in 4 countries, including 70 older adults and their family members, and 25 individual sessions have been conducted with older adults, family and home care professionals.

From all of these user-centred design activities, the team learned that VictoryaHome should have two main functions: monitoring health and safety, and facilitating social contact. Therefore, VictoryaHome will provide primary and secondary users with:

- Visit Me – older adults can touch one of their contacts on the Giraff to send a request for a visit;
- Serenity App for family and friends – showing information and alerts about the persons they care for;
- Virtual Visits – done by family and friends to the older adult, using the mobile telepresence device;
- Medication Reminders;

- Fall Detection;
- Activity Checks.

Figure 5: The architecture of VictoryaHome

The second half of year 1 has been focussed on the specification and implementation of the first VictoryaHome system and services. This system had been tested extensively in the four partner countries, first in home labs, and later in actual homes of end-users and their family. In total, 7 tests have been performed with 20 users (7 older adults and 13 family members, friends and professional caregivers) covering over 80 days of fulltime testing. Results of these tests have led to many improvements in the hardware and software system, VictoryaHome services, usability and workflows.

4. Planning

In October 2014, long-term trials will start in four countries – Norway, Sweden, The Netherlands, and Portugal. These evaluations studies will include 40 VictoryaHome systems with over 150 users (older adults and family). The older adults will have the VictoryaHome system installed in their homes for a period of 6 months. Family and friends, professional caregivers and response centres will all be involved following newly defined care procedures.

Next to this large-scale evaluation, the project team will use the second half of the project to develop a solid and sustainable business case for the VictoryaHome services, in order to guarantee the continuation of these services after the 3-year project has ended.

Strong collaboration will take place between the teams working on the business strategy, on the development of new care processes, and on the long-term effect studies. Also collaborations will be started with external stakeholders like home care organisations, insurance companies, and local and regional governments, not only to present them

the project, but also to prepare them for the near-future introduction of VictoryaHome systems in people's own homes.

5. Conclusions

After one year the project already achieved interesting results: three full-cycles of user-centred design resulting in the services described analysis of country-specific care processes in all test sites, a first complete functional release of the system and an initial business strategy with full commitment of the partners.

In the coming year the project team expects to gain a lot of practical experience when rolling out the system into 40 homes across Europe and offering the services to a large group of older adults and their family. These services will be evaluated on many aspects, including: the potential to improve pleasure, peace of mind, the burden of care, feeling connected, social contact, loneliness, being in control, self-management, physical activity, medication adherence, feeling safe, and quality of care.

First results of this study are expected in August 2015, so the reader is invited to keep an eye out on future talks and publications of the VictoryaHome team.

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B2.5. DIET4ELDERS: A Service-Oriented Architecture for the Prevention and Self-Management of Malnutrition

Taweel Adel[1], Miles Simon[2], Barakat Lina[3], Ioan Salomie[4], Tudor Cioara[5], Ionut Anghel[6], Sanders Thomas[7], Jim Charvill[8], Victor Sanchez[9]

ABSTRACT

Living independently at home is one of the key attributes for a better quality life for the elderly. However, studies have shown that a significant number of the elderly population is affected by malnutrition, which is considered one of the root causes for the occurrence of other diseases. DIET4Elders project aims to facilitate the management of self-feeding through balanced nutritional intake and evidence-based feedback. It seeks to assist the elderly in their nutrition daily activities and helping them to maintain healthy feeding habits. This paper describes the DIET4elders project overall process interaction, architecture and technical approaches designed to meet these aims. It employs a service-oriented architecture that incorporates services for the monitoring of activities using sensor networks, diet knowledge-based reasoning services for assessing feeding habits and diet recommending services combined with reliability augmented services for dynamic selection, combination and invocation of suitable food provider services to meet dietary requirements as well as the elders dietary needs.

Keywords: service-oriented architecture, malnutrition, older adults, AAL.

1. Introduction

The urgency of the increasing size of the aging population is placing a tremendous burden on health and social services in many of the European countries. Enabling older adults to live independently at home is seen one of the promising ways forward, perceived best for both the individuals as well as their carers. However this introduces a number of challenges need to be overcome to achieve. One of the critical issues affecting elderlies' ability to live independently at home is malnutrition [*2*]. Studies have shown that in Europe more than 15% of the older population is affected by poor nutrition and malnutrition caused by the problems of ageing such as decrease in sensitivity, poor dental health, lack of transportation, physical difficulty, forgetfulness and other issues [*1*].

The DIET4Elders (Dynamic nutrItion bEhaviour awareness sysTem FOR the Elders) project aims to create a solution to enable older adults self-manage their nutritional intake by preventing unhealthy self-feeding habits. It targets: (i) older adults living in care homes for which recent statistics say that are affected by malnutrition in more than 60% of cases [*3*] (ii) older adults living at home that more than 15% are affected by malnutrition. The project proposes to

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develop an a service oriented architecture incorporating: (i) monitoring services aimed at detecting malnutrition, (ii) diet-knowledge-based reasoning services to help the nutritionists to establish the degree in which the older adults follow their prescribed diet and to dynamically adjust it, (iii) diet recommending services for planned long term diet plans that also enables the dynamic selection, based on the prescribed diet, of suitable food service providers, potentially enabling automated shopping. It also incorporates services to assist older adults and their informal carers during daily self-feeding activities aimed at detecting and preventing the instauration of malnutrition.

However, to achieve, there are a number of challenges need to address, these include:

- Monitoring and detecting accurate diet intake is one of the challenging factors especially in a home setting with minimal intrusion.
- Devising a personalised suitable diet that meets the needs of not only healthy individuals but also those with common chronic diseases, such as diabetes or those with cardiovascular problems.
- Assessment of nutritional intake based on well-established diet knowledge to reach personalised targets and enable self-management.
- Recommending suitable diet plans from among available food service providers' offerings to meet nutritional and diet needs.
- Designing intuitive interfaces and devices to fit with the elderlies' capabilities and easy of use.

The address the above, the rest of the paper describes the various methods and techniques DIET4Elders intend to develop in close collaboration with its target end users. Section 2 describes the process flow and overall architecture of the project, section 3 briefly describes the underlying methods and technologies under pinning DIET3Elders approach and architecture, section 4 presents a brief conclusion.

2. Overall Process Interaction and Architecture

The basic Diet4Elders process interaction is shown in Figure 1. The process starts with the monitoring infrastructure and the older adults describing their personal profile, including their food preferences and health descriptions. The process starts with:

Data collection process, in which diet related information, is collected, automatically through sensors and/or through interactions with older adults. Older adults are provided with suitable tablets with intuitive interfaces to interact with. Data related to their diet/food intake, their daily activities are captured continuously through the system.

- **Diet Data Analysis**: as data is collected, it also continuously analysed through a learning system that builds an end user computational model mapping their profile to their food intake and activities. It provides an assessment on their unhealthy behavioural and food intake patterns that can provoke a more informed assessment for recommendations.
- **Diet knowledge**-based recommendations: provides a feedback mechanism to carers and dietician to revise diet plan and take appropriate actions. The end user themselves also get feedback on their intake and advice on next course of action.
- **Diet plan generation**: The system generates a diet plan to overcome identified unhealthy behaviour. These are used to drive short-term food intake, but also can be used by dietician to provide mechanisms to prevent malnutrition.
- **Food ordering**: the system is able to generate suitable well-balanced food or meals to order directly from

ready food providers. Food providers register their services and offering in a marketplace from which the system is able to identify suitable combinations for the older adult to choose from.

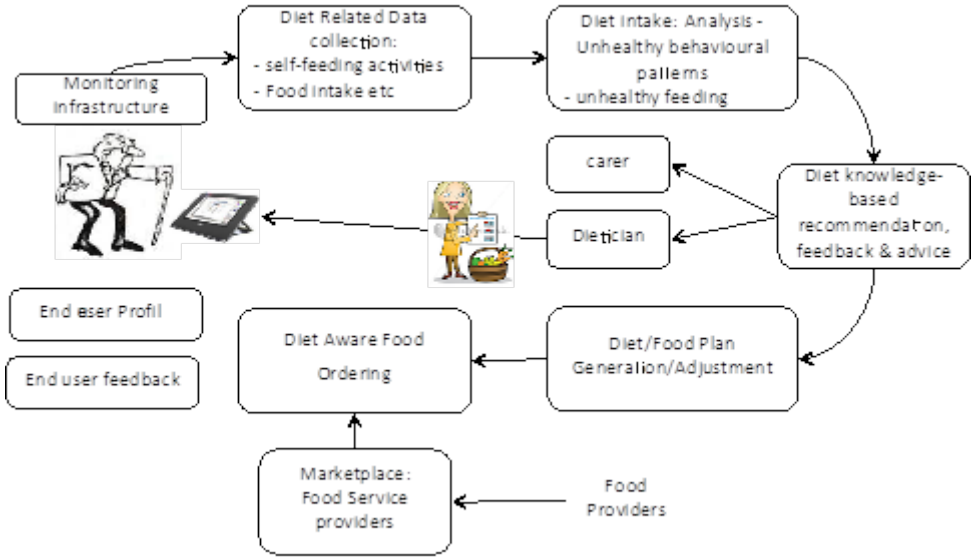


Figure 1 DIET4 - Elders process interaction

3. Underlying methods and technologies

Daily Activities and Diet Intake Monitoring

This is enabled by the use of advanced sensors technologies to track and detect older adult's daily activities and the context in which these activities took place. The key challenge is to develop these technologies that integrate seamlessly with the environment and home setting with minimal intrusion to their daily route and/or living activities. Recent advances in wireless sensor networks based monitoring infrastructure may provide such capabilities. The project is looking at using and/or where not available developing advanced wireless non-intrusive sensors that monitors the daily diet intake and physical activities aspects of older adults, including smart containers, smart fridges, accelerometers, health monitoring devices, positions sensors, RFIDs, smart tablets or phones etc.

Diet Analysis and Assessment

Validate and effective diet advice is the key objective of the project. This is pinned by the need to build a dynamic mechanism not only closely linked to accurate monitoring technologies but also based on evidence-based diet knowledge. For such, the project is developing a computational representation of diet knowledge drawn from existing well-established diet evidence. It is drawing knowledge with standardised units and measurements to be able to computationally reason over such knowledge correlated to the specific knowledge collected about individual users, taking into account not only their level of health and chronic diseases that they suffer from, but also the context and culture variations. To achieve, the project is employing two methods: ontological representation knowledge, and evidence-based diet knowledge carefully drawn to meet with target users. The need is to be able to reason over collected data to drive and identify self-feeding behavioural patterns that lead to malnutrition and create counter mechanisms to address them. This will require the development and employment of reasoning techniques

including graph theory and prediction techniques to discover patterns from chain of activities abstracted to the diet and context of use. With direct input from nutritionists, it will also require the development of learning algorithms with continual feedback and human intervention to reach more precise and accurate identification of unhealthy behaviour patterns to which counter suitable recommendations can be developed.

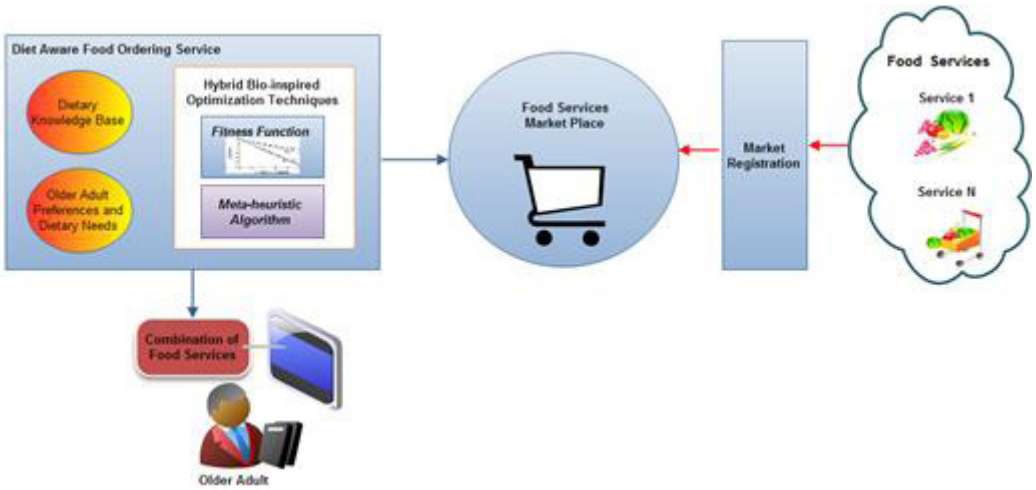
Knowledge-based Feedback and Support Services

Once unhealthy feeding behaviour patterns are identified, the architecture will employ a number of services that interconnect with the above technologies to circumvent this behaviour. The need is to be able to provide intelligible and useful feedback to both carers and dieticians to monitor changing behaviours in feeding patterns as well enable older adults themselves to manage and rectify these behaviours. In addition, given the large number of potential food providers and their different capabilities and offerings, the project will develop a service-based mechanism with well-defined diet specific market place that allows food providers to register their services and food offerings. The project will develop reliability-augmented service descriptions and mechanisms with clear quality indicators that not only enable users to have informed decisions about the food ordering but also enable the system to make informed judgement of suitable combination of food ordering with suitable levels of nutrition that meet the specific needs of the user. The project is developing mechanisms to be able to capture and validate key quality indicators of food services, not only at the food level but also at nutritional and contextual levels.

Diet Aware Food Ordering

The selection of the combination of food services which satisfies complex criteria such as the older adult recommended diet or preferences for a certain type of food is not a trivial task and cannot be addressed using conventional techniques. There are a large number of food delivery services available on the market offering various types of food, which makes the finding of the optimal combination a NP-hard problem which cannot be solved in reasonable time using conventional techniques. The DIET4Elders solution is to model the problem as a combinatorial optimization problem and solve it using hybrid bio-inspired techniques that should combine the strength elements of different bio-inspired meta-heuristics. The advantage of such hybrid techniques is that they allow identification of the optimal or a near-optimal solution in a short time and without processing the entire search space as opposed to a classical exhaustive search strategy.

In order to identify the optimal combination of food delivery services using bio-inspired meta-heuristics the following steps need to be performed (see figure 2): (1) the optimization problem needs to be formally represented, (2) the concepts of the optimization problem must be mapped to the meta-heuristic concepts, and (3) the meta-heuristic's algorithm needs to be adapted/enhanced according to the optimization problem being solved.



Intuitive interfaces and non-intrusive technologies

One key aspect of the project is its unique older adults end users and their contextual and personal preferences and their special needs to interact with technologies. The challenge is to be able to develop technologies that older adults can use and interact with taking into account their technological and cognitive skills. To overcome the challenge, the project is using three methods: to build graphical/user interfaces based on well-established human-computer interaction techniques, to learn from previous experiences drawn from other similar projects, and to engage continually and closely with the older adults during development. Relevant techniques human-computer interaction based in social and computational sciences are being drawn to drive a methodological approach to user interface development. The team is establishing collaborations with a number of projects within the AAL programme and beyond in this area, including NANA [*4*] to learn from and reuse, where possible, their experiences and/or developed approaches. A key lesson that has repeatedly been learned from many previous projects that irrespective how useful a technology may be if not easy-to-use (or not useable) it will probably fail [*4*]. Taking a user-centred approach is critical to technology success. To do so and engage with users, the project has established an end-user group of potential older adults and is continually running end-user studies to test and validate developed interfaces and technologies.

4. Conclusion

The paper presents the overall process interactions and architecture of the Diet4Elder project. It described briefly the underlying methods and technologies that will be used by the projects to enable self-management of a balanced nutritional intake based on monitoring daily activities, and self-feeding habits. The projects builds its solution using a service –oriented architectures and employs an number of services to provide nutritional advice, interact with dieticians and carers, and enable food ordering through a reliability-augmented and well-specified marketplace.

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B3. Europe Health Cluster

Session Chair: *Mendel de Jong, Mendel de Jong Media (The Netherlands)*
Session Responsible: *Peter Portheine, Brainport Health Innovation/Slimmer Leven 2020 Brainport (The Netherlands) and Edwin Mermans, Coral/ENGAGED/CASA/Province of Noord-Brabant (The Netherlands)*

A landscape of European networks, programs, partnerships, projects and clusters has arisen in recent years all working on implementation of smart ICT solutions for independent living & integrated care. Together we are a learning community to tackle the barriers for up scaling and create a market for AAL technology. We've learned that the regional scale makes a difference for serious implementation. Large entities in this European learning community are the Ambient Assisted Living Joint Programme (AAL JP), European Innovation Partnership on Active and Healthy Ageing (EIP AHA) – including the 35 regional reference sites – and the Community of Regions for Assisted Living (CORAL) about regional policy for Active and Healthy Ageing connecting regional innovation clusters. Within the Interreg programme the 'Strategic Health Cluster Europe' brings together parties from the Interreg IVA/B/C program with a total of 128 partners. Interreg projects involved are CAN, CASA, COALAS, CURA-B, DIC, GCS, In2Lifesciences, Innovate Dementia, istay@home, ITTS, NeuroSKILL, RECAP, SYSIASS, Telemedicine and Personalized Care and TTC. The Assembly of European Regions (AER) with an e-Health network and several projects like the Thematic Network ENGAGED are on the same mission. Also small innovation clusters in Central European countries are ready to join this growing European learning network. How can we connect all these networks, partnerships, programmes and clusters better to the AAL JP.

The session touched on how to create regional alignment between AAL and other European programs, projects and networks. Not only for regions to be better equipped and to be involved in such programs but also because a coherent regional strategy allows much better and wider implementation of AAL technology once developed. The session showcased Reference sites explaining their specific regional and unique selling points, focusing on specific thematic issues from references site to AAL solution. There were discussions to questions like: How can twinning activities, side events and activities from the EIP AHA, Coral, AER, Interreg contribute to better implementation and up scaling of smart ICT solutions? How can the AAL JP be promoted better within the regional innovation clusters? How can regional and municipal governments be involved and stimulated to participate in the AAL JP? What can networks like Coral, AER and the reference site do to include and mobilise partners in Central European countries? How to mobilize the regions and governments that are unengaged so far?

Invited Speakers:

Peter Portheine Brainport / Slimmer Leven 2020 (The Netherlands)
Maurice Smith, Liverpool Clinical Commissioning Group (United Kingdom)
Esteban de Manuel Keenoy, Kronikgune, Basque Country (Spain)
Ida Prosperi, Sviluppo Marche SpA, Marche Region RDA (Italy)
Vesna Dolnicar, University of Ljubljana, Faculty of Social Sciences (Slovenia)
Marta Tatar, Covasna county Council (Romania)
Raquel Fernandez Horcajada, AAL JP Central management Unit (Belgium)

B4. Smart Cities and AAL

Session Chair: *Teresa Chavarria, Istituto Carlos III, Spain*
Session Responsible: *Teresa Chavarria, Istituto Carlos III, Spain and Javier Valero, Ametic (Spain)*

What makes a city smart? Is the focus on technology or the sustainable use of resources? Increasing the quality of life of citizens? How can smart cities help older adults live better for longer?

This session explored both, the connections between Smart Cities and AAL and the impact that the crossroad in which these concepts converge can have on promoting active and healthy ageing within the broader domain of a city.

The discussion shifted from ideas to what is being done nowadays by introducing a reference smart city, AAL products and services to be deployed in such a scenario, as well as European Initiatives built to bring the Smart AAL City a little bit closer to us.

Invited Speakers:

Diego López de Ipiña, University Of Deusto (Spain)
Inmaculada Luengo, HI-IBERIA (Spain)
Paul Pelsmaeker, FiCHE (The Netherlands)

B5. Future call challenges

Session Chair: *Teresa Chavarria, Instituto Carlos III, Spain*
Session Responsible: *Karina Marcus, AAL JP Central management Unit, Belgium*

The AAL Programme began a new phase as approved in May 2014 by the European Parliament and the Council of the European Union. For the next following years the Programme is committed to accelerate the emergence and take-up of relevant, affordable and integrated innovative ICT-based solutions for active and healthy ageing, in such a way that the ICT component does not reduce human contact, maintaining and developing a critical mass of applied research, development and innovation at Union level and creating a favourable environment for the participation of small and medium-sized enterprises.

To achieve these goals, the AAL Programme identified challenges for future calls. Specifically in this session, were invited the AAL community to actively contribute with their expertise and vision in the discussions of the next and future challenges in ICT for Ageing Well and to build the best scenario through discussion, interaction and cooperative work.

Invited Speakers:

Dr Juliet Craig, University of Sheffield, United Kindom
Dr Fillipo Cavallo, The BioRobotics Institute, Scuola Superiore Sant'Anna, Italy
Prof Paolo Maria Rossini, Universita Cattolica del Sacro Cuore, Italy
Jolien Wenink, JPI Healthy Diet for a Healthy Life

PARALLEL SESSIONS

TRACK C

TRACK C
SUPPORTING PROJECTS TO MARKET

Although the AAL JP has invested the past 6 years over Euro 600 Mio in R&D, and support action to bring AAL solutions to the market, the AAL market has not yet developed a clear cut profile and visibility. In this track we explored the reasons for this. What is (are) the value proposition(s) for this market and how can we arrive there? What are the market drivers and how can we make use of them? What economic and social impact do we expect and how do we measure it? What legal model (SME, Multi National, PPP, etc.) is best suited to impose this impact?

These issues were discussed in 5 different sessions:

C1. Value proposition
C2. AAL-Projects: Evaluation of AAL Markets
C3. Economic and social impacts
C4. Informal care: a market factor
C5. Promoting innovation by scaling up: myth or fact?

C1. Value proposition

Session Chair: *Urs Guggenbuehl, SBFI, Switzerland*
Session Responsible: *Urs Guggenbuehl, SBFI, Switzerland and Peter Saraga, AAL Advisory Board, United Kingdom*

AAL financed projects aim for a market entry of maximum 3 years after completing the R&D project. A successful market entry however depends very much on the specific "Value Proposition", a promise of value to be delivered and a belief from the customer that value will be experienced.
Creating a value proposition is part of a business strategy. It needs to be considered already when starting the R&D project and must be continuously improved during the development until the market entry.
A value proposition for a new product or service should state its capability, the expected impact, a proof, and the cost, that is, the price a customer is expected to pay.
In this session we explored further, what makes a typical value propositions for AAL markets, how can a value proposition for AAL markets be derived and how can it be continuously improved.

Invited Speaker:

Andrea Kofler, University of Applied Science Zurich, Switzerland

Contributions:

C1.1. Saapho: A System To Enhance Active Ageing Through Safety, Participation And Health Services, Xavier Rafael-Palou, Guillem Serra, Felip Miralles (Spain)

C1.2. Stakeholders and value proposition CarlosGarcía-Gordillo, CGG Management Consultant (Spain)

C1.3. Value Proposition meets Values in Action (ViA) - Christiane Moser, Manfred Tscheligi, Manuel Eisele, Philipp Osl

C1.4. The value proposition of the VictoryaHome project - Gunn-Hilde Rotvold, Stephen Von Rump, J. Artur Serrano

C1.5. The People Value Canvas – A New User-Centric Tool For Building Value Propositions, Äyväri, A. , Wildevuur, S. , Bjerre. M. , Van Dijk, D. , Hammer-Jakobsen, T

C1.1. SAAPHO: A System To Enhance Active Ageing Through SAFETY, Participation And Health Services

Xavier Rafael-Palou[1], Guillem Serra[2], Felip Miralles[3]

ABSTRACT

SAAPHO (www.saapho-aal.eu) is an AAL European collaborative project (aal-2010-3-035) that aims to stimulate and support seniors to participate in the self-serve society by preserving and enhancing their independence and dignity at home through a novel system that promotes active ageing. SAAPHO system offers an accessible and usable tactile mobile app, which integrates a set of intelligent services, related to health, participation and safety by means of an open and decoupled middleware. The system also counts with a set of smart home wireless devices for supporting monitoring tasks. Promising results has been achieved on several test pilots in different countries.

Keywords: ambient intelligence, middleware, monitoring, sensors, active ageing, assistive technologies, advanced teleassistance.

1. Introduction

A key aspect on the challenge of improving seniors' quality of life is the maintenance of their independence and autonomy at their own home. Traditional solutions based on public health resources evidence critical gaps in the current context of global economic crisis and in the rapidly ageing society with decreasing birthrate [1]. These changes (e.g. current median age in the EU is 37.7, but by 2028 the average age of an EU citizen will be 52.3) have a clear effect on the society in which we live and pose a major challenge for future governments. Several technological alternatives address this problem by offering assistive, health-care and first aid tools for the older people [2] [3] [4]. However, seniors' technological receptivity is extremely sensible and directly influenced by pre-disposition, need and social support factors. Therefore, easiness of use along with accessibility, deployability into an existing life environment and usability are major issues to be seriously taken into account.

The aim of SAAPHO [5] project is to stimulate and support seniors to participate in the self-serve society by preserving and enhancing their independence and dignity at home through a novel system that promotes Active Ageing (WHO, 2002 [6]). Thus, SAAPHO creates an ecosystem composed of a set of intelligent services for the elderly related to health, participation and safety. Those are integrated in an accessible, intuitive and user-friendly mobile application communicating with a set of unobtrusive wireless devices that enable monitoring facilities.

2. SAAPHO system

Since its inception SAAPHO has followed a user-centered design methodology applying an iterative process where requirements gathering, design and evaluation stages were repeated until the final prototype. Along this period end users from two different countries (Spain and Slovenia) were involved to advice the project team regarding their

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3 Barcelona Digital Technological Centre, fmiralles@bdigital.org

needs and preferences but also to assess appropriated functional and design decisions. Once user requirements were collected (from more than 200 questionnaires and 2 focus groups of approximately 20 old people) they were analyzed and organized to become the fundamental principles of the SAAPHO system design:

- Decoupled architecture. The system is composed by independent but interoperable components that easily enable updating, replacing or even aggregating new ones.
- Open system. The system provides generic interfaces compatible with diverse communication protocols (Bluetooth, Wi-Fi, Z-Wave, HTTP, SOAP) to services and off-the-shelf sensors.
- User data privacy. Shipping and storage of data is securely done via secure protocols and encryption mechanisms.
- Low Cost. Due to limited budget of end users, wired and proprietary technologies are replaced by wireless protocols and open source alternatives.
- Market Oriented. SAAPHO works with available EC off-the-shelf devices.

The final design of SAAPHO system relies on a standard three-tier architecture (see Figure 6).

On one side we have the user at its own home in which it is running the user interface in a tablet device but also a set of wireless sensor devices. Those are monitoring the health and the user's home activities. On a second place we have the active ageing services running as cloud services. They provide automatic and on demand social, health and safety functionalities to the users depending on the actions selected from the interface but also depending on the data received from the sensor devices. Finally we have the remote middleware layer that orchestrates and prioritizes the processes of the system and interconnects the different services with the user interface.

Figure 6 SAAPHO global system architecture

2.1. User Interface

The SAAPHO user interface (see Figure 7) was developed to be delivered through Android tablets given their low cost, portability, direct interaction and ease of use. Regarding usability and accessibility, the graphic user interface holds homogeneous and easy to use screens by means of simple to recognize icons, texts and colours. The tablet application also has a settings section to personalize parameters (such as size and volume) and a help section with demonstrative video-tutorials of the system. The content of the interface has been organized in an initial home page that provides real time notifications (e.g. home temperature and humidity, health recommendations, links to common social actions or recommended news) but also with a menu to enable rapid access to the three services

offered by the system.

2.2. Middleware

The SAAPHO middleware [7] securely interconnects the sensor devices and services. Its main specifications are to be extendable, interoperable, scalable and secure. Among its functional components we highlight the traffic dispatcher that handles the requests of information from the user interface and from the services. Also we remark the security manager which controls the session IDs to uniquely identify each component and UUIDs that identify the users. The middleware also has a user interface recommender component that creates personalised messages that contain the information coming from the services to present it to the user considering his/her language, name, and gender.

2.3. Active Ageing Services

SAAPHO is aligned with the active ageing policy framework thus it provides three types of services (health, participation and safety) to enhace autonomy and independence independence of the older people comfortably from their own places.

Regarding the health services, SAAPHO has implemented an intelligent healthcare service to support remote health monitoring and to promote healthy habits and practices. Five main preventive healthcare parameters were considered: blood pressure, physical activity, weight measure, cardiac pulse and blood glucose. Different commercial Bluetooth sensor devices provide those parameters. The approach has been constructed through three different healthcare services for each parameter: 1) real time feedback generation service, 2) historical summary calculation service and 3) recommendation generation service.

Figure 7 Screenshots from the SAAPHO application

Regarding the participation services, SAAPHO sets up easy-to-use communication and participation services especially adapted to seniors to promote their inclusion in the information society. Among all the services implemented

we highlight the video-voice, picture sharing, personalized news and text communication. These services were integrated in the user interface via the open API's of Facebook, Gmail, Picasa, Google+ or Twitter providers. The participation service also provides intelligent social recommendations to enhance the user experience and promote communication proactivity.

The safety service is the responsible for ensuring the wellbeing of the senior at home. SAAPHO system connects in an open and flexible way to a set of sensors for measuring different types of events such as gas leak, fire, CO escape and presence; and ambient parameters like temperature and humidity. Therefore this subsystem consists of easy-to-deploy CE certified sensors, wirelessly integrated to the system, providing long term autonomy by an open transmission protocol (Z-wave). This service also provides ambient intelligence [8] features by adding intelligence to the surroundings for triggering alarms as well as detection of intrusion or abnormal lack of movement.

3. Results

In order to assess the usability, accessibility, applicability, impact and user satisfaction, as well as detecting areas for improvement, SAAPHO has tested three different prototypes. The Year 1 Prototype (Y1P) was tested in July 2012 as a proof of concept of the system. This prototype was tested by n=10 users from Slovenia and Spain. The Year 2 Prototype (Y2P) was tested in October 2013, in a lab setting (n=40), as well in both previous countries. This Y2P prototype already contained an initial version of the three services all together integrated with the middleware. Main results and impressions of the end users from the Y1P and Y2P were referring to an easy to use interface according to usability test parameters of effectiveness, efficiency and satisfaction. The final and year 3rd prototype (Y3P) contained the full pack of functionalities, services and devices of the system. That prototype was tested from beginning of April 2014 to end of June 2014 at n=6 users' homes, both in Spain and Slovenia. Positive impressions were collected from the participants using SAAPHO in real settings, at users' homes. In particular, they considered that using communication services would facilitate their contact with relatives and friends; using safety sensors would help them to identify potentially dangerous or anomalous events at their homes; and using healthcare services would let them to check more regularly their health status. The following Figure 8 shows some of the results of the Y3P prototype which was very well accepted among the participants in both countries; was easy to use; most of the offered services were extremely useful; responded to the older people' needs and promoted active ageing.

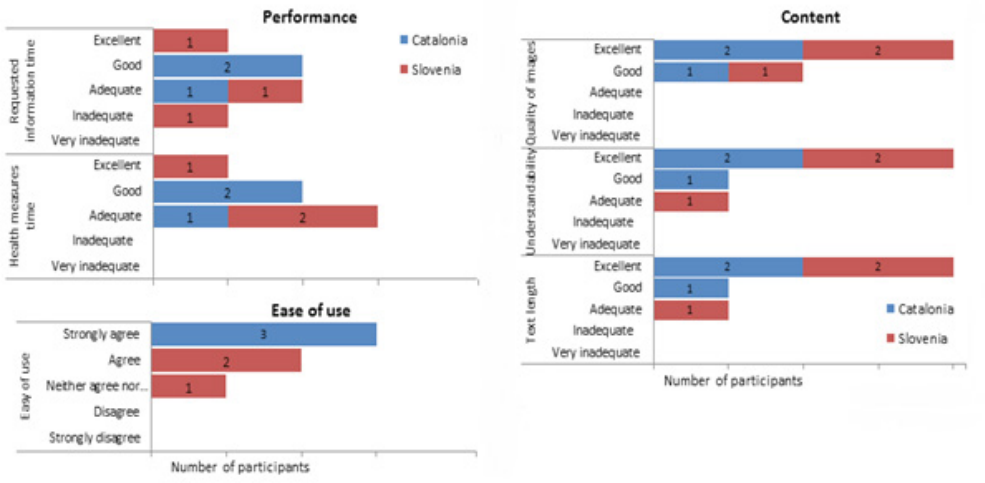

Figure 8 SAAPHO Year 3 Prototype main results

4. Conclusions

This paper describes the SAAPHO system and recent results achieved in the final prototype. These tests were performed in real settings in which several people over Spain and Slovenia were using the system at the same time at their own homes. The results confirmed the usefulness and the great help provided by the system for elderly, especially for those living alone. Beyond the project, SAAPHO coordinator and consortium expect to consolidate the exploitation roadmap of the system beyond the AAL project, with the ultimate objective to reach and impact the market. One example in this direction is the eKauri (ekauri.com) platform by Barcelona Digital, a recent ambient assisted living commercial initiative based on the grounds of SAAPHO and the Backhome projects in which the safety services of SAAPHO are being extended and applied to people with disabilities and the middleware is being reshaped to be able to offer advanced teleassistance services. These evidences aim to demonstrate show how SAAPHO has been an important step in the right direction to improve the quality of life of our seniors and people with special needs.

5. Acknowledgements

The SAAPHO Project (AAL-2010-3-035) is funded by the Call 3 of the AAL programme. The authors want to acknowledge to the whole SAAPHO consortium for its brilliant contribution and effort performed, but also to show a special gratitude to the older people involved into the project. Finally an special thanks to the Backhome project (FP7/2007-2013, grant agreement number 288566) for allowing extend important part of the work presented here.

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C1.2. Stakeholders and value proposition

CarlosGarcía-Gordillo[1], CGG Management Consultant (Spain)

ABSTRACT

Value proposition is a more or less standardized way of defining how an organization demonstrates how value is delivered to its customers. When dealing with care processes, the main problem is to identify who the customer is, since there are many stakeholders involved: end users, payers, and care givers. Balancing all of these diverging interests is essential, more so when facing an R&D project, in which case the driving force should come from the end users, with the payers acting as second in command.

Keywords: Value proposition. Triple Aim. Public Health. Research & Development.

Contents

"A value proposition is a promise of value to be delivered and a belief from the customer that value will be experienced."[2] We, of course, are sure that the product or service we are offering provides value for our customer but, have we identified clearly who our customer is?

Let´s focus on the issue of identifying our customer since, if we don't know who the customer is, how can we know what they are expecting?

Maybe we could find some answers in the Joint Programme. In its web we find that "AAL aims to create better conditions of life for older adults."[3] So, our customers are "older adults". But, is it really so clear cut?

For instance, "better conditions of life" is a broad aim that can only be achieved through a complex array of interventions. It requires the concerted effort of different stakeholders: what we call "Public Health".

Public Health is "organized efforts and informed choices of society, organizations, public and private, communities and individuals"[4] . With this in mind, the "older adult" becomes only one of the stakeholders expecting the "promise of value". There are at least two other stakeholders. "What [should then] make a typical value proposition for AAL markets"[5] has to take into account:

- Payers (public or private organizations): They tend to be conservative minded. They expect new systems and processes to enhance existing infrastructures. They are looking for improvements in the efficiency of care resources.

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2 https://www.boundless.com/marketing/an-overview-of-marketing/introduction-to-marketing/adding-value/ Retrieved (August 6, 2014)

3 http://www.aal-europe.eu/about/objectives/ Retrieved (August6, 2014)

4 Winslow, Charles-Edward Amory (Jan 9, 1920). "The Untilled Fields of Public Health". Science 51 (1306): 23–33.

5 AAL fórum. Track C1 leaflet

- Caregivers (physicians, social workers, informal caregivers): their main interest is to boost processes, leading to a smoother work-flow. They are aiming to reduce their work burden by increasing the efficacy of the care process.
- Older adults: they are looking for trustworthy and friendly user processes, allowing for better contact with their surroundings, easy access to their data, timely feedback and guidance and, last but not least, the ability to manage their own lives without unrequested outside interference. In other words they are looking for **empowerment**.

Probably, due to the fact that attending to all those interests at the same time is not easy, AAL has not delivered as was expected when the European Commission launched the first call seven years ago. But don't despair; the situation is exactly the same for other R&D programmes: "For many are called, but few are chosen."[1]

It is not only that these three main stakeholders are looking for different things; the real problem is that their interests diverge.

Although it is centred in mHealth, a study by PWC[2] shows that divergence. According to this study, the main drivers in adopting mHealth for payers are:

- Reduction in administrative time for medical personnel, allowing greater time for patients
- Improved quality of care and better health outcomes
- Lower overall costs of care for patients

As for professionals, they would be willing to adopt mHealth if it provides:

- Improved quality of care and better health outcomes
- Easier access to care for existing patients
- Reduction in administrative time for medical personnel, allowing greater time for patients

While end-users are driven by the following characteristics:

- Ability to access healthcare providers more conveniently and effectively
- Ability to reduce own healthcare costs
- Ability to have greater control over own health

One can easily see that the three stakeholders do not coincide in any single driver. But it is probably more telling that "Ability to take control over one's own health" is not even a concern for payers or professionals, neither in the three main drivers nor in any of the other eight drivers included in the study. And it is precisely this empowerment that should drive most of our efforts for better care processes.

Of course, the objective of satisfying the three stakeholders at the same time is not new. Something very similar was launched by The Institute for Healthcare Improvement in the USA some time ago in "The Triple Aim"[3] . The Triple

1 Matthew 22:14

2 PWC. Emerging mHealth: Paths for growth, 2013.

3 http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx Retrieved (August 6, 2014)

Aim states that new designs must be developed that simultaneously pursue three dimensions:

- Improving the patient experience of care (including quality and satisfaction);
- Improving the health of populations; and
- Reducing the per capita cost of health care.

We could easily match each of the three aims to each of our three stakeholders: end-user, professional, and payer.

Seen in this light, we can identify a big problem when confronted with the difficulty of achieving that triple aim, or providing value for our three main stakeholders.

In our domain, R&D is driven mainly either by research or by ICT organizations. The presence of end-users leading consortia is anecdotal, as is that of care professionals acting as such. It is true that the EC is putting a lot of emphasis on fostering balanced consortia, but that does not mean that the project achieves that balance. What we see in forums and gatherings is that most consortia are strongly led either by research or by ICT organizations.

Is there an easy answer to this conundrum? Obviously not, we have to assume that people dedicating their lives to devising new processes aimed at improving public health are wise people and that if only a few have found the philosopher's stone it is due to the difficulty of addressing the three fronts at the same time.

Nevertheless, there are a few rules that we should follow, the first being, who will drive the car of innovation. I strongly suggest that the end user is the one who should be at the steering wheel, if only because during all this years they have been in the back seat. If the trend is for the end user to assume more responsibilities in the care process, what we call the empowerment of the end user, then we have to design the care process according to their wishes and demands, thinking always of "Improving the patient experience of care" as the Triple Aim states. And who better than the end user will know how to improve the experience?

In the case of AAL there is an added problem with our end users. We are talking about "older adults", so leading the consortia there should be any of the myriad of organizations of older adults.

Consider the typical AAL R&D project. Year One is the design of the proposal and the signing of the contract; Years 2 to 4 the development phase; with the following three years for the completion of the final product or service. In all, seven years for the product to be market-ready. If our end users were in the range 70-75 at the time of inception of the proposal, by the time the product or service is in the market they will be 77-82, probably too old to use what they thought was a great idea seven years previously. No problem, the end result is for people in the 70-75 range, those people who were 63-68 years old at the time of inception; nowadays almost a generation apart when it comes to ICT skills.

So, selecting the end-user leader is not so easy. The right mix of people has to be found, so that the care process and the tools to implement it go hand in hand thinking seven years ahead.

Now, let's decide who the co-pilot should be. At this point I have to state that I may have a conflict of interest: I am an economist. But putting aside that conflict, I strongly believe that the co-pilot should be the payer. We may not like it and argue that money should not drive all our decisions, but the fact remains that "money makes the world go around" as the famous song from Cabaret tells us. We may be able to put on the market the most desirable item,

but if there is not somebody willing to pay for it, we will have another Tucker car; the best but unmarketable.

And that leaves the back seat for, guess who, those who have been in the driver's seat so far, the research and ICT organizations. They should accept the fact that they are tool makers serving end users with something that payers can afford.

If you are involved in R&D aiming at delivering value to your customer, take into account at least these 3 stakeholders: end user, payer, care giver, in that order. Otherwise, you will be doomed!

C1.3. Value Proposition meets Values in Action (ViA)

Christiane Moser[1], Manfred Tscheligi[2], Manuel Eisele[3], Philipp Osl[4]

ABSTRACT

AAL projects aim to provide valuable system to users. Typically, tools like the Business Model Canvas are used to describe the business model, i.e. how to create, deliver, and capture the (business) value of AAL system. Additionally, the Values in Action approach can help to identify values based on user needs and requirements in a user-centered design approach. These values shall then guide the development and evaluation of the AAL system. The aim of this paper is to illustrate how the Values in Action approach can help to identify the features making up a convincing value proposition. We demonstrate this through the example of the GeTVivid project.

Keywords: Value Proposition, Values in Action, User-centered Design

1. Introduction

Values are "*desirable transsituational goals, varying in importance, that serve as guiding principles in the life of a person or other social entity*" ([12], p. 21). Values define what a user considers important in life [4], are centered in people and refer to the properties or features of the desired objects (e.g., technologies) [5]. Users seek to achieve their values and the object needs to deliver them ([3] or [13]). Values are typically addressed in AAL projects when developing the business model – in particular, when defining customer segments and the offerings to be provided to them. Thereby, the value proposition tries to create added value for a customer segment through a distinct mix of features satisfying needs. Values can be quantitative (e.g., lower care costs or features) or qualitative (e.g., quality of life or autonomy) and even satisfy new, previously unperceived needs (e.g., social involvement).

Many AAL projects follow the user-centered design approach (that is grounded in Human-Computer Interaction). After having identified the users' requirements, needs and expectations, there is often the challenge of how to design appropriate system for users and how to conceptualize the iterative evaluation investigating how usable and user-friendly the AAL system is in terms of usability, how user experiences the interaction with the system and whether they would accept and use it, i.e., what the added value is.

The Values in Action (ViA) approach aims to support value- and user-centered design in AAL projects. ViA is based on the consideration that values can include both the user's perspective (e.g., emotions or experiences), as well as technological aspects, which are important for AAL projects. It assigns needs from the requirements analysis to different factors related to usability, user experience, and user acceptance and the six different values (i.e., functional, social, emotional, epistemic, interpersonal, and conditional).

In the following sections, we will introduce the concept of value proposition, the ViA approach, and the AAL project GeTVivid as a use case, where we present user requirements assigned to factors and values of the ViA approach

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and the derived set of features for a strong value proposition for the targeted customer segment.

2. Value Proposition

The value proposition is the collection of benefits that a company or a specific solution (products and/or services) offers to customers. These benefits result from solving a customer problem or satisfying a customer need [10]. Since superior value for the customers is what convinces and retains them [7], a clear value proposition becomes a key cornerstone in the business strategy: "Strategy requires a clear articulation of targeted customer segments and the value proposition required to please them" ([8], p. 10).

In order to formulate a value proposition, the following questions need to be answered (derived from [1], [10], or [11]): 1) For which market is the value proposition being created (market / customer segment)?; 2) What does the market value most? Which customer problems do we help to solve? Which customer needs do we satisfy (market needs and value experience)?; 3) What bundles of products and services do we offer to each customer segment in order to create the promised value (offering)?; 4) What alternative options does the market have to our offering? Is our offering's value to the customer superior to these alternatives (differentiation)?; 5) Are the targeted customer segments willing to pay for the value we create? What is the price a customer is expected to pay (willingness to pay)?; and 6) What evidence is there to substantiate the value proposition (proof)?.

Values can be quantitative (e.g., lower care costs or features) or qualitative (e.g., quality of life or autonomy) and even satisfy new, previously unperceived needs (e.g., social involvement). By defining the other building blocks of the Business Model Canvas, the business model has to ensure that the company is capable of providing the value proposition at reasonable costs (capability and costs).

3. Values in Action (ViA)

Fuchsberger et al. [5] developed the ViA approach in order to find a suitable evaluation approach that combines usability, user experience and user acceptance and assesses users' requirements and needs. ViA is based on the consideration that values can include the user's perspective (e.g., emotions or experiences) as well as technological aspects (e.g., accessibility or adaptivity), which are important for AAL projects.

ViA extends the five values from the Theory of Consumption Values [6] with the sixth interpersonal value (i.e., the experiences while an interaction between humans via a technology, but not for the purpose of self-presentation) for a more holistic view. The original Theory of Consumption Values addressed the functional value (i.e., the perceived utility for achieving a specific task or a practical goal), the social value (i.e., the symbolic importance of the technology for conveying social image), the emotional value (i.e., the potential of the technology to arouse emotions, which are believed to accompany the use), the epistemic value (i.e., experiencing new technologies) and/or the conditional value (i.e., technologies being tied to a specific context).

In order to identify the factors for the different values of ViA within an AAL project, a user requirements analysis is performed, i.e., user needs are assessed in workshops, interviews, or a survey [9]. In a next step, the findings of the requirements analysis are analysed again with the help of an affinity diagram in order to identify factors related to usability, user experience and acceptance and their relevance for the project. Afterwards, the factors are assigned to the six values and the relevance of them can help to prioritize the values. These prioritized values are an integral input for the concept, design, and development, and also serve as a basis for the evaluation. The aim of the

evaluation is to figure out whether the developed system satisfies the users' needs, wants, and whether it delivers the intended values.

4. GeTVivid Project: Value Proposition meets ViA

The goal of the project GeTVivid is to offer a set of AAL-related functionality and services to older adults as well as informal and formal carers. We address ageing in place within a research project that aims at developing an online platform mediating the mutual organization of informal care activities in the real world by empowering older adults with mild impairments (e.g., restricted mobility) to not only receive but also provide support. We want to empower older adults to act as receivers but also providers of support by creating an online platform that gives space to engage in satisfactory and meaningful social interaction.

Equipping an older adult's home with different technologies is not the solution to facilitate ageing in place. Technologies that are already available hold the potential to make a useful contribution as they are usually well-known by older adults. As the TV is often an integral part of people's everyday life and immensely influences people's lives [2] (e.g., supporting individuals in structuring their daily schedules), our system aims at making use of this prominent media. We aim at offering a useful and valuable set of functionalities and services on a platform by using connected TV devices based on the Hybrid Broadcast Broadband Television (HbbTV) standard in combination with an extended user interface on a mobile second screen (i.e., tablet or mobile phone with touch screen). In the project, a user-centered design approach is applied. In the first nine months, user requirements were identified within contextual interviews, workshops, and a survey (in total with 280 older adults). The following set of factors for the different values of ViA was derived from the requirements analysis and was then translated to more specific features of the GeTVivid platform that could help to fulfil the user requirements by creating the appreciated or even expected value (Table 2).

Comparing GeTVivid to existing alternatives helped to identify the differentiating characteristics of the GeTVivid system. Whether it's worth to implement all these features, however, still needs to be decided based on the efforts, as well as the customers' willingness to pay. These steps have to be taken as part of the iterative product definition and GeTVivid's agile product development process. These iterations will also help to concentrate the currently comprehensive list of value creating features to a rather short set of features to be included in a persuasive value proposition that can easily be communicated to potential users.

Value	The GeTVivid platform should address …	Implications for GeTVivid's Value Proposition	MH	Diff
Functional Value	• Ease of use (i.e., the extent to which an older adult believes that using the platform would be free of physical and mental effort – addresses the barrier of not using too complex platforms) • Perceived usefulness (i.e., the extent to which an older adult believes that using the platform would support her/him with activities of daily living – addresses the need for an added value for activities of daily living) • Perceived safety (i.e., describes the older adults' perception of the level of danger when interacting with the platform – addresses the need for accurate information and fraud prevention) • Efficiency (i.e., is the relation between the accuracy and completeness with which users achieve certain goals – addresses the need that organizing support should not be more complicated than in real world) Additional factors are flexibility, accessibility or learnability.	Combine the best from two worlds: TV as a well-known and familiar device (allowing for large, easy-to-read content) + second screen tablet as an easy-to-use input device (for complex data entry)		x
		Automatically maintain user groups, e.g., all users living in a certain area, and make them available to users to improve ease of use		x
		Comprehensive portfolio of services, both professional and informal services, to enhance usefulness by supporting a broad range of activities of daily living		x
		Ensure data security (e.g., HTTPS)	x	
		Let the users determine which information is visible for other users in their profile	x	
		Increase efficiency by suggesting interesting offerings to users or finding matching support (user profiling)		x
		Focus on efficient processes to coordinate appointments, i.e., create added value compared to the phone (24x7, asynchrony, etc.)		x
		Give feedback to the user at every process step to support "learning by doing"	x	
		Flexible UI for different levels of skills: standard mode and expert mode		x
Social value	• Social image (i.e., the extent to which older adults perceive that the use of the platform will enhance her/his status, convey autonomy or empowerment – addresses the need for longer, autonomous living) • Subjective norm (i.e., an older adults' perception of what others think about using the platform or of what others think s/he should perform on it – addresses the need for self-determination and fear of peer pressure)	Use gamification (e.g., awards for becoming an "experts")		x
		Lower barrier to "take" by also being able to "give"	x	
		Avoid stigmatization by not showing information about platform usage (in particular ordering services) if not explicitly confirmed by the user	x	
		Enable possibility to provide repetitive support and also limit the number of responses		x

Value	The GeTVivid platform should address …	Implications for GeTVivid's Value Proposition	MH	Diff
Interpersonal Value	• Reciprocity (i.e., the extent of reciprocal communication and support between older adults – addresses the need for give and take relationships) • Social connectedness (i.e., the experience of belongingness and relatedness with other older adults – addresses the need to avoid loneliness) • Interpersonal familiarity (i.e., the acquire and use of information from others to guide the interaction between them – addresses the fear of not knowing each other) • Social capital (i.e., the connections among older adults and the norms of reciprocity and trustworthiness that arise from them – addresses one potential benefit from using the platform by linking online with offline)	Users can friend other users only mutually	x	
		Show new users in a prominent way		x
		Prominently show needs of users who have supported one user to her/him in order to stimulate a reciprocal "giving back"		x
		Suggest users to each other based on similar interests etc.	x	x
		Support ad-hoc service provision and easy activation/deactivation of informal offers to provide more flexibility to informal providers (instead of long-term commitments)		x
		Possibility to post offers/ demands and respond to offer/demands from others on the platform, but actual support is enacted in the real world	x	
		Provide community manager that hosts events to get to know each other and that grants access for new users to the platform		x
Emotional Value	• Trust (i.e., trust in system is the extent to which an older adult is satisfied with how the platform will behave and trust in users is the extent to which an older adult is confident in, and willing to act on the basis of, the words, actions, and decisions of another – addresses the need for trustworthiness) • (Dis)Satisfaction (i.e., the older adults' comfort with and positive attitudes towards the use of the platform – addresses the need for satisfying support) • Engagement (i.e., the emotional, cognitive and behavioral connection that exists between the older adult and the platform – addresses the fear that other older adults might not use it) Additional factors are pleasure/fun/ enjoyment, subjective well-being or quality of life.	Enable users to get in contact prior to, or independent of, exchanging help in order to get to know each other and build up trust		x
		Enable user feedback or reviews for (professional) services used	x	
		Provide a professional community manager to grant access and to help and mediate in case of problems and conflicts		x

Value	The GeTVivid platform should address …	Implications for GeTVivid's Value Proposition	MH	Diff
Epistemic Value	• Attitude towards technology (i.e., older adults overall affective reaction to use the platform – addresses the technology affinity of older adults and possible avoidance of / skepticism regarding new technologies) • Curiosity (i.e., older adults interest in the platform and is initiated by novelty, complexity, or ambiguity – addresses the fear that other older adults might not be interested)	Use Gamification, i.e., have playful tutorials to explore the GeTVivid platform	x	x
Conditional Value	• User characteristics (e.g., motives, competence, impairments, social roles, or daily routines of older adults) • Usage context (e.g., geographical distance between older adults)	Provide functionality to limit the scope of a user's activities to a certain geographical area (e.g., only show services of people living within 2 km; make my informal offers only visible to people living within 2 km)		x

Table 2: Value-creating factors according to ViA and derived features for GeTVivid's value proposition (MH - Must-Have – also provided by competing systems, Diff - Differentiator – may act as a convincing Unique Selling Proposition, differentiating it from competitors)

5. Conclusions

ViA combines theory with applied user research in order to inform the design, development, and evaluation of our AAL system from different perspectives. Additionally, the development of appropriate business models and strategies is very important. We used a prioritized list of values and factors from ViA to derive a list of features that can help to address the users' expectations. ViA, thereby, helped to direct our attention in the solution definition process to characteristics that are really important to the users. Hence, ViA can support the identification of gains and pains for the customer segment (i.e., user needs behind the values and factors), as well as gain creators and pain relievers for the value proposition (i.e., features and functionalities of the AAL system). ViA supports the development of AAL systems with an added value for users and can help to formulate and identify a strong value proposition as a key component in sustainable business models for AAL systems.

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C1.4. The value proposition of the VictoryaHome project

Gunn-Hilde Rotvold[1], Stephen Von Rump[2], J. Artur Serrano[3]

ABSTRACT

The VictoryaHome project steps up from "video-conference on wheels" (which is already available and possible to use at home) into a full "care on wheels" solution. The existing Giraff avatar will be the basic supporting mechanism to achieve a complete new platform for mobile help informal care to the older adults. It also focuses on the informal carers, the family, the friends, and those close to the older adults with the burden of giving daily care the best they can, taking energy and time from their already busy life.

Keywords: Business Model, Informal Care, Older Adults, mHealth, Home Care, Ambient Assisted Living, Assistive Technologies, Chronic Care, Welfare Technology, Care Services, Sustainability

1. Introduction

The VictoryaHome project [1] brings a new view on care for the older adults where there is a focus on service and not on technology. Technologies are the enablers, not the end point. This is easily said but not always easy to enforce when the solution providers are by nature technology-focused. The strong involvement of care organizations from the start of the project delivers real value for end-users.

2. VictoryaHome

VictoryaHome has been active for over a year. Its initial achievements and results are presented in [2]. VictoryaHome is both a system and a set of services that monitors health and safety, and facilitates social contact. The VictoryaHome services empower family, friends and professional caregivers, and can bring immediate human presence when needed. Therefore, it includes smart devices like an activity monitor, fall detector and an automatic medication dispenser, a smartphone app for family and friends, an online dashboard for response centres, and a mobile telepresence device called Giraff [3], which works as an avatar of the family and friends and that stays home with the older adult.

3. Value Proposition

This project stresses the efforts of proving sustainability of the services after the end of the project. It does not target just the successful end of the study, but targets the afterlife of the product and services.

A proper service definition targeted at the older adults and their carers, who can most benefit from this technology will provide a dramatic cost savings opportunity compared to nursing home care. There is also a strong political force at play in the care organizations which strongly supports the business case for VictoryaHome. Elderly care

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is a hot topic in the face of an ageing population and fear of the increased financial burden it will place on an already stressed economy. Care organizations face the delicate task of balancing the emotionally-charged public expectation of quality care with the budget demands.

Most research projects are not able to transfer the developed technologies ad solutions into services in daily routine. As discussed in [4], after 6 years and 132 projects involving 23 nations the AAL Joint Programme has delivered only a few solutions to the market.

Figure 9: The VictoryaHome's Value Proposition was presented and discussed in various meetings.

VictoryaHome has been using the business model Canvas, initially proposed by Alexander Osterwalder in 2008 [5], as a strategic management and entrepreneurial tool. It focuses on how to create, deliver and capture value and considers both efficiency and increased quality of life. VictoryaHome the uses canvas model to prepare an exit strategy and bring the services to the market.

4. Conclusions

The project introduces innovation in areas such as technology, services and care processes. However, unlike most research projects, it also focus on innovative business strategies. The value proposition is aimed at the afterlife of the project: the services offered by VictoryaHome must be sustainable and persist in real settings once the funding for research has been fully used.
The business model "Canvas" has been used as a reference tool for the preparation of the project's value proposition.

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C1.5. The People Value Canvas – A New User-Centric Tool For Building Value Propositions

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ABSTRACT

The VictoryaHome project steps up from "video-conference on wheels" (which is already available and possible to use at home) into a full "care on wheels" solution. The existing Giraff avatar will be the basic supporting mechanism to achieve a complete new platform for mobile help informal care to the older adults. It also focuses on the informal carers, the family, the friends, and those close to the older adults with the burden of giving daily care the best they can, taking energy and time from their already busy life.

Keywords: value, value propositions.

1. Introduction

The aim of this paper is to briefly discuss the nature of the concepts of value and value proposition, and to reflect these understandings on one of the tools for building value propositions, namely the People Value Canvas [*1*]. We conclude by discussing the ideas how to develop further the tools for building value propositions especially in the contexts of user-centric innovation processes.

Traditionally value has been seen in terms of value delivery: the producer being the one who delivers while the customer is playing the role of the recipient of the value embedded in the products and services of the producer. The focus has been on the value-in-exchange. The evolving paradigm called the Service-Dominant Logic [*2*] contends that the customer is the main interpreter and creator of value. The emphasis on value-in-exchange has moved to value-in-use [*2*]. Thus, there is no value until an offering is used, because experience and perception are essential to value determination [*3*]. The co-created nature of value implies that value creation is interactional [*4*].

Although the S-D logic emphasise the value-in-use Heinonen and her colleagues [*5*] criticize the approach for its short-term time-frame, and they propose a longitudinal experience perspective stressing value as part of the customer's dynamic reality recognising value before, during, and after customer experiences as part of customers' cumulated life and reality. It has been suggested that also the imaginary future experiences construct value [*6*].

The contextual nature of value has been discussed by many researchers [*4, 5, 6, 7, 8, 9*]. Value and value creation are shaped by social forces [*7*] and norms, rules, and symbols [*9*]. Value has a collective and intersubjective dimension [*6, see also 6*].

The networked nature of value has recently gained more and more attention [*8, 9*]. All social and economic actors (including users) are seen as resource integrators, which implies that consumption is about integrating resources

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acquired from different sources [*4*]. Hence, value and value creation are influenced by a wider actor network or an ecosystem.

It has been claimed that value proposition thinking is at the heart of any value-focused organization because it sharpens the way organizations work by focusing activity so as to serve customers profitably [*10*]. The definition of value proposition has changed during the last two decades (see [*11*]) as the understanding of the customer's value creation processes has deepened. However, the popular text books written by both academics and consultants (for example [*10*]) mostly rely on rather firm-centric definitions of value propositions.

Frow and her colleagues [*11*] have noted that most research on value propositions has focused on the narrow customer-firm perspective. However, some exceptions can be found: recruitment market, internal market, referral market, influence market, and supplier and alliance market value propositions [*12*]. In their most recent article, Frow et al. [*11, p. 14*] define the value proposition concept in the broader context of a service ecosystem as follows: a dynamic and adjusting mechanism for negotiating how resources are shared within a service ecosystem. Reciprocal and co-created value propositions evolve through three broad stages: value propositions to customers, to key actors and within the service ecosystem.

2. The People Value Canvas

The Canvas was developed during an Ambient Assisted Living JP project called Express to Connect (2010–2013) with the aim to develop an ICT-based solution for strengthening social connectedness of older adults. The project was based on a user-driven methodology.

The People Value Canvas (PVC) consists of nine building blocks, describing the input that has to be provided in order to establish the value proposition (see Figure 1). This allows for holistic development and description of concepts, when the interdependencies between the different blocks are taken into consideration. On the one hand, the canvas helps structure users' needs and preferences, the context and effect. On the other, it describes how a proposed new solution will meet user-driven criteria. [*1, p. 137.*]

The understanding of people is the key issue in the People Value Canvas: the user is the expert on his own life and experience and should be driving the development process. The PVC is intrinsically linked to the development principles based on the Users as Designers -method [*13*], and ethnographic research methods. The first five building blocks present the user insights gained through ethnographic studies and co-creation sessions with the users.

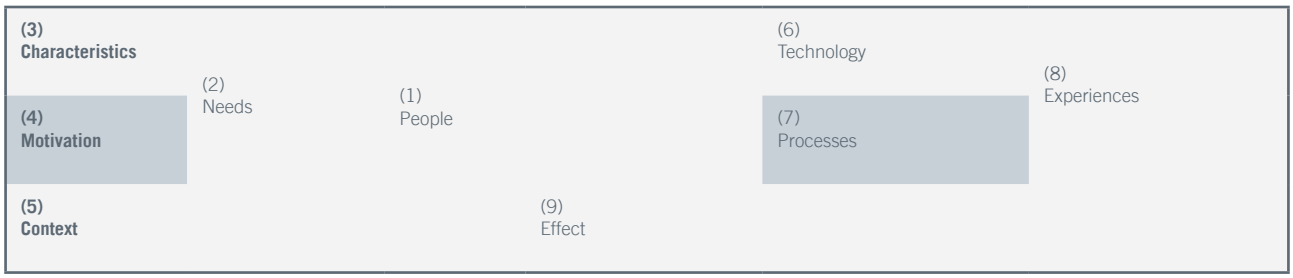

Figure 1. The People Value Canvas [*1, p. 135***]**

The first building block, People, introduces the main characteristics of the target group, and the portraits. Much like a persona, a common interaction design tool, a portrait is a description of the user, but the construction of a portrait is always based on empirical data from the qualitative research rather than a fictive description. Portraits anchor the differences within the identified user needs, and they function as vehicles for empathy and identification, visual depictions of knowledge, and representations of certain market segments. [*1 p. 152.*]

The next building blocks of the PVC – Needs, Characteristics, Motivation, and Context, provide further insights of the users. The outcome-driven innovation approach [*14*] maintains that the proper definition of "customer need" becomes clear when the job is the unit of analysis. Needs relate to how well the customer is getting a job done. A job is defined as the fundamental goals customers are trying to accomplish or problems they are trying to solve in a given situation [*15*]. The jobs can be divided into two main categories: functional and emotional jobs. Emotional jobs are related to the achievement of personal goals, and they are further subdivided into personal functions (how you want to feel in certain circumstances) and social functions (how you want to be perceived by others) [*1, p. 140*].

The contents of the Characteristics block is not only limited to the attributes of the users. It answers to questions like "In what ways are they active and connected? What kind of competences do they have? Which fears? Which dreams? What kind of relationship do they have with technology?". Motivation is what drives a person to behave in a certain way, and is crucial component in setting and reaching goals. Motivations shed light on individual aspirations, and what people value. [*1, p. 142–143.*] The fifth building block, Context, refers to the everyday context of the user where the jobs will be accomplished, thus the second building block, needs, sets the focus for the description of the context. Questions like "In what contexts do customers most struggle when executing the job today? Where else or when else might customers want to execute the job?", are helpful when trying to identify new opportunities [*16*]. Important contextual factors are for example the user's living situation (alone/with someone), place of living, his social networks (including geographical distance of family members, friends, and strength of their ties), access to resources, surroundings, time, climate, etc.

The right-hand side of the People Value Canvas focuses on the major issues related to solutions and effects. The contents of these building blocks are built upon the insights and feedback gathered from the users in co-creation sessions and prototype or interaction tests. When reaching for the technological solution the main questions to be addressed are: What technological options are relevant? How will technology respect the user feeling safe/socially accepted/connected/in a flow? Technology is not neutral; it has its own intrinsic effects and invites certain kind of use. A good interface activates people, enables them to take action themselves, and offers a context for dialogue [*1, p. 162–163*]. Designing for experiences means paying attention to both the user within his networks and the entire ecosystem within which the application or service is located. The following questions related to the building block called Process are simple at the first glance but the answers, the solutions, have to be based on a holistic understanding of the process from the user's point of view: How will the user get introduced to the intervention? How will the user be supported in usage? Is support desirable?

The 8th building block, Experience, refers to the value in use at the very moment when the user starts using the innovation, encounters service providers, other users, and artefacts related to the usage. There is a strong link to the second building block, Needs, and the third, Motivation. When the innovation succeeds in fulfilling the needs and it is aligned with the motivational base of the user, the jobs will get done, and the desired outcomes are reached.

The accumulation of positive experience and high quality interaction lays the ground for long-term effects. The description of effects, the anticipated impacts of the usage of the solution from the user's point of view, gives the

designer a new tool for evaluating the innovation during the development process. The designer is able to ask the users themselves to anticipate the impacts in their own lives. The evaluation criteria are based on the users' own input (building blocks 1—5, Gathering user insights), not on designers' views, or for example, in the context of wellbeing, the evaluation of the long-term impacts is not relying on extant generic measures of the quality of life.

3. Conclusions

The premises of the People Value Canvas are aligned with the S-D logic. The PVC clearly focuses on value-in-use instead of value-in-exchange. Customer experience and the context of value creation will be thoroughly discussed when filling in the Canvas. The last building block, Effect, covers the longitudinal perspective as proposed by Heinonen et al. [*5*].

The networked nature of value is partly taken into the consideration in the seventh building block of the PVC, Process. The understanding of users as resource integrators seems to be even less evident. Moreover, the developers of the PVC do not describe the interactional nature of the value creation although interaction is implicit in the building blocks of Technology and Process.

The People Value Canvas can be used as a tool to develop a concept, to guide its elaboration and to provide a reference point when choices need to be made later on in the development process. All together, the canvas reveals which information is lacking about the context and supporting service/technologies/processes; the 'blind spots' become visible. The canvas can help to compare the added value of different conceptual directions, to reflect on the crucial aspects of a concept, to engage in further research on a target group, or to guide the design of emerging solutions.

The value proposition built by utilizing the People Value Canvas relies heavily on the knowledge gained by using applied ethnography and co-creation methods. Hence, the People Value Canvas offers a new more user-centric framework to ensure that the value proposition is based on a holistic understanding on the users in their everyday contexts and the impacts the new solution is creating in the long run. However, the tool needs to be developed further together with its users. Based on the recent conceptualisations on value and value creation, especially the interactional and networked nature of value should be more carefully taken into consideration in the building blocks of the framework. Moreover, the value propositions should be built both for the user, the paying customer if the user is not the paying customer, and other actors involved in value co-creation in the whole service ecosystem, or the networks of networks of the user.

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C2. AAL Projects: Evaluation of AAL Markets

Session Chair: *Andrea Kofler, University of Applied Science Zurich, Switzerland*
Session Responsible: *Urs Guggenbuehl, SBFI, Switzerland and Peter Saraga, AAL Advisory Board, United Kingdom*

Although we have invested in AAL-Markets for many years now, it has not yet become a clear cut market. In this session we explored what has been achieved, what the drivers are (e-Health, ICT, smart homes, etc.) behind this market and how this market is about to evolve in the near future.

Invited Speakers:

Filippo Cavallo, The BioRobotics Institute, Scuola Superiore Sant'Anna, AALIANCE2 Network, Italy
Gabriella Cattaneo, IDC European Government Consulting, Italy
Juan Carlos Castrosin, AALA, Spain
Ingo Kirchhoff, Hocoma, Switzerland

Contributions:

C2.1. Introduction to a Study on Criteria of Successful End User Involvement in AAL Marjo Rauhala, Susanne Oechsner, Georg Edelmayer, Vienna University of Technology, Centre for Applied Assistive Technologies, Austria

C2.2. HEREIAM – Lessons Learned In The Netherlands – Rijnen Wil, Bierhoff Ilse, Nap Henk Herman

C2.2. HEREIAM – Lessons Learned In The Netherlands

Rijnen Wil[1], Bierhoff Ilse[2], Nap Henk Herman[3]

ABSTRACT

The Netherlands play a pioneer role in developing and using service platforms for long term care. To better understand success factors and barriers within this market a thorough analysis was performed of the Dutch market. This included a survey among the providers of service platforms, and an evaluation of 4 service platforms by user-system interaction experts and 26 older adults. Lessons learned were converted into requirements for the HEREiAM[4] platform.

Keywords: service platforms, usability, TV interface design, heuristics.

1. Introduction

The aim of the HEREiAM project is to help older adults to stay longer and independent at home by providing a set of services to support daily activities through a smart and user-friendly platform, accessible through their TV set at home. Besides prolonging independence, remote service and care delivery results in efficiency and flexibility gains for both care recipients and caregivers are expected.

In some countries the need for eHealth is more profound, for example because people live far away from a doctor. The US, Canada, Japan and Australia were the first countries who started to use remote care delivery. Finland and France were the European frontrunners in the field of cure technologies [*1*]. On the other hand, the Netherlands play a pioneer role in developing and using service platforms for long term care. Such an ICT platform is a well-integrated set of hardware and software components to support the execution of telehealth and telecare services [*2*]. No other country has more experience in this field. Large-scale exploitation, however, appears to be rather difficult.

To take a head start with the platform to be developed within HEREiAM a thorough analysis was performed of the Dutch market focussing on success factors and barriers within the market.

After an inventory of the service platform market, a questionnaire was sent out to 15 Dutch service platform providers, to learn more about the rationale behind service provision of different platforms, to abstract trends, to understand technicalities and to gather an insight in what the future could bring. Next, multiple service platforms have been evaluated by both user-system interaction experts and 26 older adults from the Netherlands and Flanders. Experts evaluated the Graphical User Interface and interaction modalities based on Nielssen's heuristics. The older adults tested a variety of service platforms, to discover problems and shortcomings of the current generation service platforms, and to inspire them in thinking about how such a platform can enhance their lives.

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4 HEREiAM - An interoperable platform for self care, social networking and managing of daily activities at home, AAL-2012-5-064, http://www.hereiamproject.org/

2. Overview service platforms

After 10 years of developing and experimenting in this field, the current Dutch service platform market consists out of a wide variety of systems to offer comfort, well-being, safety and/or care services, ranging from pure research projects to market ready products. Whereas some platforms focus on vulnerable older adults in general, other systems focus on specific target groups, each with its own selection of relevant stakeholders involved. Besides pure Internet-like services, more and more systems are linked with sensors and home automation. Some of these platforms make use of ordinary PC's and laptops, others are offered via touch PC's, tablets, television or even robots.

The questionnaire that was send to 15 Dutch service platform providers focused on aspects like unique selling points, interface used, target group of the platform, link with other systems, applications offered, robustness and efficiency. As a result of this research we have found the following trends:

Involve the social network around the client. A service platform is often used as a tool to interconnect all relevant parties in the care network of the clients, living either intramural or extramural. Depending on the kind of target user, the network can vary as well. In the last few years more and more parties are motivated to hook up to the platform, ranging from formal and informal caregivers to municipalities and communities. But also schools, banking companies and local entrepreneurs.

Offer a wide range of services. Whereas in the beginning service platforms were simple and offered limited functionality, most of today's platforms offer a combination of comfort, well-being, safety and care services. To be able to provide all these functionalities, platforms are linked with external websites and systems from third parties. The user can choose for himself which services to install and use.

Enhance interoperability. As a service platform provider you cannot know everything and do everything yourself. By making use of standards and open software architecture it is easier to collaborate with third parties.

Make your platform accessible on each device. Users already have ICT equipment at home and/or they prefer to choose their own brand and type of device. Therefore, service platform providers make their systems accessible on each device.

Take into account age-related changes and individual situations. Besides large screens, large font sizes and large buttons, more and more attention is paid to overcome age-related restrictions. Certain touch screen interactions like right mouse click, double click and swiping are enabled on some platforms and even solutions like eye-tracking and speech input are applied to make systems usable for paralysed users.

Allocate tasks to formal carers, informal carers and volunteers. Professionals (home care or care institutions) can put services and information online for specific user groups. The informal carers – friends and family – can add extra enjoyable and personal content like messages, pictures, music and so on. One of the service platform providers talks about a new kind of voluntary work, where people provide content for others and help each other out.

3. User experience

To find out how users experience these technologies, and whether their findings and opinions match the information gathered from the service platform providers is of emerging importance. Therefore, older adults were invited to

evaluate the usability of existing service platforms and to give feedback that will be of interest for the development of the HEREiAM platform.

The user sessions were dedicated to the evaluation of existing platforms and to perform a number of pre-defined tasks and open tasks. The purpose was to find out what constitutes an obstacle to an effective and efficient interaction with the selected types of interfaces and to identify any usability problem. Furthermore, the study ended with a focus group in which the participants discussed their experiences with the service platforms and provided suggestions for future services and designs.

The sessions were within-subjects in which the participants performed tasks on all platforms – repeated measures – and the order was counterbalanced. Tasks were given on separate sheets of paper. Researchers were present during these trials, supporting the participants and noting down relevant observations and quotes.

After performing tasks, participants were invited to complete the Post-Study System Usability Questionnaire to provide an overall evaluation of the system they used. The questionnaire contained 19 items that are 7-point Likert scales, anchored at the end points with the terms "Strongly agree" for 1, "Strongly disagree" for 7, and a "Not applicable" (N/A) point outside the scale.

The user sessions took place at the Smartest House of The Netherlands, a home-like test and demonstration facility from Smart Homes equipped with the required hard and software. Several service platforms were presented and used during the user sessions with a variety of input and control possibilities. Besides touchscreen-based systems (Viedome, Vicasa and MiBida), also a Digital TV with set-top-box and dedicated remote control was available at the location to demonstrate and use a service platform (ABC TV). Figure 1 shows some pictures taken during the user sessions.

Figure 1. Older adults evaluating current service platforms

The results of the user sessions are structured based on Nielssen's heuristics.

Navigation

The major challenge with TV interfaces is that people are used to the TV as an output device, and pressing virtual buttons on the screen is for many of them an unfamiliar concept. Keeping this in mind, it is easy to explain that people look for a solution on the remote control first; they start pressing randomly all buttons on the remote control while the solution is displayed on the TV. Touch screen interaction seems to be instinctive behavior: just point to what you want to use. Once used to work with the touch screen, it was hard to make the change for using the

keyboard to type a message. Most respondents were looking for an on-screen keyboard.

Visibility of system status

In terms of menu structure the major menu items are clearly displayed and basic actions work fine. With more complex actions (deeper in the menu) feedback is sometimes insufficient. When operating a service platform preferably textual as well as graphical feedback should be provided that a certain action was registered and could or could not be performed.

Match between the system and the real world

Service platforms use a lot of icons in their interface. Although the majority of icons are understood by the participants not all of them are clear. Sometimes one single icon represents several services that are not all self-evident. Participants often literally describe what they see when they are asked to explain an icon. However when presented a task participants often succeeded in performing the task even when they gave another explanation of the icon. In some platforms the mismatch between the icons and the real world was too big for users to understand its meaning. It is important to find a balance between expert and novice users. Use icons/concepts that are in line with daily (off-line) life but that are not in contradiction with icons and concepts used in computers and mobile phones.

User control and freedom

It wasn't clear in every tested platform how to go back to the main menu. This was mainly due to the fact that participants couldn't locate the correct button or chose the wrong button. For users to feel in control it is necessary to build a system that can be adapted to the grade of experience of the user.

Consistency and standards

Within the service platforms both good and bad examples are encountered. In general, consistent methods are used, but each method appears to have exceptions, especially when external websites come into play.

Error prevention

In general, participants could undo most of the mistakes quite easily. When choosing the wrong service, they could just pick another, and there was always the option to go back. When using a service that requires input from the user, like filling in the agenda, it is important that already entered information can be retrieved after making a mistake.

Recognition rather than recall

Users can be assisted by instructions in the interface on how to use a service or how to navigate. These instructions should be clearly visible and easily grab the attention of the user.

Flexibility and efficiency of use

It is important that the system is easy to use for novice users. They take their time to find their way and to do what they want. Experienced users may be interested in speeding up the process in selecting services and browse through content, by making use of so called accelerators. In the studied platforms no options for more advanced users were available.

Aesthetic and minimalist design

On the interface only the items that are needed should be shown, additional items would be ballast. Make sure that the right things attract the attention of the users. When too much useless information is presented, it makes the important things – like buttons – vanish. When pop-up boxes with messages are used it should be clear whether or not an action from the user is required. When a question is presented it is no problem to ask for confirmation or an answer. When only a confirmation message is shown this message should disappear automatically.

Help users recognize, diagnose, and recover from errors

In general except for choosing a wrong service, or pressing a wrong button, no errors occurred. Some participants expressed that they would like a bit more error messages to be able to solve issues themselves. The help functionality should be offered in the same screen as where the error occurred.

Help and documentation

In this test scenario, no extra documentation or paper-based user manuals were provided. The idea was to evaluate the system itself and its intuitiveness. Most of the participants needed some minutes to figure out how to interact, but afterwards they were quite able to perform the tasks. They reported that the systems were clear, simple and easy to use.

4. Conclusions

The trends in relation to service platforms clearly show that today's service platforms play a central and dominant role in the life of older adults. The platforms are the tool to communicate, to have entertainment, to take part in the community, to be socially active, and so on. Many functionalities, communication channels and network members are combined in one single screen. Easy to have everything in one place, but the question is whether all older users are able to handle the quantity and complexity.

Whereas many people, organizations, communities and entrepreneurs see added value in this new medium, healthcare professionals are a bit reluctant. For them the available data and functionality seems to be insufficient.

Overall, the older adults found the service platforms easy-to-use, although all platforms can still be enhanced in respect to usability. A number of the older adults questioned the benefits of some services and provided ideas for future additional services.

The study provided an overview of the strengths and weaknesses of the service platform market. Technology providers and older adults tend to move closer to each other, leading to an increase in user-friendly products and

services. Additionally, alignment of secondary and tertiary stakeholders is crucial for future valorisation. Continuous alertness and fine-tuning are crucial to bring AAL to a success.

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C3. Economic and social impacts

Session Chair: *Peter Saraga, AAL Advisory Board, United Kingdom*
Session Responsible: *Urs Guggenbuehl, SBFI, Switzerland and Peter Saraga, AAL Advisory Board, United Kingdom*

Despite the many trials and evaluations that have been conducted, there is still much argument about the economic and social impact, and cost effectiveness of AAL "solutions". These difficulties are often compounded by the separation of payer and beneficiary. This session brought together the disparate stakeholders to explore these issues, develop a better understanding, and attempt to thrash out the concepts, myths and realities.

Invited Speaker:

Henning Seiding, Denemark

Contributions:

C3.1. Costs and Benefits of AAL solutions high benefits for low costs? Rainer Planinc, Martin Kampel – Vienna University of Technology (Austria)

C3.2. The OPEA Assessment Framework for Large-Scale Open Platform Deployments in AAL - Marleen De Mul, Dario Salvi, Marc Koopmanschap

C3.3. Cost savings and ethical concerns in a monitoring system Marcel Boner – DomoSafety AG (Switzerland)

C3.4. The Caring Community\nan integrative PPP approach to foster and sustain healthy environments Kerstin Wessig – Hochschule Luzern (Switzerland)

C3.2. The OPEA Assessment Framework for Large-Scale Open Platform Deployments in AAL

Marleen De Mul[1], Dario Salvi[2], Marc Koopmanschap[3]

ABSTRACT

Open platforms are supposed to be the enabler for a gradual technology evolution in the AAL market, leading to more affordable, future-proof, adaptable, and accessible products and services. This paper describes the Open Platform Ecosystem Assessment (OPEA) framework that was designed for evaluation of the ReAAL project. The framework consists of a conceptual model, an indicator model and an evaluation design. It builds conceptually on models from technology assessment, technology acceptance and information system success. The evaluation uses a mixed methods design and showcases to assess the features and potential key selling points of open platforms for AAL.

Keywords: open platforms, independent living, market breakthrough, evaluation, socio-economic benefits, technology assessment

1. Introduction

Open platforms are supposed to be the enabler for a gradual, leading to more affordable, future-proof, adaptable, and accessible products and services. AAL community initiatives such as the AALOA Lecce Declaration [*1*] point at the lack of a market breakthrough because there is no commonly accepted open platform. The universAAL open platform was developed as one of the open platforms for integrating AAL services. [*2*] In its follow-up project, (Make it) ReAAL, the assumption of the value of open platforms for the AAL market will be investigated via a number of pilots, each with a different focus. [*3*] Goal of the evaluation in ReAAL is to answer the following research question in the most objective and reliable way: "Will open platforms be able to generate the AAL market breakthrough?" For this evaluation the ReAAL Open Platform Ecosystem Assessment framework has been designed. The purpose of this paper is to describe the OPEA framework, the underlying conceptual models, and our practical approach to evaluating this large-scale AAL deployment project.

2. The OPEA assessment framework

The OPEA-framework was designed based on an extensive literature search, expert interviews and discussion sessions within the ReAAL consortium and the evaluation team.

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Conceptual model

The OPEA conceptual model is the theoretical base for the evaluation. It uses a general evaluation model for socioeconomic assessment, and two causal models, that help to explain the success of ReAAL from the perspective of the end users of the technology: the developers who use the universAAL platform, and the assisted persons who use the universAALized applications and services.

For an analysis of socioeconomic benefits for the ecosystem as a whole it has to be assured that all relevant dimensions are covered. For this purpose the Kidholm et al. Model for the Assessment of Telemedicine (MAST) was chosen to be included in the conceptual model. [*4*] Its domains have, however, been adapted slightly to fit the AAL domain. For example, instead of patients, we refer to users and instead of a health problem, we speak of an assistance problem.

Causal models try to *explain* the success and effectiveness of technology. Two of these models were found useful for ReAAL (and for evaluating open platform implementation in general): 1) DeLone and McLean's Information Systems Success Model (ISS) [*5*], and the Telecare Acceptance and Use Model (TAUM), developed by Sponselee [*6*]. These two models have in common that experienced (net) benefit is the dependent variable, and there are several independent variables related to either the technology itself, the user of the technology or the (organizational) context around it. The ISS model, which originated from the 1990s but has been updated in the early 2000s has been used extensively in studying information system implementation. [*5*] The model of Sponselee is newer, and has so far only been used by its developer.

Figure 1 shows the conceptual model, with the main constructs and domains. This figure also illustrates the stakeholder approach that is needed for evaluating the use of an open platform in the implementation: on the organizational level the platform provider, application providers, (AAL) service provider and society play a role in the value network that makes up the ecosystem. Going deeper to the individual stakeholders it is clear that developers, technicians, managers, and informal carers are relevant to include, because their perspectives are relevant to determine the success of open platform adoption.

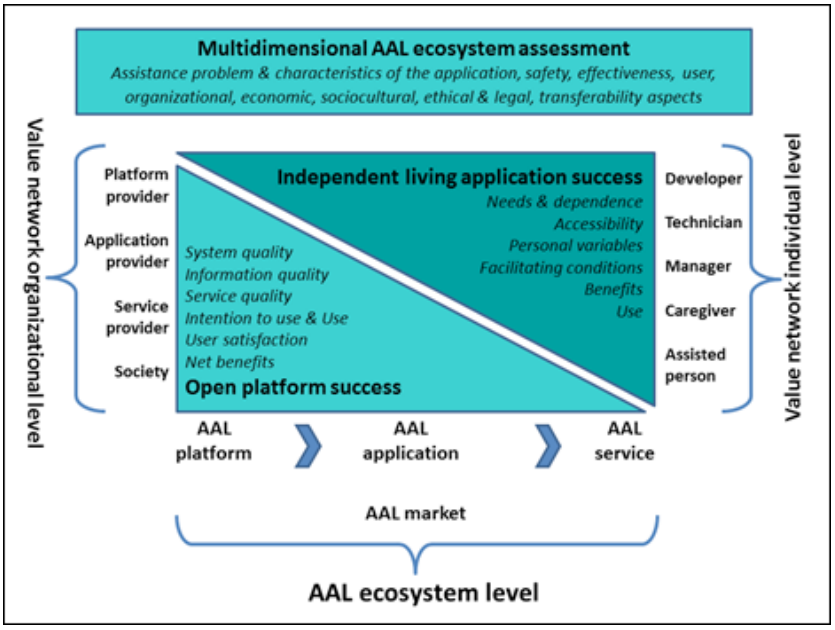

Figure 1. OPEA conceptual model

OPEA indicator model

The OPEA indicator model is a three-dimensional model that assisted us in the construction of relevant indicators for the project (see Figure 2).

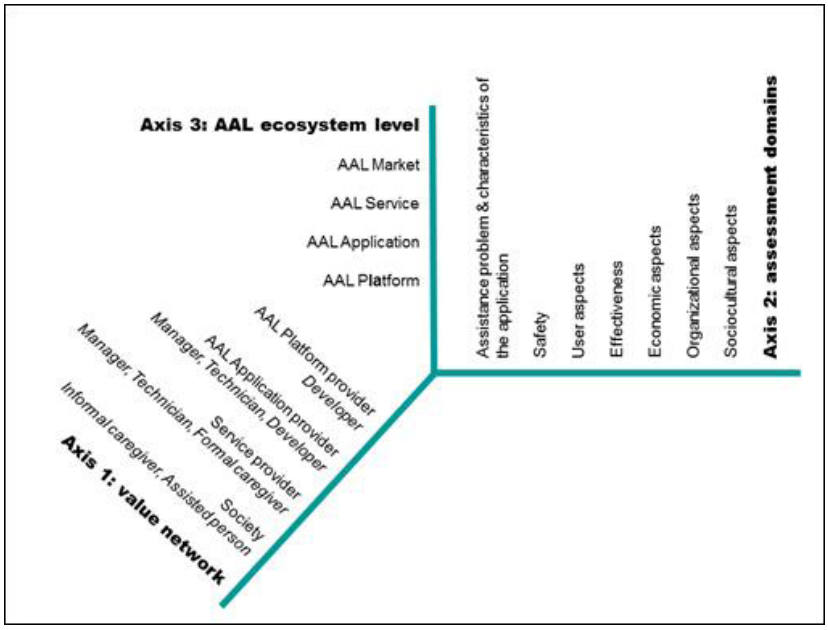

Figure 2. OPEA indicator model

The first axis depicts the value network as described in our stakeholders approach. It therefore includes the AAL platform provider, AAL application provider, AAL service provider, and society, plus the individual stakeholders on these levels such as the developers, technicians, managers, caregivers, and the assisted person. All stakeholders are relevant for the evaluation of the AAL ecosystem, and they have different points of view and receive different benefits from the adoption of an open platform.

The second axis marks the assessment domains of the evaluation, for which the MAST model was used as a basis, but adapted to the AAL context. The following domains are distinguished: assistance problem and characteristics of the application, safety, effectiveness, user aspects, economic aspects, organisational aspects, socio-cultural, ethical & legal aspects. The third axis relates to the four levels of assessing the AAL ecosystem: the system, application, and service levels can be measured in the pilots. The market level takes a societal perspective.

The value objectives of axis 1, the domains of axis 2 and the levels of axis 3 are joined in a list of indicators that will be measured with either quantitative or qualitative measures. For each indicator is it clear which domain is covered, which stakeholder should be involved in the measurement, and for which level(s) of the market it applies. In addition, frequency of measurement and methodology is added.

OPEA evaluation design

The OPEA evaluation design uses the conceptual model and indicator model. The evaluation has a stepped approach: first the pilot evaluations, then an analysis on a more general, societal level. For the pilot evaluation mixed methods design was chosen, using qualitative and quantitative methods. The data collection and analysis includes ready available (quantitative and qualitative) data such as test reports, logging data, and financial data (e.g. bills) but also blogs from the pilots. This is complemented with newly collected data from surveys, focus group interviews and individual interviews. For validation of the results panel meetings will be organised.

Of specific importance for the ReAAL project is to demonstrate the value of an open platform such as uAAL, compared to alternatives. These values will be demonstrated in the so-called showcases, a showcase being an implementation that demonstrates a set of relevant features the platform is capable of (see Table 1).

Showcase	Short description	Potential benefits for stakeholders
Resource Sharing	Is implemented when different applications share the same hardware resources (e.g. two applications using the same presence sensor).	These two showcases are mostly related to interoperability. The underlying assumption is that interoperable systems will lower the cost of producing AAL technologies and will allow their buyers to choose and compose the ones that best satisfy their needs.
Plug and Play	Is implemented when an application can switch hardware/software dependencies (e.g. an application can use two different brands of blood pressure sensors).	
Advanced distribution	Is implemented when the functionalities of an application are distributed over different nodes in home settings and on the cloud. The minimum requirement for this showcase is 2 nodes at the user side and one node on the Internet.	
Services integration	Is obtained when different AAL applications can communicate without any effort among each other.	
Proven Scalability	Is implemented when an application is made available to an increasing number of users, at least tenfold between the first and last iteration.	Scalability will benefit services providers as they will be able to offer technology-based services to a vast set of users.
Evolution	Is proven when an application is extended to include new functionalities, the adding of more nodes, more HW resources or more integrated external systems.	Evolution will allow technology providers to easily integrate new hardware or software parts as well as keeping the products updated and enriched.
Administration	Is shown when remote configuration and monitoring are implemented.	Remote administration is needed by services providers to reduce maintenance and installation costs.
Integration with legacy systems	Is shown when legacy systems are smoothly integrated with new universAALized systems. As legacy systems we particularly include those systems already used at the service provider, like user management, billing system, health records, etc.	AAL services providers usually have other systems in place that shall be easily integrated with new products at a low cost.
Security control	Is obtained when the deployer, based on the permission system of uAAL, can manually set access control and permission to applications and / or users.	Security is a fundamental feature that will make AAL products compliant with regulations and acceptable by end users.
Advanced user interaction	Is implemented when multimodality, content adaptation and consistency are applied in user interaction.	End users could benefit from multi-modal and adaptable interfaces that are tailored to their physical conditions and computer literacy.
Ambient intelligence	Advanced features of ambient intelligence like evident personalization and proactivity shall be demonstrated in this showcase.	Personalised and pro-active services are the final goal of AAL, which should be able to ensure users' independency over a long time and with minimal human intervention.

Table 1. Showcases: key selling points of open platforms

For example, the Danish pilot will contribute to showing Plug and Play showcase, because one of their applications is planned to be deployed in another pilot in a different HW and SW environment. Every pilot is involved one or more showcases, and its results will be evaluated by a panel consisting of technical experts and other stakeholders. Our hypothesis is that the more features we can test and demonstrate, the more likely the open platform will be broadly adopted by the market. We will test this assumption in the ReAAL pilots first, and then elaborate on different scenarios for upscaling.

3. Conclusions

If the platform's usefulness can be shown and the related technical knowledge is spread to an associated community of interest, a self-organizing AAL ecosystem could emerge, from which diverse stakeholders will benefit. We hope that the OPEA framework will prove to be a good tool for this purpose. The framework will be put into action in Q4 2014, and updated after its first use in the pioneer pilots.

One of the explicit objectives of ReAAL is to make the results of these evaluations public and the "experiment" replicable thanks to a set of guidelines and recommendations that will emerge from the experience of the project. All the data and guidelines will be offered to the AAL community, both academic and industrial, through the project's wiki (http://reaal.aaloa.org/wiki).

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C4. Informal care: a market factor

Session Chair: *Sophia Moreno, Spain*
Session Responsible: *Urs Guggenbuehl, SBFI, Switzerland and Peter Saraga, AAL Advisory Board, United Kingdom*

Informal care has always been a critical element of the overall care system. As technology (ICT) eases the integration between formal and informal care, there is an increasing recognition that informal care is also becoming an important factor in the AAL market. This session explored the development of the relationship of these paradigms and how it impacts on the market.

Invited Speaker:

Maggie Ellis, LSE, United Kingdom

Contributions:

C4.1. SOPHIA project – Senior Occupation after Profession: Habit Intriguing Adults - Palaiologk Anna, Smagas Kostas, Stylianidis Stratos, Sanchez Martin Victor

C4.2. ProMe: A theoretical framework for online mentoring - Katja Neureiter, Clement Leemans, Manfred Tscheligi

C4.3. RelaxedCare – Connecting People in Care Situations Emanuel Sandner – AIT Austrian Institute of Technology GmbH (Austria)

C4.4. A Multilingual Web Platform Supporting Informal Carers in 27 EU Member States - Barbabella Francesco, Efthymiou Areti, Poli Arianna, Lancioni, Cristina, Andréasson, Frida, Salzmann, Benjamin, Hanson Elizabeth, Döhner Hanneli, Goodwin Frank, Lamura Giovanni

C4.5. Connections In Informal Care: How Much Are They Needed? - Schinkinger Susanne, Tellioglu Hilda, De Carvalho Aparecido Fabiano Pinatti

C4.1. SOPHIA project – Senior Occupation after Profession: Habit Intriguing Adults

Palaiologk Anna[1], Smagas Kostas[2], Stylianidis Stratos[3], Sanchez Martin Victor[4]

ABSTRACT

This paper gives a brief introduction to the project idea of SOPHIA (Senior Occupation after Profession: Habit Intriguing Adults) – a project that aims at the continuation of an older adults occupation after one's retirement. The developed social platform will support a network of both retired adults and enterprises needing their help. The platform will be available in a web and an app versions with multimodal senior-friendly interfaces. Innovative features of this platform will regard the secure payment of senior services and the anonymized behaviour analysis process, both embedded in the system, which will provide useful insights for research organisations and policy makers involved in related matters.

Keywords: seniors' occupation, social platform, network of seniors and enterprises, behaviour analysis, on-line payment

1. Introduction

The goal of the SOPHIA (Senior Occupation after Profession: Habit Intriguing Adults) is to aid the senior adult to keep him/herself occupied after retirement. Continuing ones professional activity will result in the maintenance of his/her mental or even physical activity, thus, maintaining good health, contributing to the society and generating extra disposable income. The merits on society's behalf are obvious. On one hand, having around experienced people, with lots of free time, offering their knowledge and expertise to the ones who need it is a great benefit not systematically implemented by any society so far. On the other hand, keeping the elderly an active force of the society not only makes their life better but also creates positive externalities to the economy and social security funds as a whole.

SOPHIA project aims to create a network, the core of which will be senior adults after retirement who would like to continue offering their skills, knowledge and services. Some of the network branches will be companies and enterprises that would require the expertise of the seniors, while individuals could benefit from their help. This network will bring in contact the senior adults with the above people and handle all kinds of possible transaction they may have, in a friendly and efficient environment. Possible transactions between the senior adults and their "clients" could be assistance to set up a small business, consultancy services, or solutions to private inquiries.

1. Categories in which the senior adult can participate include:
2. Continue offering services as he/she used to
3. Provide limited services
4. Online advice through the platform in a forum way
5. Seminars to people of his/her profession

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In the first category, the senior adult will be able to continue practicing the original profession. In the second category, the senior adult will be offering his/her original profession services again, but not fully. The third category is completely on a volunteer base and includes the active participation in forums or groups where common users ask things and pose cases depending on the profession again. Continuing, institutions and enterprises may find the fourth category particularly useful, as they could ask from subscribed older adults to give lectures on their field of interest. They can choose among any member that seems to fit their case depending on the information each subject has given to the proposed network database. Finally, the persons, who would like to participate in the last category, could be contacted by either institutions, enterprises or single persons, in order to help inexperienced individuals understand delve into the secrets of their profession, by having an experienced person by their side.

2. Technology integration

SOPHIA platform will be developed with the integration and development of state of the art tools in different technological pillars. The basic technological components are presented below:

- SOPHIA Social platform: Social platform is essentially the means of communication among experts-seniors who are about to retire or have retired and interested users for the offered services. The platform will categorize all services offered by the professional specialty.
- Social Network "on the go" (mobile app): There will be a SOPHIA Mobile app in order to support the mobile version of the overall platform so that will be easier accessible to the ones familiar with mobile technology. Furthermore, SOPHIA Mobile app will provide some additional services in order to help expert –users to organize their liabilities, such as the date of seminar etc. More specifically, Seniors Calendar, job organizers and more will be supported through the mobile app.
- Alternative Payment System: All the payments should be done through a special payment system, as the senior adult most probably won't be able to (continue) provide receipts. The payments must be done online through a secure payment system like PayPal and our network will transfer the amounts to its member's accounts, keeping a small percentage commission for being the middleman just like other successful companies do (eBay etc.).
- Behavioural Analysis – Behavioural Pattern Recognition: The data from both experts and end users will be available for behavioural analysis. Among the consortium members, there will be a group of behavioural experts, including psychologists, who will have the duty to anonymously take and analyse the available data. According to end-users needs and requirements, the platform will give them suggestions like what else they might wish to see or what other help could be suitable for them. In software engineering, behavioural design patterns are design patterns that identify common communication patterns between objects and realize these patterns. By doing so, these patterns increase flexibility in carrying out this communication. As a result, behavioural design patterns can be brought in public showing things like which professions need more the expertise of someone experienced, in which areas people need more information so that society can organize public seminars, possible hiring senior adults to speak etc.
- Multi-modal Senior-friendly interface: An HTML5 front-end will be offered enabling expert –users and end-users to interact with the system via web but also through their extensively used devices such as smartphones etc.

3. Standards and interoperability

SOPHIA project will develop a number of ICT-standards in order to ensure open interfaces and interoperability. Based on the standardization competencies of the consortium partners, SOPHIA will identify relevant standardization bodies, standards and standardization processes, and then select the standards that best fit the project needs. Existing contacts and memberships etc. within the consortium will be exploited in order to implement relevant standards rapidly. At the end of the project experiences will be communicated from the use of standards to the relevant standardization bodies. This feedback will be relevant for the on-going standardization as well as for the future revision of applied standards.

More specifically, in ISO/TC 159/SC 04/WG 05 "Software ergonomics and human-computer dialogues", SOPHIA results will feed directly into new and on-going standardization projects on "Individualization" (ISO/DIS 9241-129), "Selection and combination of dialogue techniques" (NWIP ISO 9241-140). Existing contacts to other relevant standardization activities exist and will be used in order to disseminate SOPHIA research results, e.g. CEN/BT WG 185 "eAccessibility" and DATSCG (Design for-all and Assistive Technology Standardization Coordination Group).

4. Market development and business case

Despite the current solutions available on the market which are usually offered in form of blogs or articles, SOPHIA aims to stand out of the competition by covering the gaps identified. SOPHIA will provide new means of interactive communication where the seniors will be able to offer their expertise to others while creating new business models. Moreover, SOPHIA will cover different sectors into the same platform in order to have a unique meeting point where seniors and stakeholders can participate. In addition, the involvement of end-users from the outset of the project is needed to increase the access to the market with a solution that meets the needs and wishes of the end users.

Business models will have to take in account different categories of services, in order to create a mix between the basic services to be deploy free of chart (or pay by public organisations), and value added services that can be paid by users. We will follow two complementary business models: VAS (valued added services) together with
model where VAS turns out to be complex and hard to achieve.

The innovative, integrated ICT based products, services and system requested by the project can become a basis for a world leading position for European industry if the enabling technology can become a basis to build an innovative business model, in which public funding aims to set up platforms that will be managed by "big" technology providers, on which to realize very specific "vertical" services, with the contribution of SMEs especially in the field of mobile applications.

Examples of basic services, provided through the platform, are: A social platform, information exchange between seniors and users, intelligent suggestions to users, advices in a blog manner, availability of an online repository for uploading articles. In addition to the basic services, examples of value added services are: the option to offer group seminars and individual tutorials to others using advanced tools, matching tool to identify activities related with the user's preferences, or direct access to specific expert's articles or studies.

There are four main actors of the value chain: (a) Users, divided between seniors and costumers; (b) Tertiary users, like Public institutions aiming to deliver the basic services to the community; (c) Technology providers, to build and manage the infrastructure and (d) Specialist service providers (SME), to deliver value added services.

SMEs are valuable contributors to the value chain in the social care and healthcare environment, mainly because they tend to be flexible and dynamic and in addition they have a great capacity for innovation. SMEs could provide breakthrough solutions which can play an important role in the life of the SOPHIA solution, during the SOPHIA project, and beyond.

5. Conclusions

The end of active working period of every individual is a crucial point from psychological and sociological point of view. As such, the existence of ways and possibilities for a person to stay active is crucial, in order to maintain that person's physical and mental health. The platform SOPHIA follows strategic objectives of the EU and contributes to prolong the active lives of seniors who have further possibilities to contribute to society. On the other hand, people, to whom senior adult's services are addressed, will find in SOPHIA from simple handy advices to career boosts. Since a vast variety of people can benefit from SOPHIA, a big socio-economic benefit is expected on

The longer senior adults remain active, the more he or she benefits, as well as society. More specifically, by remaining active members of the society, they continue being confident, resulting the seniors' better psychological and physical state, since the physical health of a person largely depends on the mental health. Moreover, another important advantage lays in economic independence of the elderly. Especially, when the elderly continues to be pay even less money than before his retirement, is certainly in a better financial situation, so it has a chance to do more activities, for example to plan a trip or buy something. According to studies, the lack of economic independence is a reason / cause of mental illnesses such as depression.

Active ageing delays and minimizes the severity of chronic diseases and disabilities in later life, thus saving health care costs and reducing long-term care needs.

SOPHIA project offers possibilities for most kinds of professionals to stay mentally active after retirement connect with other people, contribute to the society, share and gain experience, therefore better quality of life. They can use their vast knowledge working at a pace that fits them without being subjected to any kind of pressure. It is a new hobby and a new job at the same time.

Senior users can not only share their knowledge but also stay up-to-date with new information, approaches and technology. The SOPHIA project can be their tool for social interaction and will make them remain useful and needed.

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C4.2. ProMe: A theoretical framework for online mentoring

Katja Neureiter[1], Clement Leemans[2], Manfred Tscheligi[3]

ABSTRACT

The demographic shift towards a decreasing share of people of working age and an increasing relative number of those, who are retired but still quite active, requires solutions that support older adults taking an active role in society. ProMe allows sharing professional knowledge with younger generation via an online platform. In this paper we outline the theoretical basis for the platform, addressing social-psychological aspects for knowledge sharing and HCI perspectives that need to be considered in order to enable different forms of collaboration..

Keywords: Intergenerational Cooperation, Communication, Collaboration, Intergenerational learning, Coaching, Mentoring, Community of practice

1. Introduction

Integration and connectedness of older adults to enhance quality of life are major topics and challenges of AAL solutions. The ProMe platform offers support to older adults in order to manage their transition from an occupational lifestyle towards and into retirement. ProMe allows them to support upcoming professionals, ranging from accompanying a person over a longer period (e.g., in the process of starting up a company) to simply offering advice or information on specific topics. In order to provide more than just a variety of different means of communication (e.g., text messaging, video calls), we offer the opportunity to take on different support roles and to engage in different types of professional collaboration on the platform. So far, we focus on three types of professional collaboration reflected in the following roles: *mentor*, *coach*, and *network facilitator*. The mentor focuses on career development and personal growth. The coaching relationship encompasses the idea of helping the coachee to perform and develop at work, related to a specific professional assignment, project, problem or challenge. The network facilitator supports the process of network learning in a community of practice and encourages network members to share and develop knowledge and expertise in a defined professional area, e.g., a specific field of expertise. In order to do so, different opportunities for communication are enabled through a variety of functionalities on the platform, e.g., video, text-chat, email, blogs. The main challenge is to provide more than simply different means of communication but to offer the possibility to take on different support roles and engage in collaboration that is addressing the specific needs of the users.

In the following paper we describe the theoretical framing for the ProMe platform and provide first insights with respect to the implementation of the different roles of collaboration. We describe the theoretical background on collaboration and knowledge sharing from a socio-psychological perspective and will outline in what way technologies can support collaborative processes.

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2. Three forms of collaboration

Collaboration is mainly understood as a cooperative arrangement, supporting two or more parties to work towards a common goal. This can be described as a kind of psychological contract that implies mutual obligations in order to reach the common goal and that can be described as "… a set of individual beliefs or set of assumptions about promises voluntarily given and accepted in the context of a voluntary exchange relationship between two or more parties." [*3*] With respect to the ProMe platform the success for a valuable collaborative relationship requires the development of a shared and transparent contract between a requester of support (e.g., mentee) and a supporter, meaning that an individual's perceptions of mutual obligations need to be clear to both parties. Information about what users on the platform can expect and what is expected of them when entering a collaborative relationship is seen as an important precondition for a successful relationship.

For the purpose of the project we distinguish between three forms of collaborative relationships. One way to differentiate these three is to look at the degree of 'directiveness' of the supporter. The directive versus non-directive continuum is based on who is predominantly driving the relationship, and on the role the supporter and the requester take in the relationship (see Figure 1).

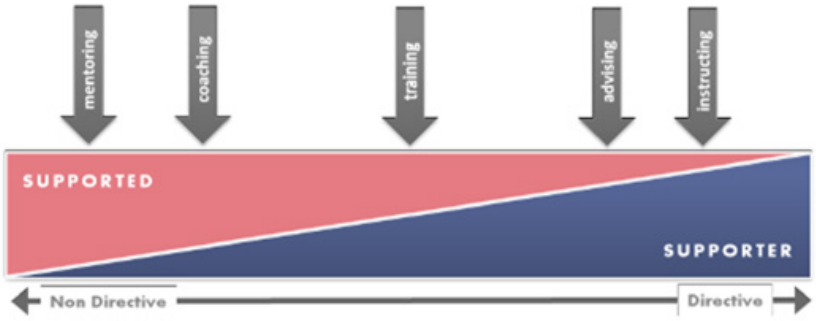

Figure 1: Adapted from: The consulting process in action [5]

Mentoring is the most non directive role, which we define as a developmental relationship, involving intense accompanying of the mentee by a more experienced mentor and focusing on both career development behaviors and personal growth and development, especially psycho-social support. Mentoring is characterized by taking a more holistic view on the person (mentee) and is not focusing exclusively on one specific topic. It is usually also seen as an 'open ended' relationship, where coaching to the contrary, ends when the 'issue or problem' the coaching process was focusing on, is solved.

According to Stern [*10*] coaching can be defined as an experiential, individualized development process, focusing at improving a person's skills, knowledge and job performance, leading to the achievement of organizational objectives. It targets high performance and improvement at work, usually lasts for a short period and focuses on specific skills and goals [*1*]. Coaching is also nondirective in the sense that the coach is not telling the coachee what to do but challenges his thinking and focuses on helping the coachee to develop alternative (innovative) courses of action in order to cope with the issues at hand, i.e., "helping the coachee learn rather than teaching him" [*13*].

As a third option for a collaborative relationship we define professional network learning, as a community of practice, where a group of people share a common concern, a set of problems, or interest in a topic (field of expertise) and who come together to fulfill both individual and group goals [*12*]. The experienced professional can play in such a community of practice two distinctive roles: sharing his expertise and experience as a member of the community or acting as a process facilitator in order to help the community to share and to learn from each other.

3. Supporting collaboration in a mediated environment

In order to put these concepts of collaborative relationships into practice, i.e., support different forms of collaboration on the platform, we consider social presence and media richness theory. Both concepts are valuable instruments to describe the ability of a communication medium to reproduce information. The modalities that are supported through the platform have been identified as influencing the communication and collaboration between people [*8*]. Depending on the form of collaboration with respect to the different roles we assume that different modalities are required, whereby there might be overlapping.

Social presence refers to the feeling of being present with somebody else when communicating over distance. It has especially raised attention in the context of learning environments, i.e., how to support collaboration best (e.g., [*4*][*7*][*11*]).

First approaches for a definition of social presence originate from Short et al. [*9*] who define it as "the degree of salience of the other person in a mediated communication and the consequent salience of their interpersonal interactions", emphasizing the importance of a medium's qualities, e.g., to convey visual or auditory cues. Social presence, the experience that the communication partner is there, can reduce perceived distance [*14*] and thus encourages immediate responses of the communication partner. Social presence is, for example, expected to be lower in asynchronous (e.g., e-mail) than synchronous (e.g., live chat) communication.

Moreover, enhanced sensory stimulation through a variety of different non-verbal cues positively influences the awareness of the communication partner [*6*]. Similar to social presence theory, media richness theory [*2*] assumes that the goal of any communication is the resolution of ambiguity and the reduction of uncertainty, which is influenced by the amount of information media allow to convey.

For the purpose of the ProMe platform we consider social presence as one important aspect when implementing different opportunities of collaboration on the platform. The higher social presence, the larger the social influence that the communication partners have on each other's behavior, which of course influences collaborative processes [*8*]. In the next section we will provide first examples in what way socio-psychological aspects of knowledge sharing and insights we gained from social presence theory are brought into practice, supporting the process of implementing different types of collaboration on the platform.

4. The framing of three support roles

We consider collaboration as a voluntary exchange relationship and cooperative arrangement, in the sense of a kind of psychological contract that implies mutual obligations to reach a common goal. In order to allow the development such a relationship it is most important that expectations and obligations of requester and supporter are clearly defined. For that reason we suggest that requester and supporter will be well informed about the different forms of collaboration, before they engage in a mutual collaborative relationship. This could be done, for example, by providing a short video that illustrates the different forms of collaboration, including information about obligations and expectations. In a second step, user profiles (from supporter and requester) could give more background information when deciding for a certain form of collaboration, which we would define as a kind of initiation tools.

With respect to the different forms of collaboration mentoring might be the collaborative relationship that requires the highest level of social presence. It focuses on career development behaviours, personal growth and development,

especially psycho-social support. Being a mentor for somebody else implies seeing the collaboration partner in a holistic manner, actually accompanying somebody else over a longer period and not only or exclusively to support a mentee to reach a certain goal. Collaboration in a mentoring relationship is more than simply sharing information and supporting somebody else with respect to a certain goal but being more a companion. This in turn requires that the platform allows developing a trustworthy relationship, which can be supported through social presence. We suggest, that for example the opportunity for video-conferencing would allow mentor and mentee to get to know each other and would provide an opportunity to reduce perceived distance [*14*].

5. Conclusion

In this paper we have outlined the theoretical background for the framing of three mentoring roles on the ProMe platform and have provided first insights on how different forms of collaboration could be designed. In a next step, these ideas are further elaborated including potential end users, which we consider as important contributors for the success of the platform.

6. Acknowledgements

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C4.3. RelaxedCare – Connecting People in Care Situations

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ABSTRACT

"How is my mom doing right now?" Answering this question in a quick, clear way without the need of calling or stopping by could relieve a lot of stress from informal caregivers. The RelaxedCare System aims to develop a solution built upon an existing AAL platform, using a multi-level pattern recognition approach to detect the current state of an assisted person, and then to communicate the state in a pervasive and unobtrusive way (i.e. lava lamp, smartphone widget, picture frame) to the caregiver.

Keywords: Informal Caregivers, Assisted Persons, Ambient Assisted Living; Behavior Pattern Recognition; User Interface; User Inspired Innovation Process; Sensors.

1. Introduction

The majority of existing AAL solutions focus on supporting persons in need of care. A representative study [*1*] conducted in Austria in 2005 showed that 80% of the people in need of care receive their care by informal caregivers (IC) at home. Moreover, more than 66% of these caregivers feel overburdened by that task sooner or later, which results in a loss of quality of the interaction between the two parties. To reduce the necessity of regularly checking the current status of a person at home by driving by or calling, RelaxedCare aims to provide a system to keep informal caregivers updated on the overall wellbeing of their relatives in a passive and pervasive way. This information is delivered to the informal caregiver via everyday objects like, for example, a color changing lamp, a picture frame or a smartphone. Additionally, the RelaxedCare System can provide more detailed information for the caregiver if this is desired, keeping in mind the security and privacy aspects of the assisted person's (AP) data. Furthermore, the RelaxedCare System may help to increase emotional bonding of the involved parties by offering the possibility to actively interact with the other partner.

2. Methods

The target end-users – elderly persons and their corresponding caregivers – have been involved in the RelaxedCare project right from the beginning. This approach was chosen in order to keep the focus, development and goal of the system as closely related to the end-users' desires as possible. Additionally, such an approach assures a higher acceptance rate of the resulting system as well as higher benefits for the stakeholders since they are invited to actively contribute in the design and to the functional aspects of RelaxedCare. Therefore, the RelaxedCare project has applied the so-called "user inspired innovation process" [*2, 3*] which ultimately yielded the general design and functional concept. The method was also used to define certain personas and, with them, distinct scenarios that were used by the technical partners to get an overview of how the overall system behaviour should look.

One of these scenarios is for example the "Overall Status" scenario, which states:

"Josef (IC) wants to know if his mother is okay even if he does not have a good relationship with her and they argue

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a lot when phoning. As he just wants to know that everything is fine, he has something that gives him the information at a glance (if his mother is ok, leaves the house regularly and has social contacts). He does not want to do more than necessary. When something is not right, he phones her to ask what is wrong."

This scenario covers some aspects of the technological functionalities of the RelaxedCare System and describes its behavior in a more general manner. The scenarios were subsequently broken down into so-called epics and finally user stories. Epics and user stories are much more fine-grained descriptions of system aspects regarding its features. This approach enabled the technical partners to start with the development process and is further used as a guideline for additional required elements to the system during the runtime of the RelaxedCare project.

3. System Architecture

Based on the findings of the scenarios, the RelaxedCare System can be divided into three general subsystems, as can be seen in Figure 12. Each of these is furthermore split up into functional groups to describe the system interaction in more detail.

3.1. Assisted Person:

This block contains all devices and systems used within the environment of the AP. More specifically, this covers sensors, sensor gateways, UI devices, a workstation (PC) on which the system runs and optionally some devices providing a user interface (PC, tablet, smartphone) for accessing the system management component.

3.2. Server:

The server effectively establishes the connection between the AP and the IC. The business logic is located in this block as well as the system and management component, for which ownCloud [*4*] is used.

3.3. Informal Caregiver:

The IC block basically contains the same elements as the AP block except the sensor and sensor gateway devices. Additionally, IC's have a cell phone app available which keeps the IC's updated when they are away from home.

To ensure a reliable communication and message exchange between the AP and IC side via the Server,

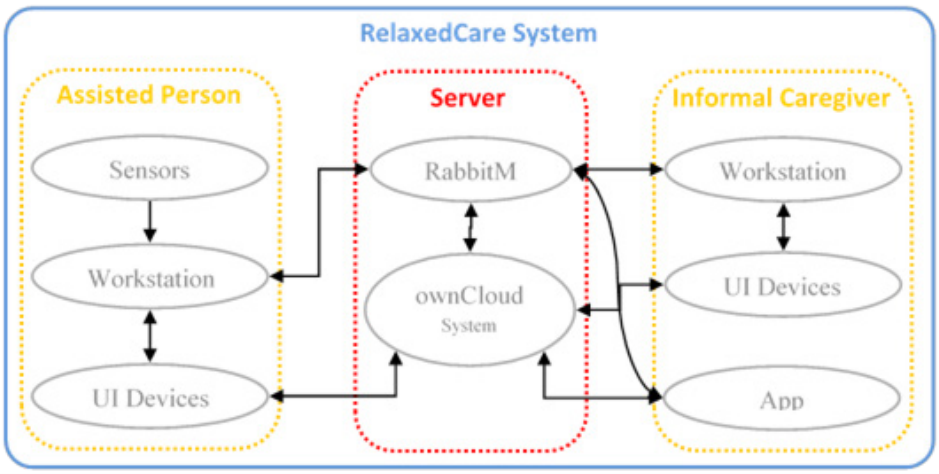

Figure 12: This figure gives an overview of the RelaxedCare System, which can be split up into three distinct subsystems: The AP-side, Server and IC-side

RabbitMQ [5], a well-known implementation of AMQP [7], is used. The open-source project ownCloud is used as the system management platform to provide a highly customizable system where the users can manage the system behaviour (i.e. “What do I want to see on which device and in which way”) as well as set the privacy (i.e. “What do I want to see / show”) to a comfortable level. Additionally, the system management platform has the capability of providing in-depth information of the AP’s status if so desired by the end-users.

In order to provide the aforementioned information about the AP, the RelaxedCare System uses sophisticated behaviour pattern recognition techniques to examine sensor data to determine if, for example, the AP is not getting enough physical activity or social interaction. Several different sensor types are used to accomplish this task: PIR, contact closure, pressure, accelerometer/gyroscope, microphone, temperature.

Other sensors may be added during the course of the project according to emerging system and/or user needs. The sensors are connected via sensor gateways, which are provided by the project partners. These gateways connect wirelessly via the WebSocket protocol to the workstation, running the Home Event Recognition (HOMER) [6] platform. This platform enables the system to be interoperable with various AAL components, sensors and user interfaces. Thus, the system is easily adaptable to the end-user’s needs and allows a high freedom of choice in user interaction.

Potential user interfaces may include, for example:

- An “object-like UI”:

Any kind of object that follows the RelaxedCare System specification can be used here. These objects are also connected via the WebSocket protocol to the workstation and furthermore with HOMER.
To show the openness of the system, such an object may be shaped like a cube, containing a NFC Reader, a RGB LED stripe and a speaker, thus combining different output modalities in one device. Therefore, instead of representing merely the wellbeing status by one color, the end user pairs are also able to actively communicate with each other by means of acoustic or ambient messages. The meaning of such an ambient message is not pre-defined and its utilization is subject to the creativity of the end users.

- Picture frame:

This object can be used to exchange pictures or photos between the end-users, e.g. a drawing from a grandchild.

If desired, the IC can use a smartphone or a tablet running the RelaxedCare app which is directly connected via RabbitMQ to the server to receive status updates of the assisted person. Figure 13 illustrates the basic concept behind RelaxedCare.

Figure 13: The image shows the basic concept of RelaxedCare. The upper part of the figure shows the AP at home with various sensors placed throughout the apartment (indicated by the green curved line symbols). The lower part shows the IC with various UI devices, either at home (left, color changing lamp), at work (middle, picture frame) or outdoors (right, smartphone app).

4. Conclusions

The generic and modular architecture upon which RelaxedCare is built makes it quite flexible – adding new users just means adding more compute power and adding new sensors, interface objects or pattern recognition modules requires minimal development effort. Initial internal tests with the user organization partners were conducted, and these found positive user acceptance for the overall system and the project concept. Several of the functions specified in the aforementioned scenarios have already been implemented as proofs-of-concept, and development of a first full prototype is well underway.

The first prototype will be tested in lab trials conducted by project partner iHomeLab in Switzerland in September - October 2014.

The RelaxedCare project is co-funded by the AAL Joint Program and the national funding authorities and R&D programs in Austria (bmvit, program benefit, FFG), Switzerland, Slovenia and Spain.

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C4.4. A Multilingual Web Platform Supporting Informal Carers in 27 Eu Member States

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ABSTRACT

Informal care is a hot topic in research and policy agendas at European and national level, since it greatly contributes to the sustainability and efficiency of national health care systems. A specific intervention – part of the wider INNOVAGE project funded by FP7 – was planned for developing and testing a new multilingual web platform for informal carers of dependent older people in the EU-27. Preliminary results of the pilot study, conducted in Italy, Germany and Sweden will be discussed. The final platform will be accessible in all official languages of the EU-27 and publicly available in spring 2015.

Keywords: informal care, innovation, web-based services

1. Introduction

Family carers experience the negative impact of caring activity on their psychological, physical health and social life. Burden, depression, anxiety and social isolation are some of the most widespread problems they have to cope with.

Different kinds of interventions supporting informal carers have been developed, especially in terms of psycho-educational or therapeutic sessions with professionals [*1, 2*]. Amongst them, web-based services seem to constitute the first step for making essential services available to carers in Europe.

The overall goal of this paper is to present the methodology, the product and the preliminary results of a sub-project (Work Package 3) of the main INNOVAGE project[11] which aims to develop a new multilingual web platform for supporting informal carers through both information resources and tailored interactive services. Specific objectives of this study are:

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10 Primary Investigator, INRCA, email: g.lamura@inrca.it

11 The project INNOVAGE – Social Innovations Promoting Active and Healthy Ageing (www.innovage.group.shef.ac.uk/) aims at developing and testing, as well as surveying and cataloguing, social innovations that will have a solid impact on improving the quality of life and well-being of older people. In particular the project aims to contribute to the EU goal of extending healthy life years, through the development and implementation of four major social innovations in the fields of user-driven housing for older people (WP2), web-based platform for carers of older people (WP3), improving obesity-related outcomes in older age (WP4), and long-term care in motion (WP5).

1. to develop a new web platform which includes a package of support services for carers that can appropriately address major needs of informal carers;
2. to collect a first evidence of the usability and, to some extent, of the effectiveness of the developed web-based services through pilot tests conducted in three countries, i.e. Italy, Germany and Sweden.

The web platform is currently being finalised and will be implemented in 27 EU Member States. Additionally, a limited number of web services will be developed for secondary target groups: care professionals and employers of carers in paid employment.

The Italian National Institute of Health and Science on Aging (INRCA)[1] and the Eurocarers Association[2] are the partners involved to carry out the development, implementation and dissemination of the web platform at European level.

The platform will provide to end-users a package of different web-based support services. These include: (1) information resources, in terms of static pages, for instance national information on care and support services, legal and financial information, information about the most common impairments of older people, strategies and information about coping with caregiving, suggestions on how to reconcile care with family and work; (2) interactive services for both peer and professional support via internal social network, forum, e-mail and private message service, e-learning course, chat and video-conferencing tools.

The web platform core aims are the provision of appropriate web-based support services to informal carers, the availability of these services in countries with few or total lack of targeted services, and the active involvement of Eurocarers network of carers' organisations.

2. Piloting Phase

The web platform was tested in Italy, Germany and Sweden during the first half of 2014. Services were piloted in a one-group pretest-posttest study for a period that ranged, for each user, between 12 and 17 weeks. The sample was composed by around 115 end-users in the three countries, recruited adopting convenience and snowballing approaches.

Each country tested a different set of web-based support services. In Italy, around 55 carers of older people affected by Alzheimer's Disease could access the following services: information resources; e-learning resources; individual support via e-mail, private messages, chat and video-chat; group support via social network and forum.

In Germany, around 20 carers of dependent older people have received the following services: information resources; individual support via e-mail and private messages; group support via social network. Additionally, two sub-groups of 3 people each attended a series of weekly sessions of group support via video-conferencing.

In Sweden, around 40 carers of dependent older people have received the following services: information resources; individual support via e-mail and private messages; group support via social network and forum.

1 www.inrca.it

2 www.eurocarers.org

In each country, a professional (social worker or psychologist) was engaged as moderator and facilitator of interactive services. Among his/her duties, it can be mentioned: the moderation and facilitation of interactions by users in the different communication channels (social network, forum, chat, video-chat); publication and promotion of news, information, posts and discussions in social network and forum; periodical monitoring of user's situation through private messages or other communication channels; individual or group support – in terms of information, advice and counselling – provided to users in need who asked for help, through any of the implemented tools.

A questionnaire was administered to carers before and after the intervention in order to assess changes in health status, quality of life (WHOQOL-BREF), social support (MSPSS), and self-perception of carer's role (COPE Index): standardised measures were used for the assessment [*4,5,6*]. Ad-hoc questions on usability, usefulness and appropriateness of the web services were also administered at the end of the study, integrated with information to be collected from a focus group with 5-10 carers in each country and with the usability assessment made through the WAMMI scale[1]. Furthermore, navigation patterns were tracked by means of Google Analytics and available for integrating the assessment.

Data collection is still ongoing, and just preliminary data based on feedback collected by moderators of interactive services are currently available. These latter ones seem to confirm the usability and appropriateness of web-based support services piloted, despite differences in usage patterns can be recognised between different countries. Overall, the platform has registered a good involvement of users on the web platform, in terms of number of accesses and participation. Just limited number of drop-outs occurred during the pilot test.

3. Conclusions

According to existing literature, social isolation, depression and anxiety are target variables for technology-driven interventions for carers [*7*]. Interactive services provide opportunities to carers to share experience, get information, receive peer and professional support and, accordingly, relieve stress and anxiety, reduce social isolation, improve managing of care [*8*]. The development and implementation of this new web platform provides indeed a set of web-based services which could be successfully implemented in 27 EU Member States by national user organisations. These latter ones started to be involved in the study for the implementation and dissemination phases, which aim to spread awareness of informal carers' issues at policy and society levels (in many EU countries, informal carers still need cultural, social and legal recognition), as well as to promote the availability and use of the new web platform. The national packages of web services to be included in the platform will be publicly available in spring 2015.

1 www.WAMMI.com

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C4.5. Connections In Informal Care: How Much Are They Needed?

Schinkinger Susanne[1], Tellioglu Hilda[2], De Carvalho Aparecido Fabiano Pinatti[3]

ABSTRACT

The daily life of informal carers are often organised around the needs and availability of the different (groups of) people who are part of their lives. First and foremost, informal carers' daily activities must fit to the personal and instrumental activities of daily living associated with the care routines they engage in. Second, their everyday life depends on the availability of the people supporting them with the care work, e.g., family members, friends, or health professionals. This paper addresses the connection needs of informal carers to stay in contact with the different people who play a relevant role in the care work provided by them, and discusses the development of computer technologies to support them.

Keywords: Connection, informal care, design, computer-mediated social support, burden decrease, heteronomy

1. Introduction

In the European Union, informal carers are currently responsible for most part of the existing care work [*8*]. The daily life of informal carers can be described as a mixture of routine work, spontaneous interruptions (mainly caused by the care receiver), and lack of time. Typical activities for informal carers concern personal activities of daily living (PADL) like body care and dressing, instrumental activities of daily living (IADL) like shopping, housework, and financial matters and activities in the social area like talks and emotional affection [*5*].

Help in different aspects of the daily life of informal carers is needed from professionals, friends, family, and other informal carers in similar situations. These groups of people are needed to support assorted care activities, e.g., washing the care receivers, orienting and helping them with some physical exercises, or treating wounds. In addition to that, these groups of people usually provide informal carers with relevant social, moral, and practical support, by chatting or going for a coffee with them, helping them with the weekly shopping at the supermarket, etc., what can potentially help with reducing the different types of burden associated with the care work [*3*] [*4*].

From our observations, most of the activities of an average day are pre-defined and the course of the day is heteronomous because it is often determined by the needs of the care receiver or negotiations with the people helping with the care duties: plan and routines are often re-planned and/or adjusted according to different variables that come into play. Therefore it can be said that heteronomy can be caused both by the care receivers – when they need urgent help or the routine care work dictates what informal carers must do – and by external service providers. Taking account of the issues above, it is clear that it is absolutely necessary for informal carers to have a connection to stay in contact with those supporting them with the care work, in order to arrange certain needed things. Not only that, informal carers also need to be constantly connected with their care receivers to keep an eye on them, when they cannot be around.

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Within the project TOPIC (The Online Platform for Informal Carers, www.topic-aal.eu), a European project by the AAL Joint Programme carried out by a consortium of partners based at three different countries (Austria, France, and Germany), we apply ethnographic methods like participatory observations, in-depth interviews, cultural probes, etc., to understand the life situation of several informal carers. Based on these findings, we extract requirements for relevant connection solutions to relieve some of the burdens inherent to the informal carers' daily life.

In this paper we quickly introduce our methodological approach (Section 2) and present some findings from the data collected during the first phase of the project in Austria, regarding informal carers' need for connection with different people who are part of their lives (Section 3). Section 4 presents some relevant conclusions stemming from the findings herein presented.

2. Methodology

The TOPIC project employs a user-centred design approach to understand the life situations of informal carers and identify their needs. This user-centred design approach is supported by ethnographically informed studies, which means that the project researchers go to the field and make use of observational methods to collect data on the issues of interest.

The sample addressed during the pre-study phase of the project consisted of 10 informal carers in each country participating of it and featured informal carers in different situations. In Austria, only one of our informal carers was male. Half of them were caring for their spouses, three of them for their parents and two for their children. Only two informal carers were not living in the same household as the care receiver. The youngest informal carer was 55 and the oldest 80 years old – the average age was about 64 years. Two informal carers were still working, but will retire soon.

We used different methodological tools while working with these informal carers within the pre-study: The first contact started with an informal interview about the situation of the informal carer at their homes. Then 3 to 4 additional appointments for observations in their homes were arranged. At these appointments we conducted participatory observations, taking note about their daily routines and talking with them and also with their care receiver, when possible, about their daily lives. At one of these appointments we brought a box with cultural probes. We gave them an introduction to all the components of the cultural probe kit and asked them to use the probes for two weeks. At the end of the observation phase we had an additional appointment in which we had an in-depth interview with them: this was to collect further data on things noticed during the observations or reported in the cultural probes which were not clear until then. In addition to the clarification question, we asked the informal carers about their opinion to some of our initial design ideas.

The box with cultural probes consisted of: *a diary*, where the informal carers were asked to write about their daily routine; *a actimoClock*, where they should report on the different types of work they engaged in during a day and the average duration of them; *emoticon stickers* which could be used for the diary and the *actimoClock* to show associated feelings to each reported situation; *picture cards* showing different photos of care situations so that informal carers could write down their related feeling when looking at it; *a polaroid camera* to take photos for the diary or documentation in general; and, finally, *a social map* for them to inform about the people with whom they were in contact during the days they were filling in the cultural probes and the frequency that they were in contact with them. The box also included two kinds of questionnaires: one to gather (socio-demographic) information about the informal carer, the care receiver, and the care situation and the *Zarit Burden* questionnaire [*1*] to stage the

burden of the informal carer caused by the care work.

3. Results

For this paper, we will focus on a typical day of one of our informal carers in order to further discuss informal carers' connection needs for informal care:

Mrs Pünktlich[1] is 79 years old and cares for her 84 years old husband who is paralysed and sitting in the wheelchair since an accident 7 years ago. She usually starts the day at 6 o'clock in the morning when she has some time for her own and does some gymnastics, takes a shower, has her own breakfast, etc. From 8am to 9am she prepares breakfast for her husband, feeds him, and brushes his teeth. At about 9am a nurse comes to her house and showers Mrs Pünktlich's husband, puts some fresh clothes on him, and put him back to bed. The nurse usually leaves one hour later and then Mrs Pünktlich does some housework, prepares the lunch, buys some food at the supermarket with a friend of her who has a car, or uses the time for some visits at the doctor's office while her husband is sleeping again. At about 12pm a nurse arrives again and puts Mrs Pünktlich's husband out of bed into the wheelchair and changes his nappies if needed. During this time, Mrs Pünktlich eats her lunch and helps the nurse. After the nurse leaves at approximately 1pm, Mrs Pünktlich starts feeding her husband. Every second day, a physiotherapist arrives at about 2pm and does some exercises with and massages Mrs Pünktlich's husband. The physiotherapist leaves at about 4pm after a coffee break and a chat with Mrs Pünktlich. After the physiotherapist leaves, Mrs Pünktlich has some time for doing housework, organisational stuff, etc. At about 7pm a home help arrives at Mrs Pünktlich home and helps to put her husband back into bed. Before that, Mrs Pünktlich has dinner and feeds her husband. At about 8pm Mrs Pünktlich and her husband watch TV together. Mrs Pünktlich then goes to bed at about 10pm and reads a book for approximately one hour before falling asleep.

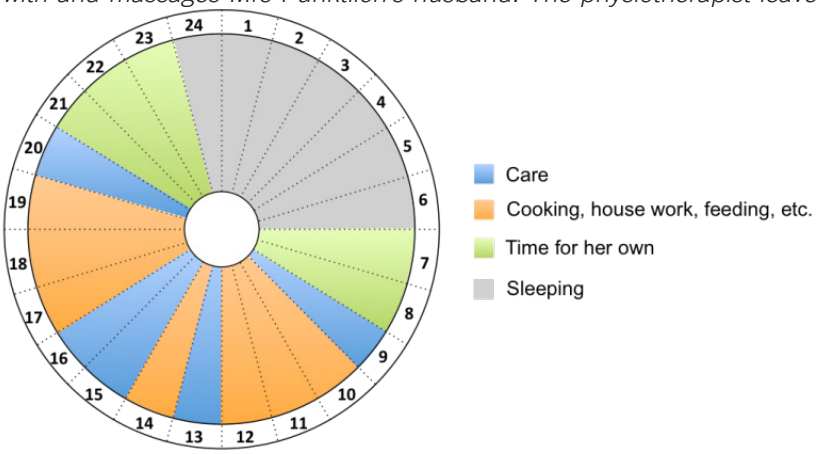

Figure 14: actimoClock: Distribution of daytime to activities of Mrs Pünktlich on our study.

With this example, it will be shown, which and how many contacts are needed with different groups of people:

Connection to professionals

It is very important for informal carers to know when professionals will come to their home and which person will be sent by the home care organisation. The main reason for this requirement is the need to plan the whole day around these arrivals. If there is a delay, this has a negative impact on the time schedule of informal carers [*6*]. On the other hand, it is very important also for informal carers, who are not living in the same household as the care receiver, to know when external help is coming. From time to time it is necessary to talk to the professionals who are providing

1 Pseudonyms are used.

care or help. In case they know when they arrive or are having a delay, they can plan their day to be present at that specific time in the home of the care receiver. In case it is not possible to be there when the external help arrives technology can support the exchange with the external help. Leaving a note read by the external help and answering to it would be sufficient enough to organise and coordinate care on a daily base.

Connection to care receiver

Although their time and mobility are limited, some technology solutions should support informal carer to be more mobile or to have a better feeling from the care receiver's safety point of view while being away from the care receiver [*7*]. For instance, Mrs Pünktlich regularly visits the doctor's office in the mornings or goes for shopping, when her husband is sleeping after the nurse visit. A mobile phone with an alarm function can notify her in case of emergency.

In other cases, we have found that if the care receiver is still mobile and even can go outside, it is important to know where the care receiver is. So, it would be useful if the care receiver wears a device providing GPS coordinates. This device should also allow the care receiver to set off an alarm in case of emergency [*6*].

Connection to family and friends

To get in contact with family members is, on the one hand, necessary to stay in touch and prevent social exclusion but, on the other hand, essential to stay connected with them if you share the care work. Friends can also help with providing care but in most cases they are important for the social life of informal carers. It is necessary to stay in contact with them over video communication.

Connection to other informal carers

When time is restricted and friends are not always available to talk because they are still working, a technology solution can offer connection with other informal carers in similar situations. In this way, informal carers can talk with each other – also anonymously if they want [*7*]. But it is not only about talking – they can also experience things together like a dinner: One informal carer is sitting at the table while having dinner with the care receiver in their home and the other informal carer is doing the same. With a technology solution, both homes can be connected via video communication so the two couples can have dinner together, although they are not physically at the same place.

4. Conclusions

As it can be seen in the results, informal carers need many different types of connection. But they have special requirements: They do not want to be available for all the time, because their priorities are not to be connected but rather to care and be available for the care receiver. Therefore it is plausible to think that informal carers need ambient solutions to let them know about who is currently available to talk to (e.g., a cube placed in the living room showing different information through the use of different colours, as for example, green when friends are online and available to talk, yellow when they are away and so forth) [*2*]. Another possibility is the use of wearable devices: it is reasonable to think that wearing a smart watch could enhance informal carers awareness about different things going on with the care receiver (e.g., when the watch displays a message that something has happened with the care receiver, whilst the informal carer is outside in the garden). Another idea of a wearable device for awareness mechanisms is a colour-changing scarf, which signals that the care receiver needs the informal carers' attention.

Technology should also be context and location based: This means when the informal carer is not at home, e.g., has gone for a walk, the technology device should just offer the functionalities that are needed when s/he is away. To sum, technology for informal carers have to be explicit, simple, and unambiguous and allow them to be connected with others as preferred.

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C5. Promoting innovation by scaling up: myth or fact?

Session Chair: *Reiner Wichert, Fraunhofer AAL, Germany*
Session Responsible: *Reiner Wichert, Fraunhofer AAL, Germany*

The Strategic Implementation Plan [*1*] for launching EIP-AHA as well as the associated Operational Plan [*2*] assume that innovation can be promoted by scaling up. More specifically, they see "scaling-up and generating critical mass" as "key for successful implementation" [*2*]. This session aimed at assessing this assumption. One-third of the time was used for reporting in short about (running) experiences with large-scale rollouts by four invited speakers (each 5 minutes). The focus of these very short presentations was on the way and extent that the corresponding programmes / actions / projects affect the market in terms of promoting innovation. The remaining part of the time (ca. 1 hour) was used to discuss the effectiveness of the presented strategies in comparison. A notetaker created a report from this session that was finalized by the attending presenters in order to provide EIP-AHA with related feedback for the improvement of the effectiveness of the EIP-AHA action plans.

Invited Speakers:

Jan Komarek, European Commission, Belgium
Andrea Pavlickova, HS24/Scottish Centre for Telehealth and Telecare, UK
Esteban de Manuel, KRONIKGUNE, Spain – download presentation
Mariëlle Swinkels, Province of Noord-Brabant, Netherlands
Saied Tazari, Fraunhofer IGD, Germany

PARALLEL SESSIONS

TRACK D

TRACK D
A GLIMPSE OF THE FUTURE

The world faces major challenges across three major domains. Economic challenges arise from uncertainty and turmoil that affect regional and markets across the globe. Environmentally our world is being affected by conditions that threaten lives and economies. Societies and economies are being reshaped and re-defined by demographic change. These challenges are creating global market opportunities and all are using the principle of innovation and the process of innovation to provide benefit for economies, societies and individuals across the globe.

This track underlined innovation as a key driver for projects and market success. It focused on aspects of innovation eg, models and processes, as well as cultures and pathways. It set out to inform, educate, advise and motivate participants at the AAL Forum 2014 to make the right choices for market success. In every AAL member state, region, sector, business and home, there are innovators. They are just waiting for the knowledge and opportunity to be unleashed.

These issues were discussed in 5 different sessions:

D1. A glimpse of the future
D2. Models of innovation
D3. Pathways to innovation
D4. Innovation Cultures
D5. Innovative public procurement

D1. A glimpse of the future

Session Chair: *Maja Arnestad, Arnestad Assistance, Norway*
Session Responsible: *Jackie Marshall-Cyrus, TSB, United Kingdom, Geja Langerveld, ZoomnW, The Netherlands, Claus F Nielsen, Danish Agency for Science, Technology and Innovation, Denmark*

It is difficult to predict anything, especially the future. Future studies (also called futurology and futurism) is the study of postulating possible, probable, and preferable futures and the worldviews and myths that underlie them. In the same way that history studies the past, futures studies considers the future. Futurology seeks to understand what is likely to continue and what could plausibly change.

This session provided the AAL Community with an exciting and challenging insight into how this relatively new area of study is driving and supporting innovation. It brought together the AAL Community a view of the future; a future that is evolving today, and provoked participants to consider "Are we thinking the right way and doing the right things?"

Invited Speaker:

Jonathan Mitchener, Technology Strategy Board, United Kingdom

D2. Models of innovation

Session Chair: *Maja Arnestad, Arnestad Assistance, Norway*
Session Responsible: *Jackie Marshall-Cyrus, TSB, United Kingdom*

With the digital revolution in full swing, there is no room for companies and projects that cling on to traditional and uninformed approaches to developing products, systems and services for the societal challenge of demographic change. Innovation is accelerating every day, driven by commercial opportunities among large, medium-sized, small and micro industries.

This session focused on what constitutes innovation – disruptive, open and challenge-led. It explored the various concepts around innovation, its definitions, its approaches and the evolving dynamics of the concept. Participants gained exciting insights into the way that innovation, innovative thinking and processes are paving the way for successful exploitation of products, systems and services across Europe.

Invited Speakers:

Diana Arsovic Hareskov Nielsen, Health Innovation Centre, Denmark
Jackie Marshall-Cyrus, TSB, United Kingdom

D3. Pathways to innovation

Session Responsible: *Jackie Marshall-Cyrus, TSB, United Kingdom, Geja Langerveld, ZoomnW, The Netherlands, Claus F Nielsen, Danish Agency for Science, Technology and Innovation, Denmark*

In business and economics, innovation is the catalyst to growth. The boundaries between industries and sectors are stretching and changing beyond recognition and good innovators must be closely connected to the societies and contexts of which they are a part. The pathways to innovation usually involve identifying needs, developing competences, and finding financial support. Businesses have to make the right choices in this fast paced and ever changing scenario.

This session explored the pathways that lead to innovative thinking, processes and dissemination with the aim of giving participants an edge with regard to the most proficient and impactful platforms that currently exist. Participants gained an insight into the ways that innovation is driving and is being driven by design, social media and big data.

Invited Speakers:

Karen Blincoe, International Centre for Creativity, Innovation and Sustainability, Denmark
Lech Rzedzicki, Technology Strategy Board, United Kingdom

D4. Innovation Cultures

Session Chair: *Maja Arnestad, Arnestad Assistance, Norway*
Session Responsible: *Jackie Marshall-Cyrus, TSB, United Kingdom, Geja Langerveld, ZoomnW, The Netherlands, Claus F Nielsen, Danish Agency for Science, Technology and Innovation, Denmark*

Successful innovation is a question of culture – not just corporate culture but lifestyle. In the both the organizational context and SME contexts, innovation may be linked to positive changes in efficiency, productivity, quality, competitiveness, market share, and others. Recent research findings have highlighted the complementary role of an innovation culture in enabling organizations and SMEs to translate innovative activity into tangible performance improvements.

This session supported participants in understanding the advantages and challenges to creating and sustaining an innovation culture within organisations and their own businesses. It challenged the myth that only large conglomerates can create and benefit from cultures of innovation. Innovation is vital for business growth, large or small.

Invited Speakers:

Asser Kallsboel, Delta, Denmark
Darrell Mann, Systematic Innovation, United Kingdom

D5. Innovative public procurement

Session Responsible: *Jackie Marshall-Cyrus, TSB, United Kingdom, Geja Langerveld, ZoomnW, The Netherlands, Claus F Nielsen, Danish Agency for Science, Technology and Innovation, Denmark*

Innovation in the public services is essential to meet the economic and social challenges of the 21st century. For the public sector innovation is all about effectiveness and value for money. The purchasing power of government is a powerful incentive to drive businesses to develop innovative products, processes and services.

This session explored the ways in which European countries are using innovative public procurement strategies to find and procure innovation solutions, to capture innovation, and the ways in which they are driving innovation in the business community through public procurement.

Invited Speakers:

Mats Rundkvist, Vateras, Sweden
Silvio Pagliara Centro per l'Autonomia Ausilioteca Campana, Italy
Christopher Brennan, Wragge, Lawrence, Graham & Co, United Kingdom

AAL PROJECT AWARD 2014

The AAL JP programme has invested significantly in almost 140 projects since 2008 and several of them are now beginning to show results and demonstrating real market potential. With the goal of boosting our projects to always improve the quality of their work and their capacity "to sell themselves", the AAL JP instituted **the AAL project award in 2011**. The award is important and helps to create and raise levels of awareness of the AAL JP progress, and results from the projects, whilst at the same time highlighting the core ideas behind the AAL Joint programme. The award is intended to recognize the most promising project of the Ambient Assisted Living Joint Programme that demonstrates great promise in terms of innovation, human-centric approaches to development and market potential.

Selection Criteria:

- The level of innovation – in terms of novelty of concept, approach to the development of the solution from both technological and social perspectives.
- Level and quality of end user integration and potential to improve the quality of life for older adults, their families, careers and significant others
- Market potential for the project – based on the analysis and understanding of the current and future AAL market trends as well as competition.

The judging panel was composed of four recognized experts in the field of the AAL:

- Peter Saraga, Advisory Board of AAL Association;
- Urs Guggenbühl, Base Camp;
- Elizebeth Mestheneos, Vice-President Hellenic Association of Gerontology and Geriatrics;
- Adina Magda Florea, Politehnica University of Bucharest.

For the first time, the programme decided to institute two separated prizes. The institutional prize, resulting from the judgement of the panel, which was entitled to the memory of former AAL Advisory Board member, Jeroen Wals, who together with his family died in the tragic air crash over the skies of Ukraine; the public prize, resulting from the vote of the public. This award was intended to recognize the most promising project of the Ambient Assisted Living Joint Programme that demonstrates great promise in terms of innovation, human-centric approaches to development and market potential. The competition was a three months process along a three steps selection, which was participated by 13 projects of the AAL Joint Programme. For the first time the main award was worth a

financial prize of € 5000, which is intended to help the winner to bring the project to go to market. The three finalists were the projects Assam, Age in Balance and Confidence.

The project Confidence, which is led by the Salzburg Research Institute in Austria won the competition. It aim is to develop a community-based mobility safeguarding assistance service for people suffering from mild to moderate dementia. Confidence combines “assistive technologies” with “personal help”. The Confidence service is built around a “virtual companion” providing different levels of assistance, depending on the situational needs of the patient and the degree of orientation loss. The service is supplemented with personal help from family members, staff of home care agencies and/or trusted volunteers. - See more at: http://www.aal-europe.eu/2014-best-project/#sthash.OxrchZne.dpuf

POSTER SESSIONS

The AAL Forum Poster Exhibition was digital. During the AAL Forum 2014 two digital poster sessions were held on 10th and 11th of September inside on the Receptions Hall, in the Parliament Palace, Bucharest, Romania.

The poster exhibition was very popular and many of the AAL Forum participants saw the posters. The poster exhibition followed the same themes as the forum in general. The posters shown were selected from a range of submitted contributions.

POSTER SESSION 1
MOBILITY & ISOLATION PREVENTION

P1.1. Advanced technology-based solutions for improving seniors mobility. The Mobile Sage project – Luiza SPIRU, FAAI (Romania), Ivar Solheim, Norsk Regnesentral Norwegian Computing Center (Norway);

P1.2. Smart technologies for active seniors. The Mobile.Old app – Luiza Spiru, Ileana Turcu, Alexandru Sterea, FAAI (Romania), Isabel Karlhuber, Stefan Schurz, LIFEtool gemeinnützige GmbH (Austria), Nina van der Vaart, Nationaal Ouderenfonds (The Netherlands);

P1.3. An efficient and affordable device to improve cognition and navigation of visually impaired people – Ruxandra TAPU, Titus Zaharia, Institut Mines Telecom – Telecom SudParis (France), Mateja Vizintin, Comland d.o.o. IT Solutions Development (Slovenija);

P1.4. An Integrated Mobility And Services Concept realized by iWalkActive by the EU AAL JP – Eddy Meyer, geo7AG (Switzerland), Andreas Rumsch, Kerstin Wessig, Hochschule, Luzern – Technik & Architektur, CEESAR – iHomeLab (Switzerland);

P1.5. Virtual support partner: a real-time, empathic elder care system that attends to the daily activity and safety needs of the elder at home, during his normal daily life– Sten Hanke, Emanuel Sandner, Miroslav Sili, Andreas Hochgatterer , Maher Ben Moussa , Eleni Christodoulou, Pedro Trindade, George Samaras, Panayiotis Andreou, Cindy Wings-Kölgen, Nico Van Der Aa, Carsten Stockloewait;

P1.6. Depression Signs Detection through Smartphone Usage Data Analysis – Ana Vasconcelos, Nino Rocha, Fraunhofer Portugal – AICOS (Portugal);

P1.7. Augmented Hearing for Eldery People – Linda Wulf - Institute of Technology - AIT (Austria);

P1.3. An efficient and affordable device to improve cognition and navigation of visually impaired people

Ruxandra TAPU[1], Mateja Vizintin[2], Titus Zaharia[3]

ABSTRACT

This paper focuses on the presentation of the ALICE project (AAL-2011-4-099) which entered in its final stage having as main objective the development of wearable assistive device for a target group of visually impaired people (elderly people aged 55-75). The ALICE device aims to provide an intelligent navigational assistant in order to improve visually impaired mobility and cognition over the outdoor environment. The system can be described as a simple device, ready to use by the visually impaired without any training.

Keywords: assistive device, autonomous navigation, improve cognition

1. Introduction

According to the World Health Organization the total number of visually impaired people worldwide is 285 million while 39 million are completely blind [*1*]. In this context, the elaboration of assistive devices for autonomous navigation dedicated to blind and visual impaired people is a challenge. Nowadays, the white cane and the walking dogs still represent the most popular tools used for obstacle detection. The cane is also the cheapest, the simplest and most reliable elements used as navigation aid [*2*]. However, it is not able to provide additional information elements such as: the speed and type of object the user is encountering, the static or dynamic nature of the obstacle, the distance and time to collisions.

This information is gathered for normal users by their eyes and it is absolutely necessary to have it in order to percept and control the locomotion during the navigation. In its absence partially sighted/visual impaired (VI) users always try to memorize all locations they have been to in order to become familiar with [*3*]. In a new, unfamiliar setting they completely depend on other humans to reach the desired destination. The task of route planning in an unforeseen obstacle environment can severely impede the independent travel of VI and thus reduce their willingness to travel [*4*].

In this context we introduce the ALICE device which aims to provide an intelligent navigational assistant for this target group in order to improve their mobility and cognition over the environment.

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2. ALICE device

The ALICE system is composed of a regular smartphone (Samsung Galaxy S4) attached to a chest mounted harness (Harness-GoPro), bone conduction headphones (Aftershokz AS 301) and a regular processing unit (Intel® Core™ i7-3610QM Processor 6M Cache, 3.30 GHz laptop, NVIDIA GeForce GT640M 2GB) in the user backpack. An illustration of the system is presented in Figure 1.

Fig.1. The ALICE device.

3. ALICE functionalities

The main functionalities of the ALICE navigation assistant are:

- Path finding system

The Global Positioning System (GPS) is used in order to assist the visually impaired to find the shortest and safest path between two interest points (Figure 2). In this context we used the OpenStreetMaps as repository and online access to information about points of interest. Routes are entered, edited and shared with Google Map

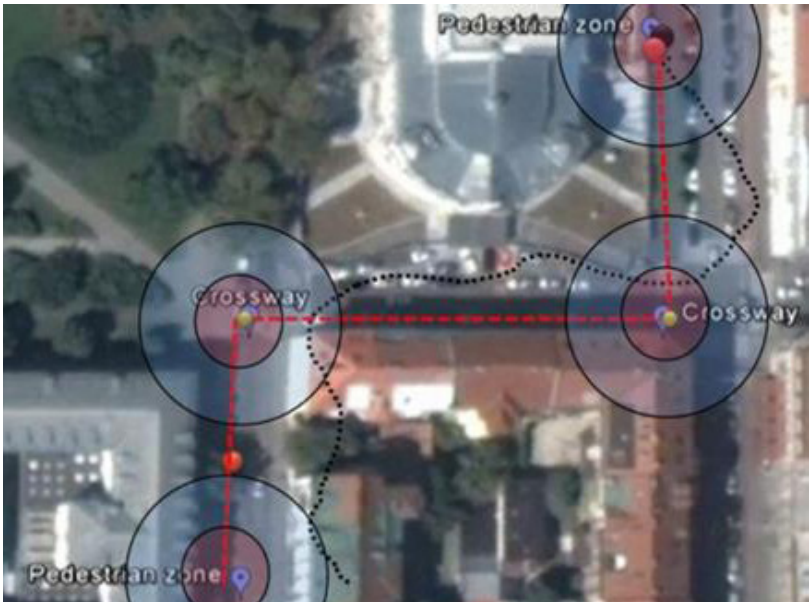

Fig.2. Path finding using the ALICE device

- Obstacle detection system

The system detects, in real time, static and dynamic objects encountered by the user during navigation (Figure 3).

Fig.3. Objects detection in outdoor scenes

- Obstacle classification system

For classification four major categories were selected: vehicles, pedestrian, bicycles and static obstacle. The considered categories are according to the most important obstacles encountered in an outdoor navigation scenario by visually impaired users (Figure 4).

Fig.4. Objects classification in outdoor scenes

- Crossing and light traffic detector

In many countries, pedestrian crossings do not have even the most basic sound signals in the form of a beep, for the blind to know when the light is green and they can safely cross the street. With the use of ALICE, they would be independent of such props, so there would be no need for adaption of the environment. In contrast, ALICE would enable them to be much more independent of their environment than before (Figure 5).

Fig.5. Crossings and traffic light detector

- Human machine interface

The human machine interface is based on a stock Android phone which relies on traditional accessibility methods, including talkback and text-to-speech transcript. ALICE system communicates with a visually impaired user via a bidirectional voice interface (Figure 6).

Fig.6. Human machine interface

4. Conclusions

In this paper we have described the navigational assistant developed within the framework of the AAL ALICE project, with main technologies and functionalities involved. The ALICE navigational assistant is a novel, simple, portable, hands and ears-free system to assist the blind and partially sighted persons in outdoor navigation. The framework is completed with an acoustic feedback that warns user by the presence of any type of obstacle, crossing or traffic light situated in its near surrounding. The system can be described as a simple device, ready to use by the visually impaired without any training. The proposed solution is low-cost, since it does not require any expensive, dedicated hardware architecture, but solely general public components available at affordable prices on the market. In addition, the system is also non-intrusive, satisfying the hands-free and ears-free requirements imposed by end users.

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P1.5. Virtual Support Partner: a real-time, empathic elder care system that attends to the daily activity and safety needs of the elder at home, during his normal daily life

Sten Hanke[1], Emanuel Sandner[2], Miroslav Sili[3], Andreas Hochgatterer[4], Maher Ben Moussa[5], Eleni Christodoulou[6], Pedro Trindade[7], George Samaras[8], Panayiotis Andreou[9], Cindy Wings-Kölgen[10], Nico Van Deraa[11], Carsten Stockloew[12]

ABSTRACT

The main aim of the Miraculous-Life project is to design, develop and evaluate an innovative user-centric technological solution, the Virtual Support Partner (VSP), attending to the elder daily activity and safety needs, while the elder goes about his normal daily life. The VSP will provide implicit support, which is based on behaviour and emotional understanding, and will interact with the elder by exhibiting distinctive emotions, delivered in a human like way in order to simulating in essence the interaction with a real life partner.

Keywords: Virtual support partner, avatars, ICT for independent living, adaptive systems

1. Introduction

It is a well-known fact that most elderly people prefer to live independently in their own homes for as long as possible. The Ambient Assisted Living domain is aware of this fact, and many researchers all around the world are focused on fulfilling this wish. Currently-developed ICT solutions seem to be the most promising approaches to feasibly reaching this goal with reasonable effort and costs.

However, most current ICT solutions provide interaction methods on a very impersonal level. Users may have the feeling that they are communicating and interacting with an ordinary computer instead of a real elder care system. For them, even a simple drink reminder becomes almost irrelevant if it is served by an abstract and impersonal application. The project Miraculous-Life aims to solve exactly this problem by providing a novel interaction approach on a more personal level. This is done by establishing a human-like face-to-face communication between the user and the system through a Virtual Support Partner (VSP). The VSP fuses together the user's facial expressions, voice intonations, gestures and other contextual information from the user's environment, and provides intelligent responses and delivery of services through an avatar-based interface. In addition, the VSP is also able to react on the

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current mood of the user and to express emotions by means of facial expression and voice intonation. The system will provide benefits on a practical, psychological and social level, enabling and motivating the elderly to remain active in carrying out their daily lives at home, thus prolonging their independence and improving their well-being.

The target group of Miraculous-Life is the big group of healthy older adults or older adults with light physical or mental health problems who live alone at home and can find pleasure and relief in getting help or stimulation to carry out their daily activities. In order to increase motivation and positive interest of the end users, Miraculous-Life is focused on wellness, convenience and comfort, rather than impairments and limitations. It considers the elderly as active collaborative agents, able to make personal choices and adapt the system to their lifestyle, personalized needs and capabilities during the ageing process.

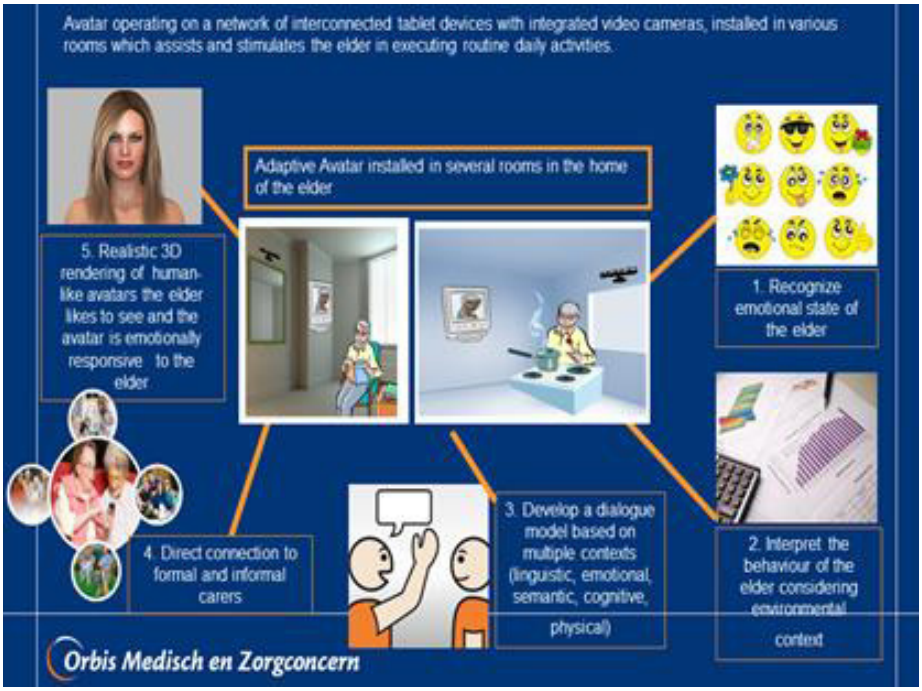

Figure 15: The Miraculous-Life concept

2. The Main elements of the VSP

The main elements of the VSP are:

2.1. Input Devices: This is the physical part of the platform. It accepts real time inputs from different modalities and sensors installed in the environment of the user. Cameras, 3D depth sensors (Kinect), microphones and touch screens are used to collect the required data in order to establish an emotional and multimodal interaction with the end-user.

2.2. Real time multimodal processing: This layer contains the necessary modules to recognize and interpret the input data, process it and indicate the meaning to the intelligent modules in order to generate a coherent emotional response to the user.

2.3. Reasoning, Decision Making: This is the "intelligent" layer of the platform, consisting of reasoning and decision taking modules. These rely on inputs from the previous layer, to determine how the

system should communicate with the user through the avatar and the different services.

2.4. Application Layer: This layer contains a set of ICT-based services to support the user as well as a Social network tool to enable the exchange of information not only with other users but also with formal and informal caregivers.

2.5. Output Generator: This contains modules to visualize the VSP to the environment through the physical parts of system (3D graphics rendering and speech synthesizer).

2.6. Knowledge base: In order to produce a coherent response, the system includes an associated knowledge base that will serve as data management server, where all data (e.g. information models, monitoring data, user profiles, etc.) will be stored and disseminated to cooperating services.

3. The Miraculous–Life Architecture

In detail, the main components of the Miraculous-Life system are:

- User Recognition Modules;
- Speech Recognition Modules;
- Environment Context Analysis;
- Human Behavior Analysis;
- VSP Multimodal Dialogue Management Framework and Avatar;
- Knowledge Base;
- Home Daily Activity and Safety Services;
- Sensor and Sensor connection modules;
- Audio Emotion Recognition;
- Avatar video rendering services;
- Avatar User Interface (Tablets).

The Home Daily Activity and Safety Services are further split up into distinct service categories, which are:

- Safety Services (High level environment context analysis, fall detection, dangerous object adviser, obstacle avoidance, emergency situation guidance, risk avoidance, low level safety service);
- Education & Leisure Services (appointment reminder, event creator);
- Guidance Services (motivation for physical activity, object locating);
- Care & Wellness Services (object location reminder, medication reminder);
- General Services (reminder service, alert service, notification service).

The Miraculous-Life components are separated in internal and external devices. The internal devices are placed in the elderly person rooms. It contains of a small PC, a tablet as well as several sensors (Kinect, microphone, home automation sensors). The PC (workstation, OS windows 8) runs the user recognition modules as well as an OSGi Apache Karaf [*1*] environment to connect the sensors in a smart and standardized way (ISO/IEEE 11073 [*2*]). Moreover, the speech recognition module, the human behaviour analysis as well as the environment context analysis is running on the PC as well. The PC also hosts the VSP Multimodal Dialogue Management Framework as well as a utility module (both running in the OSGi environment). The tablet handles the displays of the avatar (VSP) as well as manual button interaction or text presentation if needed. This information is presented as an HTML5 web page to the user.

The inner module communication is based on the NCF (Noldus communication framework), which uses the AMQP [*3*] implementation RabbitMQ [*4*] as its core component. The tablet is connected to the workstation by a wireless TCP/IP connection. Figure 16 shows the avatar displayed on the tablet.

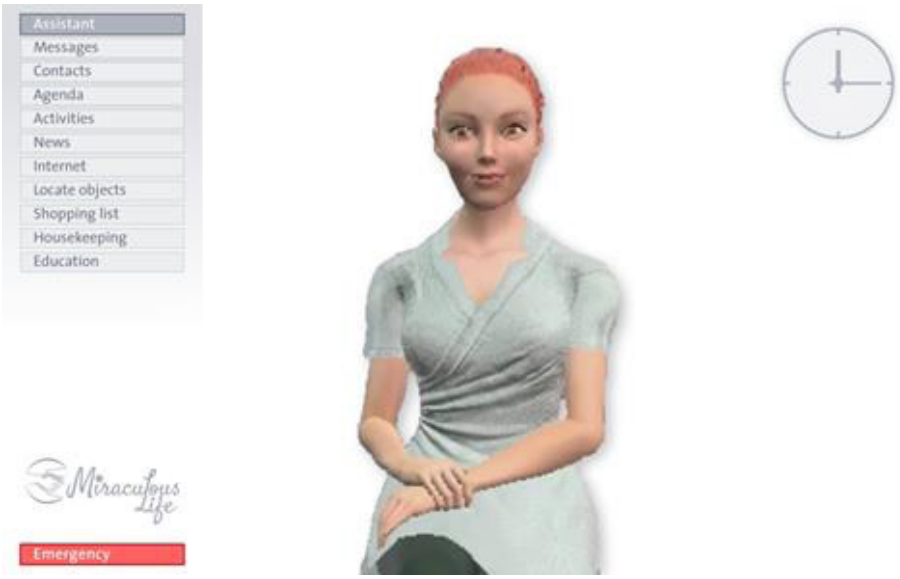

Figure 16: The Avatar displayed on the tablet

External devices are a server brought in by the project partner Zoobe, which provides the Avatar generation as well as the emotion recognition from the audio signal. A central Miraculous-Life server is providing all the services (deployed in OSGi Karaf) as well as a central database. This central server can be placed for example in a residential care service and serve many clients (living units of the older adults). This provides the advantage of a central service management (updates, etc.) as well as a central database for all information (also connected information of the end-users and their relatives in the residential care organization).

4. Conclusions

The validation of the system will be realized in two well-selected use cases in two different countries. A minimum of 120 users (elderly people and their caregivers) will use the system over a six month period. The system will be delivered to the user in form of a stand-alone consumer product, operating on a scalable distributed network of interconnected tablet and Kinect devices, focusing on minimum essential personalized elder's daily activities care support at home. The system will provide benefits on a practical, psychological and social level, enabling and motivating the older adult to remain active in carrying out their daily life at home with a high level of independence and well-being.

The pre-trails of the project already started in project month 8 (August 2014). The pre-trails at the two end user partners in the Netherlands (ORBIS) and Switzerland (MRPS) already present a full scenario including the whole architecture.

The project partners of the Miraculous-Life project are AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH (Austria), UNIVERSITY OF GENEVA (Switzerland), UNIVERSITY OF CYPRUS (Cyprus), ORBIS MEDISCH EN ZORGCONCERN (Netherlands), FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG E.V. (Germany), NOLDUS INFORMATION TECHNOLOGY BV (Netherlands), CITARD SERVICES LTD (Cyprus), ZOOBE MESSAGE ENTERTAINMENT GMBH (Germany), and MAISON DE RETRAITE DU PETIT-SACONNEX (Switzerland).

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Further Information regarding the Miraculous-Life project can be found under: http://www.miraculous-life.eu/

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P1.6. DePsigns - Depression Signs Detection through Smartphone Usage Data Analysis

Rocha NINO[1], Vasconcelos ANA[2]

ABSTRACT

Even though people are generally more aware of physical age-related changes, psychological age-related changes are equally important and have a significant impact on seniors. Events that occur in seniors' life – retirement, the loss of loved ones, increased isolation – can lead to serious problems like depression. DepSigns is a web-based platform that analyses data collected through a smartphone. Using this information DepSigns recognizes behaviour patterns and, consequently, significant changes to that patterns that may indicate signs of depression, such as a decrease in communications with friends and family, lack of activity, or variations in mood swings.

Keywords: seniors, depression, statistical analysis, machine leaning.

1. Introduction

Depression is one of the most common mental disorders among the general population and can be manifested from childhood to old age. This is a serious mental health problem that is even considered as the leading cause of disability related to illnesses and health problems. Studies show that one in four people in the world suffers or will suffer from depression [*1*].

Depression symptoms include, among others: insomnia or excessive sleeping, loss of energy, sadness, or isolation. These can often be ignored or mistaken with normal age-related behaviour, but with proper monitoring, early signs of depression could be detected allowing the patient to promptly receive the appropriate care.

Currently, smartphones and their integrated sensors provide a set of data that, with the proper analysis, can be used to build a behavioural pattern of its user. By analysing this data the authors propose an application that uses statistical analysis and machine learning to detect depression sings.

The first section of this paper presents an overview of depression in seniors and current solutions dedicated to this subject. Next, our proposed solution is explained in section 3 and the technological aspects of it are described in section 4. Finally, the last section discusses our findings and conclusions, and outlines opportunities for future research.

2. State-of-the-art

Defined by the American Psychiatric Association's in Diagnostics and Statistical Manual (DMS-IV), Depression in the Elderly is the existence of a depressive syndrome in individuals over 65 years [*2*].

Since the worldwide trend is that of an increasingly aged population, the importance of diagnosis and treatment of depression in this age group must be highlighted. According to the World Health Organization in 2025 there will be

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1.2 billion people over 60 [*3*].

According to Zimnerman, the probability of seniors suffering from depression is greater than during youth or adulthood and this increase is justified by numerous losses and limitations associated with old age that have consequences like low self-esteem [*4*]. Marques and Col(cit. per Fernandes, 2000), summarize the factors of depression in seniors in three major areas: environmental determinants, particularly the isolation and the lack of social interaction and job, death of the spouse, and social and occupational devaluation. The genetics area considers seniors as a group with a genetic predisposition to depression. Finally the organic area refers to the wide variety of organic illnesses that may present symptoms of depressive nature. It should also be noted the importance of concomitant diseases and their respective medications that may results in side effects such as depression.

The monitoring and diagnosis of depression are always performed by a doctor, but can be assessed through various a self-assessment questionnaires available for patients. The most common scales cited in the literature are the Geriatric Depression Scale (GDS) and Center for Epidemiologic Studies Depression (CES-D).

In recent years there has been a significant growth in applications related to the health sector. Surprisingly, little attention is still given to depression as there are few tools to support mental disorders. Most solutions fail by being based on general risk factors in the prediction of depression rather than in the life of an individual.

The Mobilyze application focuses on monitoring behavioural patterns and mood states by identifying states that trigger depression, thus preventing it. The strategy consists of a combination between the sensors of a personal phone with data provided by users (such as the state of mind and social context). The main advantage of this application focuses on the possibility of anticipating depressive moments. Still, the differentiation between a calm day and a sign of depressive disorder is unclear [*5*].

Depression Calculator is based on Patient Health Questionnaire Scale (PHQ-9), through which the user responds to this standard questionnaire trying to obtain a diagnosis of the depressive state. It is also provided with a digital informative leaflet with important information and advices about Depression and antidepressants previously analysed by experienced authorities in the field [*6*].

3. Depsigns

DepSigns is a web-based solution that relies on data collected by a smartphone to conduct a statistical analysis and machine learning methods to detect depression signs. The starting point of this project was Smart Companion, an Android customization developed specifically for seniors at Fraunhofer Portugal [*7*], that already collects specific data through specially developed algorithms and specific applications. In order to specify the data that should be analysed we interviewed two psychologists specialized in dealing with seniors users. Our conclusion was to incorporate in Depsigns data related to: activity level of the user, categorized by time of day (morning, afternoon and night); locations (how often the user leaves the house); mood (a self-assessment made by the user); communications (calls and messages) and ludic activities (namely, cognitive exercises).

We conduct a statistical analysis on the collected data and use it to infer depression symptoms from personal habits. The goal of this statistical analysis is to find deviations from the senior's usual behaviour, by detecting standard patterns in the senior's daily activities, and causing field-wise alerts to be shown to the psychologist or caregiver. To detect the mentioned outliers/deviances, we use an abstract evaluation function which can be configured by the

psychologist using this software. The results achieved by conducting this study vary greatly according to the senior's initial condition. The system will not generate an alert for seniors that already showed depression signs when we first started sampling data, since a depressed state will correspond to their normal condition. This is why we also conduct a study using Machine Learning.

Decision Tree Learning is one of the Machine Learning most used and practical methods for inductive inference, being the most popular among the inductive inference algorithms in large areas such as health or financial, learning to diagnose medical cases or evaluate possible cases of financial risk [*8*]. We use this method to classify depressive symptoms. To generate this tree, we allow the psychologist to provide feedback on each senior, indicating whether depressive symptoms exist or not. We commit this feedback and can then generate a training set by correlating the senior's history with the provided feedback. We use the same format as the training set to classify other samples and can therefore predict the senior's state of mind according to the previously trained rules. Contrary to the statistical analysis, the decision tree classifies symptoms according to global population standards.

4. System architecture

Being multi-user in nature, this project was a great candidate for a Web Service. For this reason, we used the most common paradigms used for implementing this kind of services on the web. Also, being web-oriented was a key factor in the decision of the structure used for this application. Nonetheless, the key features are related to how we process the data and achieve depression-detection-related results. One of the most typical approaches when creating a Web Service is using the Model-View-Controller paradigm [*9*]. Each of these three conceptual modules (Model, View, and Controller) is further divided in functional modules, which constitute the implementation of our application. Each module has its own very specific purpose and is capable of performing its duty independently of the others; meaning that changes to one module will not require changes to others, for as long as the input and output formats remain the same.

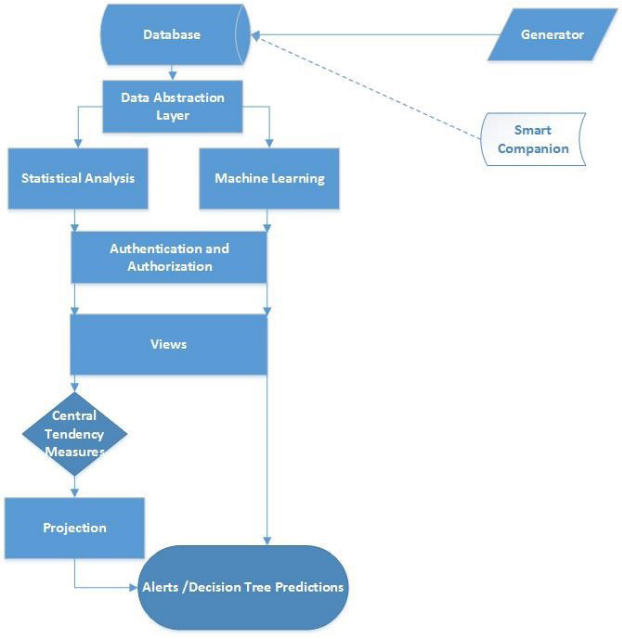

Figure1. DepSigns System Architecture

The system architecture is defined by:

- **Data origin**: All the data is intended to originate from the Smart Companion project [*2*]. However, for testing purposes we decided to create a generator (artificial data) which simulates the necessary data.
- **Database**: was modelled to represent a set of constraints that were agreed upon under psychologist guidance.
- **Data abstraction layer**: the raw data is not in a convenient format for use in the application. As such, we created a Data Abstraction Layer over the Database layer which allows the abstraction and conversion of the data into a more suitable format.
- **Authentication and Authorization**: being multi-user in nature, this application required an authentication and authorization process. Each user is required to have a user name and password.
- **Views**: this web service is composed of a set of pages which allow its users to explore the implemented functionality. The set of URL mappings constitute the service's API. Each URL serves a different purpose. Some of these URLs return HTML, which consists of a visualization of some sort, others use AJAX to perform some distinct operation. We implement this by using django Views [*10*], which consists of classes that allow specifying how each URL behaves and what HTTP methods it supports.
- **Central tendency measures**: the evaluation function is considered to yield a measure of centrality of some sort. As input, we provide an array with the data that has already been processed at any given moment, plus one entry which has not yet been processed. To achieve this effect, while we iterate through the data samples, ordered by week, we keep an array containing all previous data entries. The output will later be used as a threshold for the weeks to come. This threshold is considered to be the minimum requirement for us to consider the individual's week as fulfilled. In case this mark has not been met for the last two weeks in a row, then an alert is raised for the given field. The decision to consider the last two weeks alone was made under psychologist guidance. Past weeks are used to infer personal habits, so we can make conclusions on the senior's current state.
- **Projection**: The implemented visualization tool uses the highcharts[*11*] framework to render the graphs.
- Alerts/Decision Tree Predictions: There are two kinds of alerts which can be generated: field-wise and field-agnostic. Field-wise alerts are generated by the Statistical Analysis, providing an insight of how the senior matches his/hers usual habits. Field-agnostic alerts, on the other hand, are generated by the Machine Learning analysis and provide a means of comparing the individual's physical and mental state by comparison with the general population. These alerts are shown to both the psychologist and the caregiver.

5. Conclusions and Future Work

We can conclude that this preliminary study offers a great support to psychologists and caregivers, given the way that this web service shows the personal habits and the general population deviances. One important feature is the detection of the behavioural pattern classified by the decision tree learning algorithm of the machine learning. We want to improve this application by adding automate data gathering with Smart Companion, study more central tendency measures to help the psychologist improve the statistical inference, prioritized alerts and send alerts to the care-giver's phone. In the psychologist's main menu we will continue the development offering more features such as a calendar, events management, among others.

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P1.7. Augmented hearing for elderly people

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ABSTRACT

In this contribution, we present the project AHEAD - Augmented Hearing Experience and Assistance in Daily Life- which aims at developing a speech-based hearing glasses system extended with assistive services. The key feature of AHEAD is the voice-user-interface (VUI) embraced with a microphone and communication components enabling speech-based system interaction. Additional intelligent sensors for vital-sign measurement as part of the health-related service ensure an improved self-management of health.

Keywords: hearing glasses, speech-interaction, elderly people

1. Introduction

With increasing age eye sight, hearing, memory and coordination skills decrease. The use of assistive technology systems can help maintaining or even improving the quality of life of elderly people. Assistive technology has the potential to support them to continue living an independent life despite of physical changes. To meet the requirements of physical changes in older age as well as to ensure an easy handling of assistive technology new operating and interaction concepts are needed.

Against this background, we present the European research project AHEAD - Augmented Hearing Experience and Assistance for Daily Life – which aims at providing a speech-controlled assistive system that supports elderly people in their everyday life as communication tool, e.g. initiating phone calls and healthcare manager, e.g. recording vital-sign parameters, initiating emergency calls, medication intake reminder, etc.

Within this project our goal is it to investigate the potential of speech-based interaction for elderly people using a hearing glasses system. Most research activities that have investigated speech-based interaction with elderly people mainly with multimodal user-interfaces such as smart home environments [*5*] [*6*] [*7*] or Living Home Centers [*8*]. These studies have revealed two relevant insights: On the one hand the results showed that elderly people appreciated the idea of “speaking to a home” and that multimodal voice- and touch-enabled interfaces allow an easier use of technologically complex devices and services as well as improve electronic and social inclusion of elderly users [*8*]. Ferreira et al. [*6*] performed a user evaluation of a multimodal medication assistant for elderly users based on a smartphone. Their study showed that interaction through spoken language and recommendations given by a medication assistant evoked a positive impact on elderly users.

The mentioned studies, involving elderly people, investigated multimodal user interfaces mostly applied on a smart phone or tablet. To our knowledge there are no studies that have evaluated the elderly people’s use of hearing glasses. We can conclude that speech interaction as unique input modality without touch or keyboard/mouse interaction has rarely been investigated and least of all with elderly people.

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Therefore, our project will extend the current state-of-the-art by integrating technological components into common everyday objects (in this case: eyeglasses and hearing aid) enabling an unobtrusive way to interact with a system. The hearing-glasses enable the user to receive relevant information via speech-interaction, which can help to master everyday life in an easier and less complex way.

2. The AHEAD system

The hearing glasses are equipped with intelligent sensors for vital-sign measurement as part of the health-related service that ensures an improved self-management of health. The AHEAD hearing aid will be able to measure vital signs such as heart rate, body core temperature and oxygen saturation through sensors that are located in the inner ear and transmit these data for further analysis helping elderly people in self-managing their health. Finally a 3D inertial sensor will record general physical activity and risky behaviour. The AHEAD assistant is wireless connected to a smart phone and part of a smart living environment. By this, the AHEAD system allows ubiquitous and non-obstructive monitoring services such as triggering emergency calls.

Another novel aspect of the AHEAD system constitutes the application of ontology-based context management with the OpenAAL middleware (based on UniversAAL reference architecture). The middleware enables a simple implementation, configuration and situation-dependent provision of flexible, context-sensitive and customized assistive services. The aim of the middleware is to provide relevant background information to all stakeholder groups accelerating the development and introduction of innovative AAL solutions. This enables us to involve different user groups of primary and secondary users (family members, friends, health-care professionals) to enhance the communication and to improve the cooperation between these user groups for an advanced health-care management. Furthermore other stakeholders, .e.g. hearing aid acousticians will be integrated into the development process and service delivery to guarantee a holistic usability and accessibility of the AHEAD system and related services. Throughout the project's research activities will be performed involving elderly users and other stakeholders.

3. Research Activities

The following section reports the implementation and results of the research activities.

3.1. User Requirements

To ensure the acceptance of elderly users for the AHEAD system we first conducted a user requirements analysis involving 38 primary users, aged between 51 and 87 years, to explore the preference and suitability of different features and the developed use cases.

The participants had to evaluate the proposed use cases according to their usefulness (0= very useless – 10= very useful) in everyday life.

The best evaluated use cases were the emergency call function (Mn=8.92), the health care monitoring function (Mn=8.16), the oven/window warning system (Mn=7.55), the phone call function (Mn=7.5) and the drinking reminder (Mn=7.44). By this, we were able to identify the must-have features for low-fi AHEAD prototypes that will be applied in first lab evaluation involving also elderly users. Other uses cases with middle values were the medicine intake reminder function and the finding assistant. Considered as less useful use cases were for example the camera, weather information function and public transport assistant.

3.2. Focus groups

Focus Groups were also performed in Austria and Germany. In Austria 4 nurses and one managing director of mobile home care attended as formal caregivers at the focus groups. In Germany informal caregivers, family members (n=12) and formal caregivers, hearing aid acousticians (n=4) participated at the focus groups.

The results of the focus groups showed that the attitude of the secondary users group (health care staff) was less positive compared to the primary user group. The focus group members mostly doubted that the hearing glasses system could be easy to use and to handle by the elderly users. Another concern was related to the proposed medical services like medicine intake reminders and vital signs measurement. These features were considered to be too insecure in terms of reliability. The only service that was appreciated was the reminder function if the user would leave the house without the keys.

The focus groups with family members showed a rather positive attitude towards the hearing glasses system. They especially appreciated the integrated communication service that enables direct contact to the primary users as well as the vital sign measurement. Additionally they stated that the control of the system's configuration should be in the hand of the primary user. Most of the family members stated to use the AHEAD system too if someone from their age group would use it as well. The focus group with hearing aid acousticians underlined the beneficial effect of such a system for the life of elderly people in particular when it comes to emergency situations and health care support.

4. Conclusions

The results of the user requirements analysis revealed a positive attitude towards the proposed AHEAD system by primary and secondary users. The most preferred feature was the emergency call function, followed by phone call, health care monitoring functions and the warning system (open window/running stove). The majority of the primary users indicated to possibly use such a system in future. For the focus groups the results were more heterogeneous. The attitude of the secondary users group (health care staff) was less positive compared to the primary user group. The focus groups with family members showed a more positive attitude towards the hearing glasses system. They especially appreciated the integrated communication service that enables direct contact to the primary users as well as the vital sign measurement. The focus group with hearing aid acousticians underlined the beneficial effect of such a system for the life of elderly people in particular when it comes to emergency situations and health care support.

We can conclude that the proposed voice-controlled hearing glasses extended with assistive service is a very promising system that has the potential to add additional value to the lives of elderly people taking advantage of ICT use. The results of the user requirement analysis will directly be integrated into further developing and optimization processes of the hearing glasses prototype. Future work will target at user-studies evaluating first low-fi prototypes by elderly participants to guarantee user-tailored system which meets with the needs of elderly users. Following this user-centered approach will enhance the overall acceptability of the hearing glasses system by the future user.

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POSTER SESSION 2
INTEROPERABILITY & LIVING LABS

P2.1. Towards A Better Interoperability Of Platforms Dedicated To Seniors: The Mediate System Architecture- Wassila Aggoune-Mtalaa, Damien Nicolas, Younes Djaghloul, Djamel Khadraoui, Hedi Ayed;

P2.2. Smart living and AAL services – Vadym Kramar, Markku Korhonen, Yury Sergeev, Oulu University of Applied Sciences (Finland), Serge Smidtas, Camera Contact LTD (France), Marjo Rauhala, Vienna University of Technology (Austria);

P2.3. Near Field Communication-based Wearable Device For Self Care Management- Gabriele Rescio, Alessandro Leone, Pietro Siciliano, CNR-IMM (Italy);

P2.4. Users Voice: Participative Design and Living Lab approach in LILY – Pekka Ala-Siuru, Marjo Rauhala, Vadym Kramar, Eeva Leinonen, Serge Smidtas;

P2.5. MyGuardian – Supporting caregivers with integrated solutions – Inmaculada LUENGO, Diego FUENTES, Elena MUELAS, HI-IBERIA INGENIERIA Y PROYECTOS SL (Spain);

P2.6. Framework, process description and technologies for managing fall risk – Milla Immonen, Heidi Similä, VTT Technical Research Centre of Finland, Patrik Eklund, Four Computing Oy (Finland), Lars-Åke Johansson, Alkit Communications AB (Sweden), Elixabete Altude Arabiurrutia, Hospital La Fuenfria (Spain), Carlos García Gordillo, CGG Management (Spain);

P2.7. AAL4ALL: Large pilot of AAL productsVservices in care and residential environments – Filipe Sousa, Fraunhofer Portugal – AICOS (Portugal);

P2.1. Towards a better interoperability of platforms dedicated to the seniors: the MEDiATE system architecture

Wassila AGGOUNE-MTALAA[1] , Damien NICOLAS, Younes DJAGHLOUL, Djamel KHADRAOUI, Hedi AYED

ABSTRACT

This work is part of investigations towards a better interoperability of platforms dedicated to the elderly people. Within MEDiATE project, the key objective is to enable better communication among formal and informal helpers of elderly people at their home. To this aim, the MEDiATE targeted solutions will be built, deployed and interfaced to existing elderly platforms: Touchscreen VisAge and Internet-connected TV application e-Lio. The MEDiATE architecture will be conceived following distributed system paradigm. The interoperability will be covered with the use of models and standards and implemented within XML language.

Keywords: Communication, helpers, interoperability.

1. Introduction and motivation

Currently, ICT services, especially those involved in the support of healthcare, are mainly focusing on elderly people and professional carers, offering them a large set of adapted services. The numerous existing platforms supply a large number of useful services such as video conference, instant messaging, email boxes, pictures management, agenda, for instance.

However these systems are rarely accessible among them due to a lack of openness and a poor use of open standards. Moreover, the interconnection between heterogeneous platforms involve to address many questions concerning not only data communication at a low level (protocol and data layers), but also collaboration of the applications at an upper level (business layer), as well as the user security management.

One of the main objectives of MEDiATE project is to propose an architecture that enables the ease integration of heterogeneous services and data from several platforms in the most transparent way possible for the users, but also allowing for a minimum of modifications from the existing platforms side.

In order to create an extensible, opened and evolved solution, service-oriented approach (SOA) will be used. SOA provides simplicity, extensibility, openness, robustness out of the box and a high level of independence regarding the technologies. The interoperability will be covered with the use of models and standards and implemented within XML language. The MEDiATE targeted solutions will be built, deployed and interfaced to existing technological platforms: Touchscreen VisAge[*1*], Internet-connected TV application e-Lio[*2*] and EGLU platform[*3*]. The MEDiATE architecture will be conceived following distributed system paradigm. One development example could be based on agent-based approaches in order to facilitate contextual decision making. The final architecture of the system will be built according to best practices in the domain of Multi-Agent Architecture methodologies.

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In this paper, an overview of the MEDiATE architecture model is presented in order to give an insight of current practice for further improved developments. The choice of the architecture topology is described together with the different component and services as well as the nature of data exchanged between the different nodes and services.

2. Rationale

MEDiATE project aims at proposing the exchange of heterogeneous data, and the collaborative and common usage of services from different existing systems with their own models and internal rules. The choice of the architecture's topology is motivated by a set of criteria and guidelines that are related to the innovative nature of the project and a set of user and functional requirements addressed previously within the project. The main motivations in the design of MEDiATE architecture can be summarized as follows:

- Each platform has to be as autonomous as possible. Each platform provides a set of local services that can be exposed to other platforms and is able to communicate directly with other ones. This requirement can be achieved via the use of a peer to peer system architecture. MEDiATE proposes a set of added value services that will enrich the pool of services provided by the existing platforms via collaborative and communicative facilities. The actual MEDiATE services (new or enriched) are more related to the management of the communication among platforms, the selection of services, the planning and the rescheduling of activities, and the dissemination of messages between platform and tiers. This can be achieved via the usage of a client/server based architecture.
- Each platform keeps its own data model; therefore a coherent communication between platforms at the data level is required. The adoption of a common data model for exchanging messages (for the communication or the services exploitation purposes) is the key to guarantee this coherent communication. This can be achieved via the exploitation of SOA paradigm.

Considering the above mentioned criteria, the best solution is to follow a high decentralized architecture that can be qualified as a hybrid distributed peer-to-peer (P2P) architecture [*4*], where each element of the system can be viewed as a node. In this context, a dedicated MEDiATE specific node is used for the deployment of new services.

The SOA approach requires that each connected tiers platform should provide a communication interface that respects the MEDiATE interface specifications. Additionally to this, a common exchange data model is required in order to facilitate the communication among the platform via the MEDiATE node or even directly between the platforms themselves. Technically, this can be achieved by the development of a SW module (also known as a wrapper).

The communication over the MEDiATE ecosystem, which includes the external nodes as well as the MEDiATE specific node, should also follow a MEDiATE communication protocol that will be defined in a further work.

3. MEDiATE Architecture model

The proposed architecture model is based on a hybrid distributed nodes system of peer-to-peer (P2P) type [*4*] with one or more additional federating nodes.

Each node represents the heterogeneous platforms of MEDiATE ecosystem. The nodes are able to communicate directly with each other or through a standard compliant interface. The security in the communication is ensured

by a unique and temporary ticket, generated by a federating node which allows building a reliable link between the called node and the calling node.

The federating node proposes two main services:

- The security management at the upper layer (MEDiATE ecosystem). It proposes the management and the creation of unique and temporary tickets, enabling the platform authentication, the authorization for the platforms to use dedicated services and last the use of these services;
- The platforms and services management in the form of a flexible, dynamic and searchable recording model.

The above-mentioned support services are gathered in a classical node which has to be registered by the federating node and shall declare all its services as the other nodes (platforms) belonging to the MEDiATE ecosystem.

Let us remark that each node keeps its own security model and is able to validate or not the trustworthy ticket depending on the demand.

The following figure presents an overview of the proposed architecture:

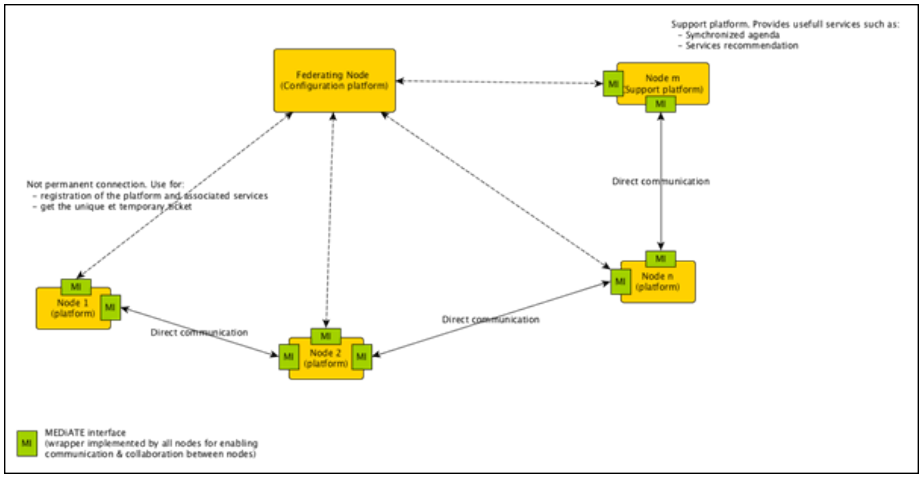

Fig. 17: Overview of MEDiATE Architecture Model

In the following a description of the different components of MEDiATE architecture is given.

3.1. MEDiATE Federating Node

This node contains new services and facilities proposed by MEDiATE related to clearing and to support services. These services are considered as native for this node and are not part of existing services already proposed by the existing platforms. No service from the existing platform is deployed in this node.

This node is considered as a sort of gateway between MEDiATE and the connected existing platforms.

Two main services are proposed in this component:

- The management of the profiles of the platforms and the services belonging to MEDiATE ecosystems in order to ensure consistency between needs and proposed services. It gives the possibility to add/remove platforms, manage the status and to allow platforms exposing their services as a capability without deploying them. The possibility of exposing these services is important for the recommendation service. This component plays the role of a registrar;
- The management of the security of the ecosystem at a system level (authentication, authorization, access) in order to guarantee a first level of trust between platforms.

3.2. MEDiATE Support Services Node

In order to enable collaboration between the services of the platforms, a certain number of support services are proposed such as:

The ability to synchronise in real time different agendas/calendars under constraints of various types;

- The recommendation of services proposed by the platforms according to the user profile, needs and proposed services. It delivers relevant services associated to their hosting nodes. It receives requests from platforms, and according to the nature of the messages, it dispatches them to the appropriate services. This will allow other platforms to call directly the needed services deployed locally.
- These services bring a real added-value to MEDiATE eco-system as far as they are available for any platform member of the ecosystem.

3.3. MEDiATE Interfaces (Wrapper)

In order to communicate with other nodes, each platform has to develop and integrate a local module called "MEDiATE Wrapper". Two main tasks should be provided by this wrapper:

Data Transformation: from internal data model to the MEDiATE Data model and vice versa. For message exchange (emission or reception) the wrapper transforms the data to be used internally in the case of reception and to be interpreted with a unique way in the case of emission;

Communication gateway: with both platforms (Wrapper: P2P Direct communication) and to call MEDiATE Service of the Federating Node (Wrapper: Federating Node part).

3.4. MEDiATE Messaging

Different types of messages can be exchanged. From a communication point of view, two main kinds of messages can be exchanged in MEDiATE environment: the P2P Messages and the Federating Node ones. Each type should have special structure and semantic.

P2P messages are directly exchanged between platform's nodes without a central point. In this case, three possible types of messages can be used: Human messages which use text, voice/video used to communicate between two users directly; direct service invocation where one of the two platforms plays the role of service server for the other

platform which plays the role of client, and Senior Activity message related to activities needed by the senior and done by other tiers.

The Federating Node messages are exchanged between platforms and the Federating Node. This communication is principally used to call MEDiATE services. Four types of messages can be sent. The first type is a call to a MEDiATE service: a Tier 2 platform can call a MEDiATE Core service. The second is a human message for which, the Federating Node plays the role of relay and central point of communication. This is helpful if one wants to trace the message or to send it to a restricted group of the network of the senior. The Senior Activity message is sent to all the authorized persons even if they do not use the same platform. The platform management has to manage the capabilities and the status of the platform.

4. Discussions and conclusion

MEDiATE is a solution which is independent from any specific technology, such as the devices and applications supported within the project. On this particular issue, MEDiATE, as a matter of fact, aims at achieving a strong interoperability level thanks to a carefully-designed blueprint of applied web-services and modus operandi, also leaving room for best practice exchange and performance benchmark further on. This independence from any specific technology involves the experimentation, within MEDiATE itself, of at least three different actual interfaces servicing the elderly for the targeted services: Touchscreen VisAge, Internet-connected TV application e-Lio, and EGLU platform. This interoperability level is reinforced by the overall information management configuration, leaving room for the integration of other similar platforms along the way or technological as well as service delivery evolutions in the future.

In other words, once the interoperability are proven to be effective, other AAL platforms stakeholders will be invited to join the MEDiATE user community and governance group and participate in the extension of MEDiATE network beyond MEDiATE perimeter countries or regions.

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P2.2. Smart living and AAL services

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ABSTRACT

The paper describes the Smart Living concept as well as the Decentralised Service Delivery Architecture, presents some particularities of the architecture and systems that utilise it - HoviMestari and VisAge. It also describes integration levels and service templates with respect to the architecture. The presented approach addresses interoperability in the AAL domain. The approach was developed within the Advanced Support for Independent Living; Human Lifecycle Approach in Senior Housing (Lily) project, funded in the Ambient Assisted Living Joint Programme. The decentralised approach differs from traditional approaches where services are provisioned via central nodes as via service portals or hubs, dedicated home platforms or systems. The idea of the architecture is to use linked descriptions of samples of service-product continuum that can be discovered using certain criteria, and thus provisioned through the AAL systems.

Keywords: smart living; smart home; smart space; service.

1. Introduction

A Smart Home can be defined as a residence equipped with computing and information technology which anticipates and responds to the needs of the occupants, working to promote their comfort, convenience, security, healthcare, education, communication and entertainment through the management of technology within the home and connections to the world beyond. [*1*],[*2*] A list of aspects relevant to human living may be extended even further by adding occupation, hobby, social interaction, variety of inclusions, and others.

The ageing population in many countries brings about more challenges to researchers and opens us new research fields. One of those is gerontechnology. "Gerontechnology is an interdisciplinary academic and professional field combining gerontology and technology. Sustainability of an ageing society depends upon our effectiveness in creating technological environments, including assistive technology and inclusive design, for innovative and independent living and social participation of older adults in good health, comfort and safety. In short, gerontechnology concerns matching technological environments to health, housing, mobility, communication, leisure and work of older people. Research outcomes form the basis for designers, builders, engineers, manufacturers, and those in the health professions (nursing, medicine, gerontology, geriatrics, environmental psychology, developmental psychology, etc.), to provide an optimal living environment for the widest range of ages." [*3*]. As it is seen in the definition, the Ambient Assisted Living (AAL) [*4*] domain and support for independent living have a direct relevance to this new research field.

There is a medium that at these days penetrates all the intelligent environments and therefore may be considered for a variety of interoperability aspects. This is the Web. A vast number of consumer and professional devices that

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are able to access the web exist, and rapidly grow. Those devices may be used to form intelligent environments, or may be parts of the environments.

For example, smartphones are personal end-user devices that are essential in intelligent environments. Other essential devices are TVs and touch-screens that are widely used as front-ends of Smart Homes. An impact of web-enabled devices to industries is so big that governments have to recon-sider their strategies, and new branches occur that merge some industries, like mHealth, for example [*5*].

Such shared communication channel as the Internet, Web as a shared medium, common data models, and generic service processes are enablers of an architecture proposed in this work.

2. Related Work

A Wikipedia article about Gerontechnology lists more than a hundred platforms dedicated to elderly care in its most comprehensive version in French. Most of the platforms are proprietary and the only possible way to build an interoperable system is to use APIs provided by those platforms. A few projects are on the way to integrate existing AAL technological developments focusing on interoperability.

ReAAL project [*6*] is probably the largest EU-wide effort to develop interoperable AAL solutions – those are based on Universal Open Platform and Reference Specification for Ambient Assisted Living developed under the universAAL project [*7*]. Its idea of interoperability is more to build one common platform that supplement others than by opening it: 3 buses are used inside of the platform to exchange data but only one is open and accessible throw an API. The usage is focused on gathering hardware information from local devices such as domotic or health monitoring devices.

MEDIATE project [*8*] gather a connected e-Lio TV platform [*9*], a touch screen device VisAge [*10*], a website Hakisa [*11*], a tablet Eglu [*12*], and a smartphone James [*13*]. A methodology to make interoperability is to propose to the community an API to share messages (web-service API, P2P) about the state of elders on any topic (health, social, agenda), using open ontologies with RDFs description.

SONOPA project [*14*] allows platforms to exchange data from sensors on elders. Various existing platform are involved: Docobo [*15*], dedicated to health, VisAge [*10*], a smart display with PIR sensors Smart Signs [*16*], and an actioner device Abotic [*17*]. The Sonopa webservice API allows to gather data from sensors of older people and perform long term behaviour analysis. It includes data from door opener, cameras, and motion sensors.

NITICS project [*18*] is quite similar with the objective to perform long term behaviour analysis. It includes data from, motion sensors, health monitoring devices such as blood pressure, and data from indoor localisation. Existing platforms gathered in the project: Eeleo [*19*] , eclexys [*20*], and VisAge [*10*].

3. Smart Living

A number of systems and applications that affect to human living is enormously huge, and more are to come. Those are not only Smart Home systems. Even in a living environment, there may be systems that are not belonging to a complete implementation of a Smart Home. Some aspects of human living, such as education, work, cultural and social life, range beyond the living environment.

This gets even more complicated when so-called intelligent or smart environments are observed from a higher level of immersion, which is beyond Smart Homes, like Smart Cities, Smart Universities, Smart Factories, Smart Communities, Smart Hospitals, and others. The concept of Smart Living [*2*] is a better suitable since it essentially assumes all the aspects of human living affected with technologies. Figure 1 shows some of manifestations of Smart Living that are grouped by domains.

Regardless of the domain, technological challenges in all of those manifestations are the similar. Those are the following:

- Generation of data and information;
- Infrastructure;
- Information Management;
- End-user terminals and interfaces;
- Best Practices and Adoption.

Smart Living may be considered as a large smart space that consists of smaller smart spaces with other smart spaces – nested and intersected. It means that technological solutions addressing the above-mentioned challenges may be reused across the smart spaces. Following this idea may reduce a number of interoperability problems that isolated systems have.

Fig. 1. Manifestations of Smart Living

Such shared communication channel as the Internet, Web as a shared medium, common data models, and generic service processes are enablers of an architecture proposed in this work.

4. Systems Utilising the Decentralised Approach

Ubiquitous Home Environment (UHE) [*21*][*22*][*23*] is a user-centric set of systems that serve users in domestic space and expands its services to other spaces in order to facilitate the Smart Living concept. A primary goal of the HoviMestari as the UHE front-end is to be an interface for home services supporting independent living [*24*].

As it is seen from the definition, the UHE is a fragment of the ultimate ubiquity, which is bound to a domestic environment. There may be a number of systems that form the environment, all having any number of devices, nodes, entities, and things. Systems may be categorised by complexity (ranging from dumb home appliances that do not have any connectivity through sophisticated Smart Home implementations); by autonomy (ranging from embedded demotic systems through autonomous robots); and in a number of other ways.

The UHE systems typically expose and utilise a variety of services: internal - platform/system overhead services, generic - platform/system reusable services, and front-end services – those, that are directed to users. Front-end services are exposed via end-user devices, and may be provided by systems, or provisioned with via the systems. For example, a Smart TV may provide a video-recording service, but video-on-demand services may be provisioned via the Smart TV.

HoviMestari [*25*][*26*] as the UHE front-end developed on a base of the UbiHomeServer [*23*], targets people of different ages and abilities with a purpose to make easier life at home by simplifying everyday tasks and activities and therefor provide a support for independent living [*24*]. The HoviMestari may be positioned as an utilising the Decentralised Service Delivery Architecture framework, through which a variety of AAL services may be provisioned.

The system has a reusable modular architecture allowing delivery of a variety of services through an original user interface designed for TV, mobile, and touch-screen devices [*27*]. Such NoSQL database engine as mongoDB [*28*] and OpenRDF Sesame [*29*] framework were used to store and process service-relevant data, search criteria, profiles, templates, and required overhead information [*27*]. The GUI of the HoviMestari inherited all the features of the UbiHomeServer.

Within the Advanced Support for Independent Living; Human Lifecycle Approach in Senior Housing project, funded by the Ambient Assisted Living Joint Programme, a one-year field trial with third-age end-users and primary caregivers was launched in the Raahe District of Northern Ostrobothnia, Finland, in the spring 2014.

The following services were proposed for the field-trial:

- Local weather forecast;
- National news;
- Local newspaper news;
- Local events information;
- Public transportation schedules;
- Drawing tool;
- Memory-developing game;
- Bible audio-book;
- Church services;
- Video-guided exercises;
- Radio;
- Audio;
- Sonami – natural sound samples [*30*];
- Maps;
- Calendar;
- Local restaurant menu;

- Local supermarket offers;
- Help request.

The test group of 20 end-users was supplied with a limited version of the HoviMestari that was entirely mobile: the only end-user terminals were 7" Tablet PCs, Google Nexus 7 (v.2, of year 2013) produced by ASUSTeK Computer Inc. [*31*].

VisAge [*22*] is a social network for older people and carers. It uses cloud infrastructure dedicated and terminals at home of older people. It is made of a connected touch screen with sensors (camera). As a personal TV, it broadcasts information to the screen, and gathers feedback from the activity of the elder. The screen broadcast programs (also called services or apps) automatically without requiring any motivation of the older person, among a hundred of them. Themes of services include health monitoring, prevention, physical activity, nutrition, sleeping advices, food delivery, entertainment or games. The large panel of services are co-developed with customers such as local shops, insurances, or local authorities. These customers want their program to be broadcasted to the largest number of users, whatever their terminal is at home, a connected TV or a tablet.

The VisAge system relies on a framework to broadcast e-services through the older person's terminals. The user's terminal is composed of a touch screen that is always on. The screen displays content from e-services. E-services can be hosted anywhere on the Internet. For example, distant e-services can show local weather or deal with fall prevention, serious game for health, social interaction, tele-monitoring, or connecting people to other people. Registering a new e-service that an older person would be allowed to subscribe to, or be subscribed to by a helper, requires OAuth and web-service WSDL function access. Examples of functions accessible through the web-services are as follows [*22*]:

- setUserWall allows an e-service to write on the 'wall' of the elder and share information with other e-services;
- getUserLastActivity returns the last e-services broadcasted;
- getUsersSeeingMe returns the social network persons accessing a user's information.
- getActimetry returns the activity diagram of an elder so that, for example, a service can interrupt itself if the user goes away;
- setServicePriority sets the priority of the e-service itself. A service with a (normalised) high priority at a given time will have more probability to be displayed on the screen. For example, for an e-service showing an RSS-feed [*32*], if fresh news arrives, the service can increase its priority.

In the VisAge system, a broadcasted content is adapted using unintentionally given information, gathered from the older users. For that purpose, a built-in camera is used to monitor activity of users when content is shown on the screen [*22*].

In the framework of the Lily project, a field trial that aims to evaluate end-user practices with VisAge, has been performed in the the Creuse area in France, in 2012-2014 and continues. 218 services were broadcasted to a group of about 80 test users. Average age of test users is above 75 and the group consists of retired and pre-retired people.

5. Decentralised Service Delivery Architecture

The aim of the Decentralised Service Architecture is to allow AAL stakeholders to make their services available to a large number of AAL systems with the minimum or no development effort. The idea of the architecture is to abstract whenever it is possible from the low-level technical interoperability to interoperability via such the high-level media as the Web.

The over-the-web interoperability may be achieved by using principles of the Linked Data [*33*]. Those samples of service-product continuum [*34*] that stakeholders would like to offer, need to be annotated with RDF [*35*] or RDFa [*36*] in accordance to the Best Practices for Publishing Linked Data [*37*]. Thus, service and product descriptions will be added to a huge mass of metadata available on the Web, particularly to a layer of Linked Data. It means that a variety of software systems, agents and bots may run queries and discover products and services using specified criteria (such as geographical location, time, and many other), and proposed them to inhabitants of intelligent environments – basically any smart spaces of the Smart Living concept. Figure 2 shows a general overview of the architecture.

In accordance to the architecture, service and product descriptions may be retrieved from publicly available RDF storages and SPARQL [*38*] endpoints, and/or collected to local storages of systems/applications. That may be applicable at different levels, from low-profile sensor networks where motes are able to work with simple RDF-based data models, through web architecture where web portals exchange information using sophisticated data models. Using generic technologies and specified data models simplifies information exchange with EHR/EMR systems keeping medical and wellness data - since it does not require developing of dedicated interfaces but utilisation existing, operating with those data models.

Data processors of Smart Homes are belonging to private spaces. They may operate with some private RDF and file storages. A key point is to advance those data processors so that they would be able to operate with Linked Open Data, particularly, using specified data models. Operating with both, private space data, such as part of user profiles or linked to those, and open space data, such as service description, will allow systems to be aware of all discoverable via the open spaces services that satisfy to specified requirements stored in both, private and open spaces.

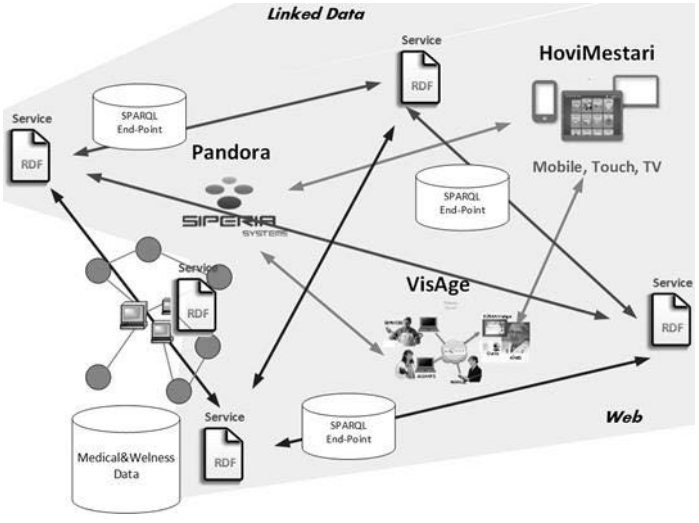

Fig. 2. Decentralised Service Delivery Architecture

The GoodRelations Web Vocabulary for E-Commerce [*39*] was selected [*40*] to be used for descriptions of products and services. The GoodRelations model ontology is available under the Creative Commons Attribution 3.0 license and is formed the following widely-adopted data models, vocabularies and namespaces: RDFS, OWL, PURL, Schema.org, vCard, FOAF, DBPedia, Dublin Core, ECLASSOWL, CEO, Geo, and Yahoo. [*27*].

The GoodRelations is already used by a number of e-Commerce companies and online shops, among which are Google, Yahoo!, BestBuy, Sears and Kmart. Services are listed among other specific industries, which are more tangible, such as Books, Cars, Classified ads, Concert tickets, Consumer electronics, Guided tours and outdoor events, Museum admission, Music for download, Price Comparison Engines, Real estate, Restaurants, Movies and Videos. Some of those, like Restaurants, Tours, Music, and Movies may be also a subject of home services.

To simplify a provisioning of generic services, and allow scenarios when a system is not a part of any smart space, three Integration Levels are introduced.

Integration Level 0 means that the system is not aware, who is the user. Therefore, the system may be used by any unidentified user, and does not have to be integrated into the smart spaces. No personal services are possible in this case, while only generic ones, are offered. Those generic services may be classified as informative, that have only one-way information flow – from a service provider or content supplier to a requester [*23*]. Examples of such services are the following: weather forecast, RSS feeds, info-pages, persistent multi-media content, etc.

Integration Level 1 means that the system is aware of the user and makes a personalisation of services possible. Integration with smart spaces is required, since user profiles typically handled by the smart home platforms are used to keep essential user data (e.g. name, contact information, address, location, sizes of shoes and clothes, generic personal preferences) and service-specific data along with personalisation data (that is formed based on a history of use, and service-specific personal preferences). Such integration may be performed with the software, and does not require any specific configuration.

Services implemented in accordance to Integration Level 1 may be interactive – request-response model allowing purchase orders using a single customer ID from a single household, or fully-interactive – advanced version of previous, allowing purchase orders using multiple customer IDs from multiple locations, taking into account a variety of preferences and customizations [*23*]. Shopping, appointments, communications – are among such services.

Integration Level 2 is a further developed integration. The system is aware of the user, and complicated services can be configured. Those services may require additional installation and configuration settings of communication protocols and equipment (e.g. sensors, Bluetooth access points), software and hardware platforms, which support a functionality of services provisioned in accordance to the architecture. These kind of services are classified as ultimate [*23*]. Integrated home automation systems, and such sophisticated services as Safety Navigation [*41*] are examples of ultimate services.

A summary of description of Integration Levels is collected to the Table I. A use of a dumb profile with Integration Level 0 is required for those systems implementing the architecture that operate at higher integration levels too, and therefore utilise user profiles.

To simplify a development of services, and automate a service provisioning, service templates were proposed. Applicability of the service templates is similar to operational templates or algorithms. Service templates may be

used at Integration Levels 0 and 1, but not all services may be implemented in accordance to the service templates yet. The templates are built as a result of observation of similar functionality required by certain services.

Integration Levels:			
Properties:	**0**	**1**	**2**
System is aware who is a user	No	Yes	Yes
User profile is used	No / Dumb	Yes	Yes
Personalisation	No	Yes	Yes
Customisation	Possible	Possible	Possible
Type of services	Informative	Interactive	Ultimate
Examples of services	Weather forecast RSS feeds info-pages persistent content	Shopping appointments communications	Home automation safety navigation transportation
Development effort	Relatively low	Average	High
Extra requirements	No	Interoperability with information systems of involved stakeholders	Domestic installation and maintenance

For example, a process of making an appointment with a dentist is similar to a process of making an appointment with a car service company. Among service templates are the following: RSS reader, appointment maker, purchase maker, and media player. Some typical cases of remote couching and serious gaming may also be implemented with a help of the service templates.

Ethics and Trust Considerations

Trust is an important consideration that is required at early stages of implementing the Decentralised Service Delivery Architecture. Its prerequisite is a quality of data, but also some aspect that are relevant to business behaviour of stakeholders. In addition to that, the more services will be provisioned in accordance with the architecture – the more difficult it will be to manage them. For example, in large cities a number of restaurants near certain locations may be significant and basic criteria will discover them all. Thus, basic criteria are not sufficient. Additional criteria may be used, based on historical data of user behaviour, personal preferences, etc.

Additional criteria are typically stored to the user profile. User profiles are certainly limited when they are formed using the smart spaces user data only. A larger share of personal activity on the Web may occur in the outside of smart spaces, using traditional web application and services. Even more, some parts of personalisation, or even dedicated personal data may require to be stored in certain repositories outside of smart spaces.

For example, national health registers store personal medical data, while some part of it may be available and can

be used to form personal profiles. Therefore, there is a need for technologies that allow exchanging data between profiles, or simply linking them, taking into account security and privacy considerations. For that a signing of linked data graphs and modern trust models [*42*] may be used.

The linking of data raises ethics issues that need to be carefully considered. These issues regarding privacy and data protection must be taken into account early on when planning the services infrastructure. No sensitive data, and health record data is sensitive, should be used without the explicit, voluntary, and freely given informed consent of the person in question. National privacy legislation must be carefully considered in the planning stages but also the European Union context must be taken into account. Here important changes which are likely to make the international cooperation in AAL contexts easier are about to take place. The current patchy situation regarding privacy and data protection legislation in the European Union where each Member State has had their own legal framework regarding data protection will end. It is expected that within 2015 the new Data Protection Regulation will replace the outdated Directive 95/46/EC and become a pan-European law, consistently implemented across the 28 Member States of the EU.

6. Conclusions

For online retailers, service providers and content suppliers a use of decentralised architecture means marketing and business exchange channels with an unlimited potential [*40*]. With non- to low-effort, exposing open data to the web allows promoting of own products without limitations of search engines and dedicated web portals operating with monetary business processes demanding an obvious effort.

Utilisation of open standards of Linked Data technologies opens opportunity to any application/system developers that would be able to bring solutions operating with information about products and services that are not discovered via dedicated APIs that differ from vendor to vendor, but freely available on the Web and discovered in a generic way.

This interoperability could allow the emergence of large market of e-service for elders. These services contribute to the well-being of elders. They could target the elders living in rural areas deserted by the young persons. They could be delocalised for some of them and produced from a foreign country that would like to export its personal services.

At the same time, arranging interoperability between systems and applications at high levels using well developed data models allows overcoming a complexity of interoperability at low levels – relevant to hardware specifications, communication protocols and data formats.

Smart Living concept unites smart/intelligent solutions that form variety smart spaces that affect to human living by any mean. The concept admits a level of abstraction where common communication media and many similarities relevant to service processes at higher levels, and data models and lower levels of a provisioning stack may be observed.

Integration Levels position different service provisioning models that may be developed with a different development effort. Service Templates simplify development processes by applying generic procedures that unify functionality of similar services.

By the end of Lily project it is still possible to observe some barriers that may make more difficult an implementation of any demanded services using the Decentralised Service Delivery Architecture.

First barrier is a status of the architecture that at this moment may be considered as work in progress due to a lack of annotated in a proposed way samples of service-product continuum, particularly from retailers, service providers and content suppliers at some locations is observed. As it is the case with many other application areas of linked data on the web, the architecture may excel under a condition of a critical mass of discoverable resources available. Involvement of local stakeholders that may be interested to provision their services via such systems as the HoviMestari or the VisAge, and a use of transformation tools that would allow processing of data formalised in accordance to different data models may help to achieve the critical mass.

The other barrier is a small number of available service templates. The more service templates will be developed – the more services may be provisioned in an auto-mated way in accordance to Integration Level 1. It may be possible to design unified templates for very sophisticated services using modern modelling tools. Some of the services may be so complicated that will remain to be Integration Level 2 services. More service templates may be developed by analysing Smart Living use-cases and developing generic scenarios.

Decentralised service delivery architecture does not address all the technological challenges of the Smart Living concept. It does not imply generation of data and information as well as end-user terminals and interfaces, allowing that remain at a service level – even though service templates are used to build GUIs. It dies imply infrastructure, information management, and best practice and adoption. The future work is all about developing of the architecture future, addressing those aspects of these challenges that are not covered yet.

Decentralised approaches are getting more popular in those circles that are aware of Linked Data and Semantic Web technologies. Particularly, solutions that propose similar approaches but for discovery and utilisation of annotated data of government and public authorities, are on a way.

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P2.3. Near Field Communication-based Wearable Device For Self-Care Management

Rescio Gabriele[1], Leone Alessandro[2], Siciliano Pietro[3]

ABSTRACT

Wearable devices might contribute to evaluate the human physical conditions improving the quality of life, promoting healthy behaviour and awareness in Ambient Assisted Living contexts. This work presents a platform for continuous monitoring of clinical sign parameters through a smart and non-invasive Near Field Communication-based (NFC) wearable device. The NFC technology allows to establish an instantaneous and automatic connection without pairing between two NFC-enabled devices by bringing them in proximity. It will be widespread among commercial mobile devices that could be used as gateway to bridge healthcare smart devices and external services.

Keywords: Healthcare, wearable, Near Field Communication, Open Platform, Thermometer.

1. Introduction

In recent years the healthcare costs for aged population are rising, so that new welfare models have been defined in order to permit homecare monitoring through ICT infrastructures. The health status monitoring of aged people becomes a priority in order to improve the well-being and the autonomy level. The interest of research and market is not limited to dangerous events detection (e.g. falls) but also on the physical condition evaluation [*1*]. Wearable devices might contribute to improve the quality of life of elderly, promoting healthy behaviour and awareness. Wearable systems for health monitoring may include several kinds of miniaturized/implantable sensors. Normally, they are able to measure relevant clinical parameters as heart-rate, blood pressure, body temperature, etc., providing an useful tool in self-care activities supporting healthcare specialists with elaborated and customized information. In order to guarantee a wide diffusion of wearable devices for clinical monitoring, an easy-to-use, comfortable, robust and maintenance-free technology is required [*2*]. Moreover, an important constraint about the usage of them is the lifetime of battery that should allow a long-term monitoring to reduce the intervention of the end-users or caregivers. Several wearable commercial devices for healthcare applications are often limited in terms of usability and feasibility due to the high power consumption (and then limited battery lifetime), especially when wireless modules are activated for data transmission.

A more recent technology for radio transmission is the Near Field Communication (NFC) that assures a very short-range link (up to 10 cm) through inductive coupling. According to the TouchMe paradigm [*3*], NFC is easy-to-use and low-power, presenting a short latency compared to the Bluetooth protocol. Several consumer mobile devices integrate NFC, so they can be used as gateway in homecare medical services, by transmitting clinical parameters/measurements from the point-of-care to remote servers [*4-5*]. A NFC-based architecture for Ambient Assisted Living (AAL) scenarios is described in the following. The first prototype realized integrates a biomedical chip thermistor for body temperature measurements. It allows a continuous monitoring of the thermal balance, even in presence of critical diseases, during medical treatment or everyday life. Moreover, an open source Arduino ecosystem is used [*6*], allowing the integration of different kind of sensors for clinical signs monitoring with low-level effort during tuning

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and adjusting activities.

2. Near Field Communication Technology in Healthcare

The market NFC devices is growing more and more in both active and passive form. It has been estimated that the amount of smartphones adopting NFC will increase to more than 800 million by 2015 [*7*]. NFC technology is a half-duplex wireless communication protocol, which enables an easy, fast communication between two devices in proximity. The communication occurs with 13.56 MHz operating frequency [*8*] providing a high-level safety than other well-known wireless technologies as Bluetooth. Since NFC reaches a maximum transfer speeds of 424 kbps, the power consumption is lower than the other aforementioned wireless protocol. However, the time to establish a connection through NFC is lower than 0.1 sec., whereas Bluetooth normally takes up to 6 sec. for pairing without the need of the user interaction over a screen or using a button. This is an attractive technology option for some human interaction transactions according to the Internet of Things paradigm (Figure 1). The interoperability between NFC and more powerful current technologies, makes easier to use and incorporate the NFC in many applications.

In healthcare domain, the need for a secure communication is very important. NFC enables a connection only if two devices are closed, so that the data exchange is less prone to hacking by a third. Moreover several encryption techniques and security system has been developed and other new security schemes are important topics of research [*9*]. Furthermore, the data size generated by medical devices is usually within the capability of NFC to transmit without any undue delay. The wearable/implanted devices or long-term monitoring medical devices should have highly energy efficient and save as much power as possible. NFC protocol is well suited for such applications, as the reader can activate the RFID tag only when necessary and can also transfer power wirelessly. NFC is also more intuitive and easily understandable than other wireless technologies for elderly patients. Since NFC, in its passive form, acts just like any other RFID tag, it can be used to keep tabs on pill boxes, blisters and other drug dispensing solutions.

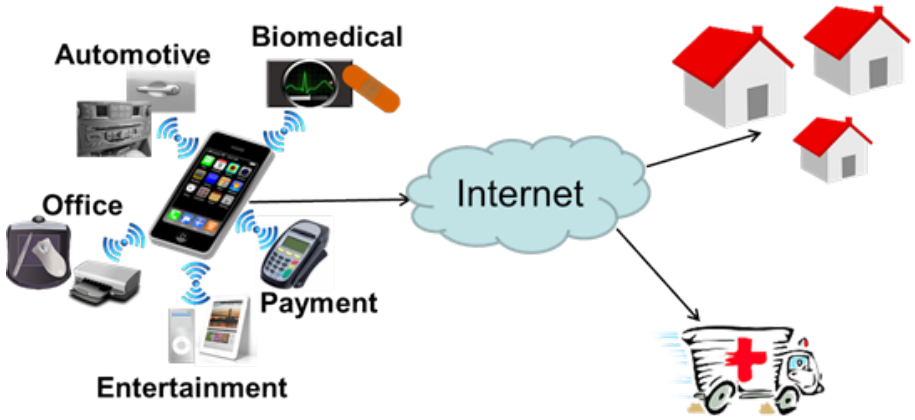

Figure 1. Internet Of Things scheme.

3. Hardware and Firmware Platform for Clinical Signs Measurement

Arduino is an open-source electronics prototyping platform, based on easy-to-use hardware and software. Arduino has developed many boards Atmel AVR-based processor since their compact size, useful peripherals and low-power sleep modes. A USB slave connector is used both to program the board and to provide power (otherwise a separate regulator can be used). Arduino software is implemented by using a simple Integrated Development

Environment (IDE): the system accepts simplified and compiled C/C++ codes in a standard GNU tool-chain, and a simple boot-loader to automatically upload code to the processor. In this work, the first release of the platform has been customized for body temperature measurement. The Arduino NANO board (43mm x 18mm) [*10*] has been considered for the integration of a commercial thermometer since the expected workload is compatible with the integrated microcontroller (8-bit Atmel Atmega328p). For the final prototyping, the Arduino board has been replaced with a full custom designed board, by integrating the same microcontroller. The dimensions of the overall system are lower (and then compatible with the mobile application), an accurate power management of each electronic module has been made and a full compatibility with Arduino open-source software platform has been guaranteed. The final discrete prototype circuit is shown in Figure 2.

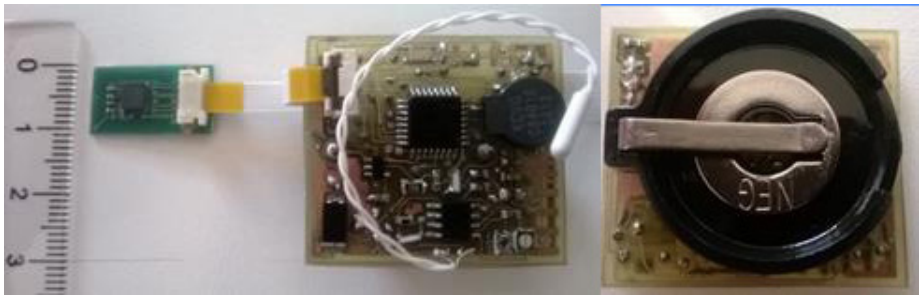

Figure 2. Bottom (a) and Top (b) view of the final platform.

The developed platform is suitable to be integrated in a wearable device. In Figure 3.b it is shown a first prototype of a customized package (as a watchstrap), made in Polylactic Acid (PLA) by a BQ Witbox 3D printer [*11*]. The layout of prototype presented can be optimized and the dimension reduced. An example of application that can be developed for NFC-equipped smartphone is reported in Figure 3.a. Approaching the smartphone to the wearable device, the values of body temperature can be read instantly and automatically by the users. Furthermore the temperature data can be sent to a caregiver for home healthcare services (HCS), by using the smartphone as gateway.

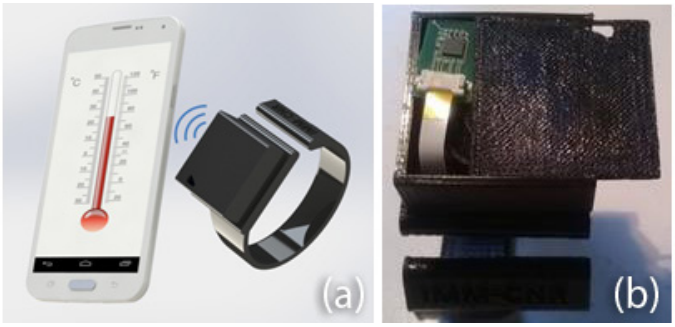

Figure 3. Application example (a) and first package (b) integrating the platform.

The firmware for Atmega328p has been developed by using the Arduino IDE and the related open source libraries. The first step of the code considers the initialization of the peripheral I/O ports and the NFC parameters set up. Afterwards, the device is ready to measure the human body temperature and to send the data by NFC. In order to guarantee stability of the measurement, and according to the functional principle of the commercial temperature measurement devices, the time required to calculate the temperature is about 30 sec. The system is able to record on the on-board EEPROM up to 500 body temperature values, allowing to evaluate the trend of body temperature along the days.

4. Conclusions

An open and low-power platform based on Arduino ecosystem for mobile clinical signs monitoring has been developed. To reduce the power consumption and to obtain a user-friendly system, the NFC technology has been chosen as wireless protocol in proximity. The first prototype of the platform integrates a NTC thermometer for temperature acquisition. The dimensions and weight of the 3D printed package are compatible with the considered application scenario, though the dimension of the device can be further optimized. The architecture is based on Arduino libraries permitting an easy integration of other customized functionalities. Through the free SonyFelica SDK for healthcare, cost-effective applications for smartphones or mobile devices can be realized in order to read and handle data coming from the presented platform.

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P2.4. Users voices: Participative Design and Living Lab approach in LILY

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ABSTRACT

In this presentation it is described how the users (three levels: end users, care givers, relatives and other stakeholders) are participating to the design and definition of the LILY services system from the early phases to the implementation and piloting phase. The different user groups are presented and described the specific features of the groups in France and Finland. The methods to be used in data gathering and analyzing are described.

Keywords: user participation, living lab, co-creation, participative design, older people, ICT, active aging, adaptive interfaces, communities and networks

1. Introduction

The project Advanced Support for Independent Living; Human LifeCycle Approach in Senior Housing (LILY) is a cooperative project the objective of which is to create a sustainable senior-centered system for a comprehensive innovative management of the independence and participation in 'Self-serve Society' for older people via advanced ICT. The LILY project focuses on the improvement of the quality of life, autonomy, participation in social life, skills and employability through a transportable adapted home environment for a self-serve of daily living activities.

This paper reports about the research efforts to elicit user needs and requirements with respect to the envisaged LILY system and the main findings of such efforts in sites in Finland and France. In both sites the design and development of the LILY services and software has been carried out via a Living Lab approach, which has been found out very useful both by developers and different user groups.

The LILY project has a strong commitment to user-centred research and development. The main contribution of this presentation is formed by the results of the research work undertaken in close cooperation with users which can directly inform the technical development work performed in the LILY. Both in the Finnish and French sites, the close cooperation with users has begun at the early stages of the LILY project with many contacts originating in a cooperation with the users dating back to a time preceding the LILY project. In this way, it has been possible to integrate long-term experiences from user engagement and preferences and use experiences with regard to new technologies in homes into the LILY context.

The overall aim of the user involvement is to ensure that the users' voices and their preferences are heard in the entire development process. This is likely to contribute to useful and acceptable LILY solutions. From theses voices and preferences, all technical partners have been also included to transform these user requirements into functional specifications presented in the second part of this document.

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2. Living Lab approach

The LILY approach to user-centred design is grounded in the project partners' University of Oulu, Camera Contact and the Raahe District of Care and Well-being and Technical University of Vienna Assistive Technologies research long-standing experiences in close and personal cooperation with the intended end users of the envisaged LILY systems and products. The principal approach of all partners to user involvement is a participatory one. Direct contact with all levels of users in eliciting user needs is preferred to desk research. The partners also share a familiarity in the use of qualitative methods in user needs elicitation and data analysis.

In each of the project's sites where users have been engaged the previous experiences in working with older people has shaped the approach taken in informing the LILY development. For example, the employment of facilitators and the use of installed communication systems in the homes of older people that enable the continuous contact and feedback between the service providers and users (thereby constructing a Living Lab) have been established in the Camera-Contact's approach. It is possible that the role of facilitators as specifically trained professionals capable of building trust in the use of new services and systems needs to be explored in more detail in the course of the LILY project.

Whenever (potentially vulnerable) users are engaged in a research project it is of central importance to consider any ethical aspects that may arise in recruitment and in documenting, recording, analysing, processing, using as well as storing the data obtained, and to develop strategies and a policy of dealing with these issues. Researchers and other project workers need to be attentive to ethical issues in their work and this document has been prepared in order for the LILY partners to have a common and shared source of guidance in dealing with ethical challenges that they may encounter in the course of the project. Ethical issues in user involvement have been addressed in detail in the separate ethical guidelines for the project.

User participation

For capturing a deeper understanding of user needs and requirements Eisma et al [*1*] and Lines and Hone [*2*] highlight the importance of the participation of older people in the design process. Massimi and Baecker [*3*] report that participatory design meetings are social events for the older participants, and therefore it is important to build trust and to create a relaxed atmosphere among the participants. In this way, it is possible to work innovatively and effectively as a design group [*4*].

According to Dix et al. [*5*] a user-centred design process starts with an analysis of user requirements and the context of use. They argue that successful development of ICT is preceded by early user participation. In her literature review on the benefits and challenges on user involvement, Kujala [*6*] concluded that user involvement has generally positive effects, especially when it comes to user satisfaction. "[*S*]ome evidence exists to suggest that taking users as a primary information source is an effective means of requirements capture." (Ibid.) In a later article Kujala writes that "[*A*] lack of user involvement has been repeatedly associated with failed software projects and the benefits of user involvement are shown in several studies"[*7*]. The obvious risks related to failed software production are user dissatisfaction and high costs related to redevelopment. Other rationales for engaging users in the development process relate to ideals of democracy and participation and skill enhancement (Ibid). While there is relatively wide-spread agreement that users need to be somehow engaged in systems development in order to develop usable products there is less agreement about the appropriate approach to be taken, the roles that users are to be allocated in the process, or about the timing of user involvement. As participatory design, for example, with

its focus on internal or custom development has not been flawlessly adapted to the product development, Kujala recommends that the form and rationale of user involvement need to be reconsidered to fit the product development purposes.

In product development, the forms of user involvement can be seen to be located on a continuum from informative, through consultative to participative. The roles occupied and allocated can be seen as active, or more passive, where the users are considered as providers of information, commentators, or objects of observation. (Ibid.) In the LILY context, the form of user involvement is both informative and participative, the role of users is more active than passive and they can be considered providers of information and commentators rather than objects of observation.

In the French site, altogether hundreds of older people included at various stages and the ones who were also users of the VisAge system were interviewed using a semi-structured interview about their preferences with regard to new services. The interviews focused especially on interests and leisure time activities, wishes with regard to new services, and degree of satisfaction with current available services. Printed, semi-structured questionnaires where used by three interviewers to help ask questions and gather answers.

In the Finnish site, the approach chosen to user involvement is participative and the main techniques for user needs elicitation consist of workshops and interviews with the intended end users of the LILY system, namely older people themselves and care personnel.

The Living Lab approach for one user group (care givers) is implemented in the development of the LILY services in the Kummatti Senior Housing Area in Raahe Finland.

The Finnish informants consisting of older persons and care givers were invited by the project partners University of Oulu, The District Joint Municipal Authority of Health Care in Raahe, Siikajoki, Pyhäjoki and Vihanti and Siperia Systems to participate in two workshops in project months 5 and 9. Additionally, partners Univ. Oulu and University of Oulu Applied Sciences (OUAS) conducted interview sessions and a questionnaire study involving older persons and care givers.

Questionnaires were distributed to older persons and care givers. In what follows, the results of the workshops, interviews, and questionnaire study in the Finnish site will be presented. These results have been further used to derive user requirements and to construct use case scenarios.

Besides workshops an early end-user inclusion in the design of user interfaces, and generic system functionality was launched. A series of small field trials with a known and ad-hoc user groups were conducted during 2012 at various locations: laboratory context, shopping environment, private nursing/elderly house, and local business offices.

Altogether about 50 test users participated, tested, expressed opinions, and commented on relevant questions during 10 months. A group of users had a series of iterative tests on using the HoviMestari Service platform developed by OUAS.

In the workshops, three systems were presented to the participants in order to generate discussion:

- Pandora Service system by Siperia Systems Oy;

- HoviMestari (front-end of the UbiHomeServer system) by Oulu University of Applied Sciences; and
- Safety Navigation Concept by University of Oulu, Department of Information Processing Science.

Following the presentation of three cases, the older participants and professional care givers were encouraged to note down their comments on Post-it notes which were then collected for discussion and grouping. In total, 60 Post-it notes and 77 comments were collected. During the discussion the Post-it notes were grouped in categories. User requirements were categorized and discussed in workshops in Finland and the following main categories could be made:

- Sociality;
- Safety;
- Usability – easy to use;
- Mobility;
- Independence in activity;
- Functionality;
- Technology;
- Costs.

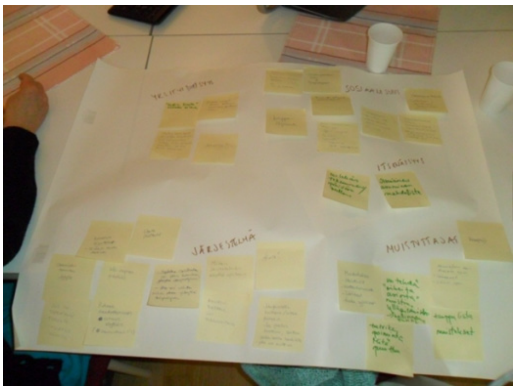

Figure 1 Workshop Session studies in Siikajoki, Finland.

3. Conclusions

In general, the Finnish workshop results point to the fact that social, face-to-face contacts and doing things together have high importance to the participants. Clubs on various kinds were mentioned as being interesting, maintaining and sharing one's own skills were considered central. Support in such kinds of activities including cooking, knitting clubs, reading clubs, virtual sowing clubs, guided exercise sessions, and Skype circles were mentioned.

Safety aspects of daily life were also discussed in diverse ways. Linking safety, sociality and independence, it was thought that the safety/security services should encourage independence and sociality. The system itself should allow for deviations in one's routines. Choice and control of use should somehow be the responsibility of the user. The user should be able to select the services he/she finds important instead of having those that have been recommended to him/her. Additionally, safety came up in terms of safety of mobility and finding safe roads, and in health-related safety. It was suggested that there should be links to pharmacies, remote doctors and nurses, and home care personnel.

The participants were also concerned about support and learning the use of new devices. The service catalogues and maps should be clear and all instructions as easy and clear as possible as learning new things is not necessarily easy. Design aspects were addressed in that it was hoped that the colors used should be pleasing, taking into account color blindness, an alarm button should be available on the screen, and the icons should be clear. With regard to the service and support, participants wanted to know whether the system to be provided would be provided by the public authorities or private company. Also, it was of interest whether there would always be a service person available to help. Finally, costs to be expected were addressed.

The technology itself was addressed as well in various ways. Compatibility issues were asked about; what about the use of one's own computer together with the system?

Collaborating with end-users at early stages of the project has given an opportunity to be better acquainted with users' needs, demands and requirements. Users offered expressed their demand for some services and functionality of a proposed system that have not been to that time considered by developers (e.g. pharmacy shop, and church services).

Brainstorming on selected use-cases has brought a better understanding of the end-user needs for some particularities of the services (e.g. automatic insertion of a departure place in a Transportation case).

In the French site, a mixed approach was adopted. On one hand, users have been allocated an active role through the direct contact between them and the service providers. A living lab approach has been put in place by the Partner Camera-Contact. On the other hand, there is an effort to follow the approach to innovation paved away by Steve Jobs. The approaches that allow users and their preferences a strong role in the innovation process, especially one that centers on market research, has not been approved of all successful innovators. Jobs' main concerns seem to focus on the fact that it is difficult for lay people to genuinely participate in innovation processes on the same level as innovative designers and engineers. Jobs claimed that, "[*P*]eople don't know what they want until you show it to them. That's why I never rely on market research." (http://insight-to-strategy.com/archives/184)

Following this vision, Camera-Contact uses its installed base systems and researchers also use the system themselves. That way, feedback coming from the daily usage of the system by end-users and experiments made to provoke end-users give fruitful information to complement questionnaires and group discussions and programs. It is then possible to address some questions such as understanding why a program interested a person, how often s/he interacts with the system, why there is a difference between what end-users give as their answers and what they really do.

This work has been carried out in the AAL project LILY (www.LILY-AAL.eu) and been nationally funded by ANR (France), Tekes (Finland) and FFG (Austria). The LILY services & systems developed with users are currently under pilot phase by hundreds of users in France and Finland. The results so far have been very good and we expect the LILY approach to show more results during this piloting phase.

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P2.5. Myguardian - Supporting caregivers with multiple solutions

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ABSTRACT

MyGuardian is focused on enhancing the quality of life of seniors with mild cognitive impairments and improving well-being and efficiency of caregivers by providing multiple functionalities and solutions with up-to-date information. MyGuardian provides a platform that intends to link seniors with MCI to a group of caregivers through multiple devices and a wide range of customizable functionalities that make possible the independence of both (seniors and caregivers) ensuring at the same time the continuous monitoring of the senior from the distance. Currently, MyGuardian 1st prototype is in trial phase in real environments, feedback will be included in next prototypes.

Keywords: caregivers, senior, dementia, MCI, multiple devices, web services, mobile application, service personalization, living independently.

1. Introduction

The European AAL MyGuardian project (2012-2015) aims at, enhancing the quality of life of seniors with mild cognitive impairments and improving wellbeing and efficiency of informal and professional caregivers by providing them with multiple functionalities and solutions with up-to-date information and helping them with the care efforts coordination through the different actors by means of an interoperable solution that can be used on a wide range of devices.

The main objectives of MyGuardian are to support care at home of people with MCI enabling easy-to-use and rich communication between the seniors and their caregivers, (either informal or formal) making possible the "virtually guard" of the senior by getting in touch at anytime; to improve the well-being and efficiency of voluntary caregivers by ensuring their peace of mind and keeping them informed when the senior is experiencing confusion states and risk situations when out and about; and to improve efficiency of professional caregivers by providing them with up-to-date information and by supporting coordination of their care efforts.

MyGuardian provides a service platform that links seniors with mild cognitive impairments to a group of caregivers using multiple devices (web through PC, tablet or mobile devices). In consequence, different services are considered for MyGuardian, each of them focused on the different users of the service and their devices and with the purpose of promoting the care at home of seniors with dementia by caregivers. For each service, MyGuardian offers a set of customizable functionalities, so each user could create his own service with the functionalities useful for him.

In consequence, the purpose of the present document is to explain how MyGuardian services support caregivers and improve their quality of life providing them with a wide variety of functionalities adapted to each user profile and needs. The project is on its second execution year and currently the first prototype has been developed and it is on the trial phase. With the feedback obtained from end-users experiences it will be improved as a second prototype

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together with new and advanced functionalities.

2. MyGuardian Service

MyGuardian offers a service platform that links seniors with mild cognitive impairments with their caregivers to distribute care tasks and responsibilities, coordinate emergency situations, and communicate. MyGuardian service covers a wide variety of functionalities that will be accessible from multiple devices through a normal web browser or through a mobile application. So, different applications are considered in this platform, each of them focused on different target end users:

- MyGuardian Senior is an application for seniors with mild cognitive impairments, which runs on a mobile device. The application has being designed for seniors who have limited skills can use it, so it is very easy-to-use. The application can be used for:
  - voice communication in both directions (senior to caregivers and the opposite way) with caregivers/ seniors stored in the circle of contacts by clicking on their picture.
  - location monitoring and optionally confusion state and predefined message communication depending on the senior status. Moreover, an alarm button is available for emergency situations.
  - battery monitoring when the battery is almost empty the senior and the primary caregiver will receive a notification or even an alarm.
  - exchange of messages from caregivers that could be used to remind the senior something to do or simply to send reassurance messages.

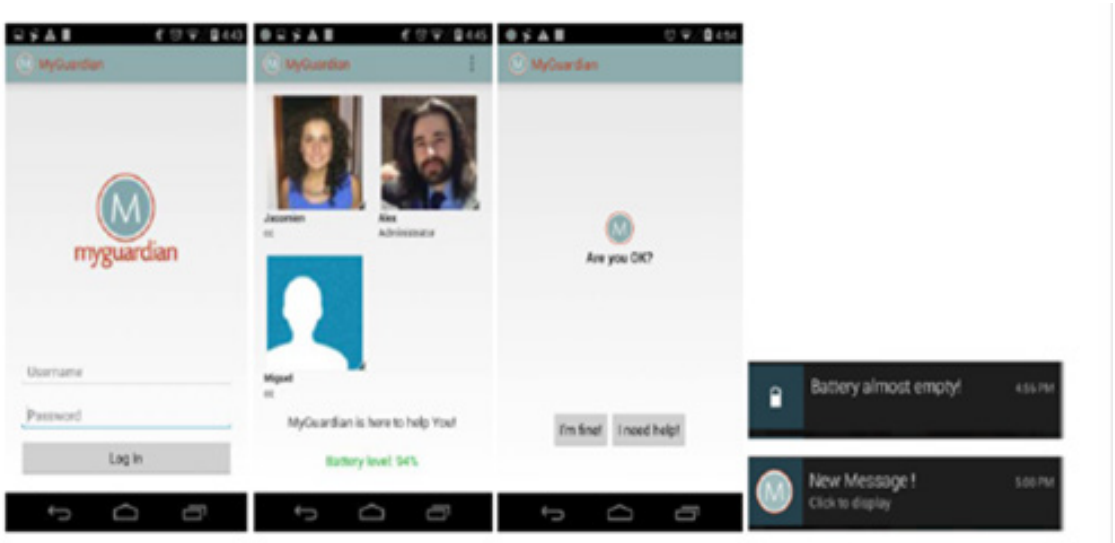
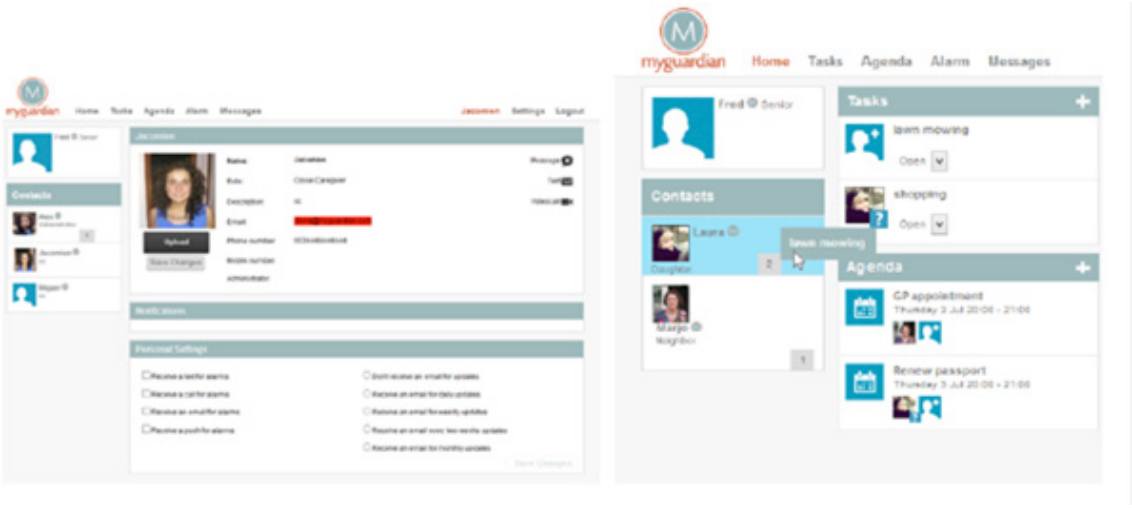


Figure 1 - MyGuardian Senior Mobile Application

- MyGuardian Caregiver is a two-fold application for the professional and informal caregivers. The application enables dynamic and seamless distribution of care tasks and responsibilities between voluntary caregivers and supporting professional caregivers, coordination mechanisms for emergency situations, communication with the seniors, configurations parameters and access to the senior information in case of emergency, management of the caregivers contact circle, alarms configuration or just for "guardian" purpose. It also includes a back-up communication with a professional call-center. MyGuardian Caregiver consists of two applications:
  - MyGuardian Caregiver Web, which is an online service for caregivers who are directly involved with the care activities of an individual. It is a full-fledged web-based portal that can be used in web browsers with a sufficiently large display. The service includes all the functionalities available for caregivers.
  - MyGuardian Caregiver Mobile, which is a simplified version of the web application and provides only those functions that are needed to communicate and react to requests and alarms when on the road.
- MyGuardian Call-Centre Portal, which is a web-based portal for a professional caregivers call-centre and is used as back-up support for seniors and their informal caregivers. The portal requires a 24/7 operator that processes the incoming task requests and alarms following a stipulated protocol for each user.



All the services described, intend to constitute a superior solution that intends to deliver a service that supports care at home and make possible the incorporation of the seniors in the society and the continuation of the caregivers with their normal life.

3. MyGuardian for Caregivers

Apart of supporting care at home of people with MCI, MyGuardian is strongly focused on providing caregivers with tools that help them to improve their wellbeing and efficiency. The final objective is to ensure the peace of mind of caregivers while keeping them informed with information about the senior at any moment; and at the same time, to improve the normal work of professional caregivers with information about the senior combining simultaneously the care efforts among caregivers and making possible the coordination of them.

Caregivers can enjoy their free time ensuring that seniors are monitored along all day. So, MyGuardian proposes

a caregivers' network for each senior that makes possible a 24 hours monitoring of the older adult. Thanks to this functionality, the caregivers have got shared responsibility of the senior care tasks and depending on their availability (preset) they will receive (or not) an alarm if any problem occurs to the senior. To make it possible, MyGuardian ensures the synchronization among all the caregivers through a shared agenda that enables the coordination of care activities in specific timeslots.

Moreover, for the communication, caregivers can contact the senior through voice or video communication which will be very useful to keep calm and ensure from the distance that everything is going well with the senior. Besides, to improve the caregivers' confidence they can check the state of the senior through text messages.

In addition to this, the caregiver can monitor the patient state at any moment including location and alarms. Caregivers can set a comfort area that includes the safe zones where the senior can stay. If the senior is out of this zone, it is considered as a dangerous situation and the caregiver is alarmed with the current location. It will improve the independence of the caregivers and the senior but without neglect the care of the senior.

Furthermore, it is important to remark that the caregivers are alarmed when there is a problem depending on the scalability of the alarm, i.e., depending on the type of caregiver, the availability or the type of alarm (health, not working system, empty battery...). Also caregivers can remind seniors with notifications and alerts through MyGuardian services at different levels depending on the type of caregivers. This way, the caregivers can be sure from the distance that the senior is aware of their tasks and appointments.

Finally, to support and ensure that the caregivers are really quiet, they can follow all the activities and iterations that have taken place using MyGuardian services thanks to a report that updates the status of the senior with a list of the last alarms, appointments and messages.

With all, caregivers can enjoy of their free time and continue with their normal life. In parallel, their older relatives can continue their independently life being sure that they are constantly monitored and if any problem emerges the caregivers will be notified immediately.

4. Conclusions

As shown along the previous sections, MyGuardian has two main challenges to deal: help seniors with MCI at home and improve the quality of life of their caregivers (formal and informal).

Thanks to the wide variety of services and functionalities that MyGuardian offers, the initial purpose of the project is covered. With all, the solution enhances the interoperable solutions that supports care at home and allows services to be delivered efficiently in the society making possible the use of the outcomes through elderly users, elderly care user organizations or institutions and informal caregivers (family and friends).

5. Acknowledgements

MyGuardian is a project funded under the Ambient Assisted Living Joint Programme (AAL JP) on the forth call AAL-2011-4, with the collaboration of the European Commission, Ministerio de Industria Energía y Turismo of Spain (MINETUR), Federal Office for Professional Education and Technology (OPET) in Switzerland, The Netherlands Organisation for Health Research and Development (ZonMw) and the Agence Nationale de la Recherche in France.

P2.6. Framework, process description and technologies for managing fall risk

Immonen MILLA[1], Eklund PATRIK[2], Similä HEIDI[3], Johansson LARS-ÅKE[4], Altube Arabiurrutia ELIXABETE[5], Garcia Gordillo CARLOS[6]

ABSTRACT

This paper gives a short introduction of the fall prevention framework and process description, developed in AAL JP Ageing in Balance project. In addition, it describes the technologies used in supporting the whole process of fall prevention for older adults. The paper describes how the process is designed to have the older individual in the central role and how the technologies have been designed in close relation to end-users.

Keywords: prevention, fall risk, process management, care process, ageing, older adults

1. Introduction

Falls result in high socio-health costs and need more attention as population is ageing and resources are been reduced. Fall prevention should be introduced into the care process and automatized in order to save costs and time of care, and improve the quality of life of older adults. Ageing in Balance (AiB) is a novel process covering the full process of fall risk management, comprising fall risk assessment, preventive and remedial actions and follow-up.

2. Fall risk management framework

The proposed fall risk management process incorporates both self-management support at home as well as care support in health care context. The starting point is individual´s assessment, which can be made either as self-assessment or by care professionals. Further, municipal and regional home care organization consists of groups of home care teams by geographic subdivision, and daily administration communicates with home care teams, residential services, and health care providers.

Comprehensive fall risk assessment takes into account both intrinsic and extrinsic risk factors, such as, age, physical and psychological condition, medical factors, drugs, living environment, etc. Observations related to falls are also more physical as compared to observations for general geriatric assessment. This means that sensors and devices become more important in particular in fall risk assessment. Fall risk is then calculated given all observations by humans and devices, and a personal fall prevention plan is designed. AiB approach is described in Figure 18.

The personal plan includes recommendations and interventions for reducing fall risk or for maintaining the current condition. The effective falls prevention entails physical exercises for improving muscle strength, balance, endurance and flexibility, cognitive exercises, environmental adjustments, nutritional hints and automatic activity and performance evaluation. In close collaboration with end users, AiB has designed and implemented a system that supports fall prevention at home. It provides exercise instructions, guidance, and tools for self-assessment and activity monitoring also outside home for the user.

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The personal care plan allows fall prevention oriented information to be integrated and related to other socio-health care information. This process is built on a value oriented generic process, consisting of assessment, fall prevention plan including goal set up and selection of activity types for reaching the goals, execution of activity instances and follow up. This individual oriented process will allow fall prevention information to be integrated and related to other care and nursing information. This will lead to integrated process support for fall prevention. Advanced technology such as depth camera gaming devices is used in a structured way through the design, planning and monitoring of

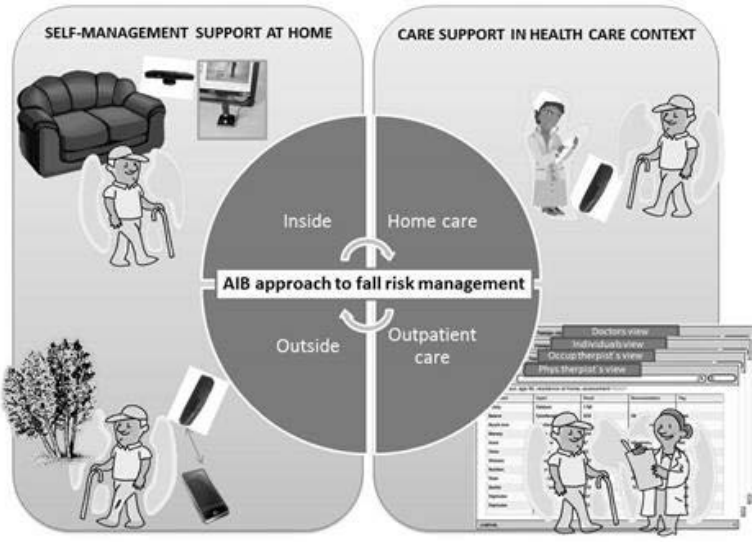


Figure 18. AiB process description

adherence to the care plan. Structured information can be interchanged between IT-based socio-health services all along the process.

Fall risk assessment is based on a formal ontology and typing system. Formal logics based ontology is adopted in order to enable structured relations between WHO's reference classifications on health. Uncertainty modelling plays a fundamental role in classifications of health, in particular within the AHA (Active and Healthy Ageing) area where classifications of functioning are important, i.e. as appearing in the ICF nomenclature. The provision of formal logic based accommodation of international classifications on health provides fundamental structures also for regional and national databases and registries.

3. Conclusions

AiB provides a unique composition of technologies for supporting the whole fall prevention process. In addition to the process management tool, the product has integrated components for comprehensive fall risk assessment, short or quick assessment, self-assessments, assessment with sensors and technologies for fall prevention interventions. The set of tools can be modified according to the needs of the end-user organization to support a) organization's own fall prevention process, b) fall risk assessment as part of geriatric assessment, c) chosen variety of fall risk assessments, d) patient activation, and e) self-management of fall risk.
For further reading: http://aib.vtt.fi/.

THE MOVIE HOUSE

The movie house took place on 10th and 11th September in the Reception Hall at the Palace of the Parliament. At the movie house we put you in front of some of the most radical and innovative thinkers. The aim was to stimulate you to think about how these ideas might shape our work in AAL, or how our ideas in AAL might shape the rest of the world.

Track D - Video listing for the Movie House

Day	Duration	Speaker name	Title of Talk	Web link and description
Wednesday 10th September 2014	12:36 mins	Marco Annunziata	Welcome to the age of the industrial internet	Everyone's talking about the "Internet of Things," but what exactly does that mean for our future? In this thoughtful talk, economist Marco Annunziata looks at how technology is transforming the industrial sector, creating machines that can see, feel, sense and react — so they can be operated far more efficiently. Think: airplane parts that send an alert when they need to be serviced, or wind turbines that communicate with one another to generate more electricity. It's a future with exciting implications for us all. http://www.ted.com/talks/marco_annunziata_welcome_to_the_age_of_the_industrial_internet#t-377302
	18:04 mins	Simon Sinek	How great leaders inspire	http://www.ted.com/playlists/171/the_most_popular_talks_of_all Simon Sinek has a simple but powerful model for inspirational leadership all starting with a golden circle and the question "Why?" His examples include Apple, Martin Luther King, and the Wright brothers.
	19:24 mins	Sir Ken Robinson	How schools kill creativity	http://www.ted.com/playlists/171/the_most_popular_talks_of_all Sir Ken Robinson makes an entertaining and profoundly moving case for creating an education system that nurtures (rather than undermines) creativity.
	19:50 mins	Hans Rosling	The best stats you've ever seen	http://www.ted.com/playlists/171/the_most_popular_talks_of_all You've never seen data presented like this. With the drama and urgency of a sportscaster, statistics guru Hans Rosling debunks myths about the so-called "developing world."

Day	Duration	Speaker name	Title of Talk	Web link and description
	15:09 mins	Nirmalya Kumar	India's invisible innovation	https://www.ted.com/talks/nirmalya_kumar_india_s_invisible_entrepreneurs Nirmalya Kumar details four types of "invisible innovation" currently coming out of India and explains why companies that used to just outsource manufacturing jobs are starting to move top management positions overseas too.
	02:03 mins	Technology Strategy Board	Non-conductive paint- Bare conductive	Bare Paint, is the first non-toxic conductive paint aimed at individuals interested in engaging with interactive electronics and in bringing surfaces to life. Bare Conductive's products provide users with an exciting platform for prototyping, experimenting, and learning about electronics and the company was able to develop this product thanks to a grant from the Technology Strategy Board http://vimeo.com/88256564
	01:49 mins	Technology Strategy Board	Ingenious light technology- the Zeta Lifebulb	The new Lifebulb from Zeta Specialist Lighting has no warm-up time and contains no glass or mercury, so it doesn't need specialised recycling -- and it also works well with dimmer switches. The innovative bulb uses only 10W of energy to create the brightness of a 60W bulb. http://vimeo.com/88257050
	20:08	Jef Staes	The Naked Sheep	In a very confrontational and controversial (and humorous) talk Jef Staes talks about how our generation was turned into the Lost generation and how we have all grown up to be sheep. He expands on what this means for organisations, employees and the future generation. http://www.youtube.com/watch?v=QOy7IB-P3nk
Thursday 11th September 2014	18:00 mins	Sarah Jones	What does the future hold?	https://www.ted.com/talks/sarah_jones_what_does_the_future_hold_11_characters_offer_quirky_answers In this hilariously lively performance, actress Sarah Jones channels an opinionated elderly Jewish woman, a fast-talking Dominican college student and more, giving TED2009 just a sample of her spectacular character range.
	15:53 mins	Krista Tippett	Reconnecting with compassion	http://www.ted.com/talks/krista_tippett_reconnecting_with_compassion The term "compassion" — typically reserved for the saintly or the sappy — has fallen out of touch with reality. At a special TEDPrize@UN, journalist Krista Tippett deconstructs the meaning of compassion through several moving stories, and proposes a new, more attainable definition for the word.
	07:20 mins	Kevin Allocca	Why videos go viral	http://www.ted.com/talks/kevin_allocca_why_videos_go_viral Kevin Allocca is YouTube's trends manager, and he has deep thoughts about silly web video. In this talk from TEDYouth, he shares the 4 reasons a video goes viral.
	13:50 mins	Pranav Mistry	The thrilling potential of SixthSense technology	http://www.ted.com/playlists/171/the_most_popular_talks_of_all At TEDIndia, Pranav Mistry demos several tools that help the physical world interact with the world of data — including a deep look at his SixthSense device and a new, paradigm-shifting paper "laptop." Mistry says he'll open-source the software behind SixthSense, to open its possibilities to all.

Day	Duration	Speaker name	Title of Talk	Web link and description
	14:00 mins	Marianna Mazzacato	Government: investor, risk taker and innovator	Why doesn't the government just get out of the way and let the private sector — the "real revolutionaries" — innovate? It's rhetoric you hear everywhere, and Mariana Mazzucato wants to dispel it. In an energetic talk, she shows how the state — which many see as a slow, hunkering behemoth — is really one of our most exciting risk-takers and market-shapers. http://www.ted.com/talks/mariana_mazzucato
	03:29 mins	Technology Strategy Board	Retrofit for the future	A video highlighting the key elements to a successful retrofit project http://vimeo.com/91785470
	07:28 mins	Rachel Armstrong	Architecture that repairs itself?	Venice is sinking. To save it, Rachel Armstrong says we need to outgrow architecture made of inert materials and, well, make architecture that grows itself. She proposes a not-quite-alive material that does its own repairs and sequesters carbon, too.

YOUNG RESEARCHERS WORKSHOP

The Young Researchers' Workshop 2014 took place between the 9th and 10th of September 2014 in the Palace of the Parliament, Bucharest, Romania and it was part of the Ambient Assisted Living Forum 2014.

The organizers were The League of Romanian Students Abroad (LSRS) and Center for Accessing the Expertise of Students and Alumni from Romania (C.A.E.S.A.R.).

SIDE EVENTS

The Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) has received 18 proposals for the side events and one for side event at Intrarom headquarters, that have been accepted and advertised during the preparation phase of the Forum. Before the Forum, due to the number of registered participants and the availability of organizational team for each side event, two of them were cancelled.

Therefore, during the AAL Forum 16 side events took place on the 9th and the 12th of September 2014 at Marriott Hotel, Bucharest and one side event at Intrarom site. The total number of participants to all side events was 358. The participants were from different EU countries. The side events consisted of sessions and workshops which provided an excellent opportunity to discuss themes relevant for the AAL community.

Side events at a glance:


digital healthcare

9 September 2014

Room	Timisoara Room / Hotel Marriott	Ploiesti Room / Hotel Marriott	Brasov Room / Hotel Marriott	Craiova Room / Hotel Marriott	Braila Room / Hotel Marriott
Time					
09:00-12:00	AAL Solution Deployment Seminar	Engaged Mutual Learning Workshop on Business Models	An introduction to the AALuis approach for the authomatic generation of user interfaces	Building a better path for ethics in AAL: sharing your experiences and challenges (canceled)	Mobile Apps for Independent Living: An end user, business and technical perspective on mobile apps to support independent living of older people
12:00-13:00					
13:00-14:30	AAL Solution Deployment Seminar	Results of the AALIANCE Network: Roadmap and more	From actimetry to ADL ,in the framework of remote medical monitoring of elderly from living labs to the nursing home	Interoperability APIs and Living Labs for AAL	Info Event on Funding "associated pilots" by the ReAAL project
14:30-15:30			User Forum and workshop for exergames in AAL		
15:30-16:00					
16:00-16:30	Constanta Room / Hotel Marriott Brokerage Event on ICT for Ambient Assisted Living in H2020 – Idealist/ EEN				
16:00-					

12 September 2014

Room	Timisoara Room / Hotel Marriott	Ploiesti Room / Hotel Marriott	Brasov Room / Hotel Marriott	Craiova Room / Hotel Marriott	Braila Room / Hotel Marriott	Galati Room / Hotel Marriott	Intrarom – site event
Time							
09:00-10 30	Health literacy and patiënt empowerment	AAL2Business methodology workshop	Bringing Together Indoor and Outdoor Mobility Solutions	AAL products and services in support of self-management of healthy occupation	AAL development in Romania	Going live with telehealth: Lessons learned	Intrarom R@D Engagement under the AAL Framework
10:30-12:00				Care ethics lab (cancelled)			
12:00-13:00							
13 00-16 00			Bringing Together Indoor and Outdoor Mobility Solutions				

EXHIBITION

During the Forum 28 exhibition booths were organized at the Palace of the Parliament, C.A. Rosetti Lobby Hall. The exhibition area showcased the latest technology in the field and brought the projects of the programme under the spotlight (www.aal-europe.eu/projects). European companies had a fantastic opportunity to promote their product and-or service to a target audience, to open new collaboration and discover new markets.

The following organizations had exhibition booth:

No. crt.	Organization	Booth no.
1.	Teamnet World Professional Services	32 (7)
2.	FUNDACION TECNALIA RESEARCH & INNOVATION	31 (8)
3.	Inovamais	10
4.	Instituto Pedro Nunes	11
5.	Fraunhofer Portugal	12
6.	Fraunhofer Portugal	13
7.	Fraunhofer Portugal	14
8.	Megatel GmbH	15
9.	IBERNEX Ingenieria S.L.	16
10.	Noldus Information Technology	19
11.	University of Geneva	20
12.	ICT&S Center, University of Salzburg	21
13.	ISOIN	22
14.	ISOIN	23
15.	DFKI GmbH	24
16.	DFKI GmbH	25
17.	AIT Austrian Institute of Technology	26

No. crt.	Organization	Booth no.
18.	AIT Austrian Institute of Technology	27
19.	New Tools for Health	28
20.	EXEL s.r.l.	29
21.	ZHAW Zurich University of Applied Sciences	30
22.	Centrul IT pentruStiintasiTehnologie	38
23.	University of Innsbruck - West-AAL Pilot Region	39
24.	TNO	40
25.	VTT	37 (41)
26.	University of Oulu	36(42)
27.	Lucerne University of Applied Sciences and Arts - iHomeLab	47
28.	Karde AS	48

All together, the exhibition was appreciated and well-attended.

Exhibition at a glance:


ChefMyself
Assistance solution for improving cooking skills and nutritional knowledge for independent elderly people
community
technology
nutrition
eat better feel good think positively
Fraun
GoLivePhone

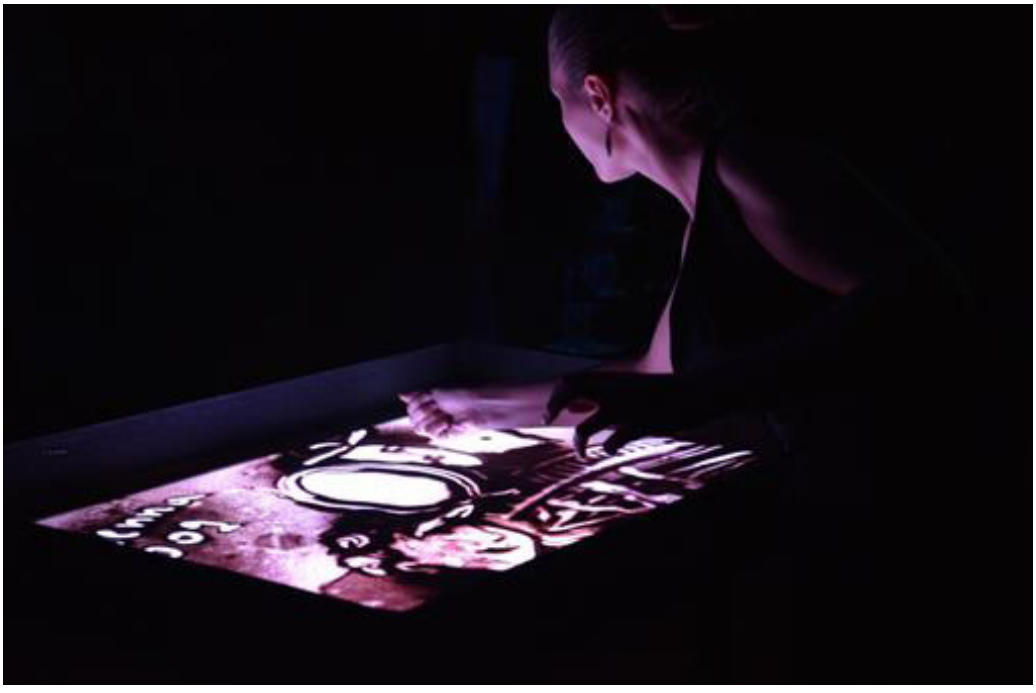

FOR TODAY'S ACTIVE PEOPLE
iWALK ACTIVE
Winner of the AAL Award 2013
iWALK ACTIVE
IWALKACTIVE.COM
AIT
TRIONIC
geo7
TRIXON


MIRACULOUS LIFE
ARE YOU RELAXED?
RELAXED CARE
WE NEED YOUR

OPENING EVENT

In the afternoon of the 9th September, the forum was officially opened by the President of the AAL Association, Rafael de Andres Medina, the Minister of National Education, Remus Pricopie, the Minister Delegate for Higher Education, Scientific Research and Technological Development, the Mayor of Bucharest, Sorin Oprescu and the Deputy Head of Unit, DG Connect, European Commissio, Peter Wintlev-Jensen. Irina Pacurariu and Bogdan Miu, well-known Romanian television programme hosts, professionally moderated the opening event. The opening event included also the message of The Vice President of European Commission, Nelly Kroes.

Ana Munteanu, visual artist, presented in a brilliant way the 6 year story of the forum using sand animation and music (Ode to joy, the Anthem of Europe and music by Ciprian Porumbescu). After the plenary event the audience was invited to a networking dinner at the Palace of the Parliament with some food and entertainment provided by a group of Romanian artists.




Welcome to AAL Forum
Bucharest 2014

CLOSING EVENT

In the afternoon of the 11th September, the forum was officially closed by a concluding event, with Irina Pacurariu and Bogdan Miu, well-known Romanian television programme hosts.

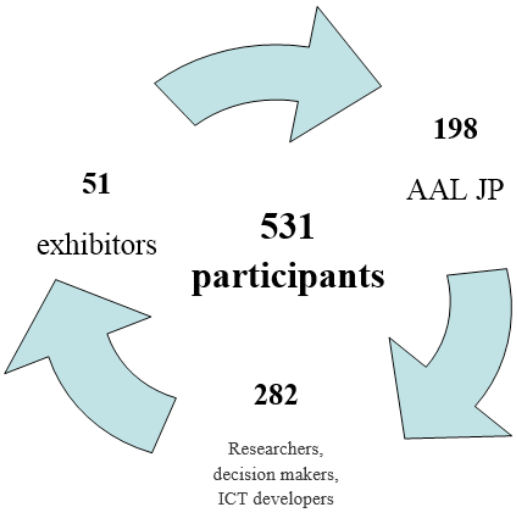
The President of the AAL Association, Rafael de Andres Medina, and Adrian Curaj, the chairman of the forum programme committee, concluded the forum. More than 500 people had attended the forum. Adrian Curaj thanked the president of the AAL Association, the forum programme committee, the other AAL association members, attendees, speakers, contributors and Romanian authorities for the excellent organization of the forum. The overall impression was that the AAL Forum 2014 was a success.

The closing event also contained the AAL Award prize giving and the closing dinner. During the dinner, Romanian ASHA band performed.

PARTICIPANTS TO THE AAL FORUM IN BUCHAREST

The total number of participants to the AAL Forum were 531 from different public authorities, research organizations, NGOs, SMSs and other organizations. The participants were from EU countries and also from different other countries outside EU.

Some relevant statistics:



Organization	No. Participants
SME	77
Large organizations	25
Research Organizations	32
Public Bodies	98
NGO	6
End Users	21
Others	272
TOTAL	531

	Bucharest, Romania (2014)
Participants	531
Exhibitors	51
Sessions	20 regular &5 plenary
Posters	14

Countries Attendees distribution:

Country	No.Attendees
Other	18
Austria	29
Belgium	31
Bulgaria	3
Cyprus	3
Czech Republic	3
Denmark	13
Finland	9
France	17
Germany	38
Greece	2
Hungary	2
Ireland	2
Israel	3
Italy	20
Louxembourg	2
Mexico	1
Republic of Moldova	1
Netherlands	52
Norway	16
Poland	2
Portugal	13
Romania	125
Serbia	3
Slovakia	1
Slovenia	4
Spain	36
Sweden	21
Switzerland	27
Taiwan	3
United Kingdom	31
TOTAL	531

ORGANIZERS OF THE AAL FORUM

The AAL Forum 2014 in Bucharest, Romania was co-organized by the AAL Joint Programme jointly with the Romanian Ministry of National Education (MEN) and Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI).

The AAL Joint Programme was founded by 14 member organizations on 19 September 2007 in Brussels, based on Article 185 of the TFEU,

The Programme is designed to strengthen research cooperation between Partner States' own initiatives and those of the EU to financially support the Ambient Assisted Living Joint Programme (AAL JP) of actually 22 countries involved (19 EU, 3 non EU countries): Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

The European Commission is not part of the implementation structures but contribute with a financial support of 150€ of the programme´s planned total budget 700 M€, of which approx. 50% is public funding - from the AAL Partner States and the European Commission - and approx. 50% is private funding from participating private organizations (e.g. enterprises).

MINISTERUL EDUCAȚIEI NAȚIONALE

The Ministry of National Education (MEN) is an institution of the central public administration, a legal entity, which is organised and operates under the authority of the Government and has a role of synthesis and coordination with a view to implementing the Government's Strategy and Programme in the field of education, instruction, scientific research, technology, technological development and innovation.

MEN's mission is to lead the national system of instruction, scientific research, technological development and innovation, by exercising its responsibilities through laws and other regulations in its field of activity and, together with other ministries, carries out the governmental policy in its area of competence.

Thus, MEN has responsibilities in the field of education and instruction by elaborating, applying, monitoring, controlling and evaluating the national educational policies, and by coordinating and approving the national curriculum and the national system of evaluation.

MEN has forward-looking function by running diagnosis and prognosis studies in the field of education and by

monitoring statistical data with a view to monitoring and foreseeing the educational trends in relation with the labour market. MEN is the governmental body responsible for the creation of an unitary framework of implementation of the national educational policies by elaborating methodologies, recommendations and regulations on this area.

Also, through MEN, Romania fulfils its obligations as European Union member state and participates in the process of drafting policies and regulations in its area of competence. Likewise, MEN is the Intermediary Authority for the Sectoral Operational Programme "Human Resources Development" and the Sectoral Operational Programme "Increase of Economic Competitiveness" in Romania.

The Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) is a public body of the Central Administration under the ultimate authority of Ministry of National Education (MEN), in Romania. Its mission is to promote quality and leadership for higher education, research, development and innovation.

UEFISCDI plays both the role of higher education funding council, and research and innovation council. In this respect, it acts as executive agency for the advisory councils of the MEN with responsibilities in the fields of higher education, research, development and innovation.

UEFISCDI provides advice for policies in areas of competences. Active regional and international, UEFISCDI implements forward-looking projects targeting higher education, science and innovation, professions and skills, research infrastructures, food and rural development. It has been innovating in foresight methods, real time argumentative Delphi, horizon scanning and big data. Bucharest Dialogue linked to the forwiki 2.0 platform, is one of our brands.

The agency encourage the global development of Futures Studies and Foresight, particularly in Central & Eastern Europe and Black Sea being awarded by World Futures Studies Federation (WFSF) with "WFSF Award for Futures Institutions 2014 for a great inspiration to other institutions coming into the futures studies field particularly those who decide to become institutional members of WFSF."

AAL FORUM 2014

AAL PROGRAMME

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