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"ACTIVAGE project: European Multi Centric Large Scale Pilot on Smart Living Environments. Case Study of the GLOCAL evaluation framework in Central Greece"

Research

"ACTIVAGE project: European Multi Centric Large Scale Pilot on Smart Living Environments. Case Study of the GLOCAL evaluation framework in Central Greece"

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Abstract

ACTIVAGE Project is an initiative that has received funding from the European Union's Horizon 2020 research and innovation program (grand agreement No.732679) and focuses in meeting the challenges posed by the ageing of the population via solutions entailing the use of the Internet of Things, a digital interconnection-based concept that will make it possible to make older persons safer, contributing to their staying independent and having an active social life, as well as reducing the negative impact involved in chronic disorders and degeneration.

It has the support of 49 organisations, 10 of which are industrial, 14 leading research institutes or universities, 11 major corporations plus 15 highly innovative small and medium-sized enterprises and is coordinated by Medtronic Ibérica co-funded from the European Union's Horizon 2020 research and innovation programme"

This article mainly focuses in presenting the Central Greece use case and expected results as well as the multidimensional evaluation framework of the project "GLOCAL".

Key-words: Ageing population, Active and Health Ageing , IoT services, quality of life, Health Related Quality of Life, Health Technology Assessment, GLOCAL evaluation framework, Open data base

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Introduction

Throughout Europe and all around the world, mortality rates have fallen significantly over the past decades leading to considerable changes in the age distribution of societies. In this context, people aged 60 are now expected to survive an additional 18.5 to 21.6 years and soon the world will have a higher number of older adults than children. This transformation is expected to continue, with the age group of elders (65+) growing from 18% to 28% of the EU population by the year 2060. Furthermore, according to the 2015 Ageing Report[1], one in three Europeans will be over 65 with a ratio of «working» to «inactive» population of 2 to 1, this representing a heavy impact on health and social care systems. Indeed, population ageing creates a common challenge for European countries as they must find ways to do more with less. Therefore, citizen empowerment and incitation to self-equip is one of the explored options.

ACTIVAGE Project is an initiative that has received funding from the European Union's Horizon 2020 research and innovation program (grand agreement No. 732679) and focuses in meeting the challenges posed by the ageing of the population via solutions entailing the use of the Internet of Things (IoT), a digital interconnection-based concept that will make it possible to make older persons safer, contributing to their staying independent and having an active social life, as well as reducing the negative impact involved in chronic disorders and degeneration.

This large-scale pilot scheme will be carried out for three and a half years actively involving nearly 10,000 older persons in seven different European Union countries. The pilot is implemented in Spain (Madrid), Italy, Greece (Attica, Central Greece and Macedonia), France (Grenoble), Germany (Woquaz , Region of Hessen), United Kingdom (Leeds) and Finland.

Nine different use cases that deal with the elderly everyday needs are deployed across Europe using the Internet of Things. Within the Use Cases focused on IoT supported independent living for elderly users, the Greek cluster is currently implementing 150 smart homes on Municipality of Metamorfosis, 150 smart homes on Municipality of Pylaia-Hortiati and 150 smart homes on the 10 Municipalities of Central Greece that are members of CitiesNet S.A.

Central Greece pilot mainly focuses in supporting elderly users in prevention of frailty. The main objectives are to promote the autonomy of the elderly living in their own homes by supporting demand driven solutions through high quality and yet sustainable welfare systems, to pursue Silver Economy policy initiatives, to allow the elderly to have a healthy and active everyday life while staying at home for as long as possible via a smart house service that offers better prevention, innovative home care services and community base solutions and finally to boost innovation by accelerating the development of ICT services.

The users involved in the pilot are elderly people (+65) that live alone, professional caregivers or relatives that have the role of the informal carers, health care providers e.g. service providers or health centers, smart living –AAL (Active and Assisted Living) ecosystem and integrated care in general.

The everyday needs are addressed via a number of services such as daily activity behavior monitoring at home for formal and informal carers' support and follow up, health tele-monitoring and tele-care services for increasing efficiency and fast response times as well as outdoor monitoring services to increase mobility and prevent social isolation.

All smart homes are using a number of sensors (motion Sensor, door/window sensor, panic button) that are installed to the elderly's home. All sensors send daily indications and/or alarms both to the ACTIVAGE platform that the appointed health personnel monitors as well as to the informal caregiver via an email service.

Methods

One of the most important objectives of ACTIVAGE is the implementation of a reference evaluation framework for Smart Living for aging well solutions. Particular attention has been dedicated to raise specific indicators related not only to QoL (Quality of Life), Economic, Acceptability and Usability but also

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to deployment scale and service model achieved during the pilots. The evaluation framework reports together with the analysis of enabling factors and potential barriers, will show the EVIDENCE to motivate the mobilization of the investment at public and private levels, not only in Europe but also world wide, in order to start the way for massive adoption of IoT solutions with a clear European leadership. ACTIVAGE does not reinvent methods and approaches but rather builds on top of existing best practices and experiences.

ACTIVAGE points out the importance for each partner to organize the Key Performance Indicators (KPIs) to be used to measure and evaluate outcomes of the piloting phase and to support the scaling up of ACTIVAGE LSP (Long-Scale Pilot).

This need will be covered through the ACTIVAGE "GLOCAL" evaluation framework. One key aspect of the ACTIVAGE approach is the multilayer and multi-dimensional evaluation strategy, which is able to catch and integrate Global and Local specific features (GLOCAL approach). Each pilot site will measure not only global indicators related to domain standard reference parameters able to contribute to demonstrate effectiveness of the implemented solution (impact on citizens' QoL, sustainability, innovation), but also to local socio-economic indicators that will attract the mobilization of investment by public and private entities in each site according to the actual socio-economic context.

ACTIVAGE will apply different evaluation strategies in the different use cases in order to make an overall assessment that will allow to constitute a coherent and structured evaluation framework. On such basis it will be possible to properly correlate and compare outcomes of the same use case scenario implemented in different pilot sites and assess the relevance of global and local specific indicators.

The GLOCAL evaluation framework is based on three main evaluation categories referring to the main Triple Win indicators of the EIPonAHA: impact on QoL, Sustainability, Innovation & Growth. Every category is composed of sub-criteria focused on specific aspects. Both global and local indicators will be detailed in terms of measurement tool, target and reference methodology.

Finally, GLOCAL will seek synergies with MAFEIP, ASSIST) and MAST (Kidholm et al.,2012) evaluation frameworks[2].

The results and lessons that will derive from this evaluation framework will be communicated in the best possible way to various stakeholders via a global data-repository called "ACTIVAGE Evidence Open Data Base": This repository has three different user interfaces (views) that access it:

The LSP-Dashboard: A user interface to be accessed by partners of the project in order to access in real time the information that is being captured by each deployment site.

The "ACTIVAGE Public Evidence website": A user interface to be accessed openly by any person or professional interested in accessing the underlying ACTIVAGE Evidence Open Data Base. This tool is foreseen to remain active and available after project ends in order to offer a rich interface to the whole ACTIVAGE evidence.

The "AHA-ADVISOR": An interface that will provide a reference web-based ICT multi modal platform for people interested to know about IT solution for aging well, with broad range of services and benefits in the domain of Smart Living and self-monitoring devices for aging well.

Results

The central Greek pilot has established a concrete evaluation schema when it comes in measuring the local KPIs. The ACTIVAGE smart home environment is evaluated (Table 1) in terms of impact on QoL and well-being (for both the elderly end user and the informal caregiver) and on sustainability, reliability, scalability, acceptability and innovation of the ACTIVAGE services.

There will be three evaluation periods (baseline, intermediate and final) during the one-year pilot and the evaluation tools used are the following:

CarerQoL-7D to measure the impact on quality of life of the caregiver[3]

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EQ5D-3L to measure the impact on quality of life of the elderly end user[4]

UT-AUT to evaluate the end user's acceptance of the service[5]

Global Questionnaire which is a common evaluation tool designed for all 9 Deployment sites that will provide input on QoL and Acceptability of ACTIVAGE IoT platform by users

ADL and IADL to measure the end users' level of independency on everyday chores[6&7]

UEQ to measure the end users' level of empowerment[8]

UCLA to measure the end users' level of isolation and loneliness[9]

FES-1 to evaluate the end users fear of fall[10]

Table 1. "Central Greece ACTIVAGE Deployment Site KPIs"

Improvements in the elderly Health Related Quality of Life that are actively ageing, independent living via IoT supported services	Impact on QoL	EQ-5D- 3l
Independent Living of elderly via IoT supported services promoting AHA	Impact on QoL	User Experience Questionnaire (ADL & IADL)
Informal caregivers of elderly expected to experience a decrease in care burden and feel comfortable living of their elderly at home via IoT services	Impact on QoL	CarerQol-7D
Decrease social isolation	Impact on QoL	UCLA LONELINESS SCALE
Increase the patient empowerment	Impact on QoL	User Experience Questionnaire (UEQ)
Enhancement of usability and acceptance of provided personalized services by the elderly	Sustainability	UT-AUT
Share of main users wanting to continue using service	Sustainability	Nr of implemented technologies/ services offered
Enable new IoT based services and increase the number of services provided to elderly people	Innovation	Number of IoT supported users
«Creation of business case for use of IoT solutions for healthy ageing»	Innovation	Business Plan
Global ACTIVAGE Questionnaire		Input on QoL and Acceptability of ACTIVAGE IoT platform by users
Reduce the fear of fall	Impact on QoL	FES-I

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So far 16 smart homes have been installed, thus 18 elderly end users and 12 relatives/informal caregivers have gone through baseline evaluation. All 150 smart homes are expected to be installed and in full operation in January 2019.

During this small pilot baseline evaluation, the following questionnaires were distributed:

CarerQoL-7D to measure the impact on quality of life of the caregiver

EQ5D-3L to measure the impact on quality of life of the elderly end user

Global Questionnaire which is a common evaluation tool designed for all 9 Deployment sites that will provide input on QoL and Acceptability of ACTIVAGE IoT platform by users

ADL and IADL to measure the end users' level of independency on everyday chores

UEQ to measure the end users' level of empowerment

UCLA to measure the end users' level of isolation and loneliness

FES-1 to evaluate the end users fear of fall

Discussion

The emergence of remote IoT telemedicine services has motivated the need in measuring the impact and evidence of the benefits of these relatively modern practices in the health sector. Some of them are focused on specific application domains (e.g. telemedicine), others are related to specific aspects (e.g. technology user acceptance, socio-economic impact). Apart from GLOCAL, other specific selected methodologies have been developed with relatively different focus (e.g. MAFEIP Monitoring and Assessment Framework for the European Innovation Partnership on Active and Healthy Ageing services (EIPonAHA) [11], ASSIST Assessment and Evaluation Tools for Telemedicine and MAST [2].

These methodologies have proved their reliability and sci-

entific-based approach to help decision makers about future investments in the Smart Living and telemedicine domains, which have a strong parallelism with the IoT technologies for active and healthy ageing. For example, MAST has been already used in integrated care pilots with large number of users (BEYOND SILOS, SMARTCARE, MASTERMIND, RENEWING-HEALTH, etc.). MAST is very much focused in the assessment of the outcomes of telemedicine solutions, and may be more clinically oriented when compared to other contexts of IoT for ageing well.

Conclusions

ACTIVAGE mainly focuses in overcoming the fragmentation of vertically-oriented closed systems, architectures by investing towards open systems and integrated environments across different domains and creating a unified framework for the integration of different IoT technologies and AHA approaches.

During these 3,5 years project a variety of IoT technologies will be implemented in large scale pilots across Europe and evaluated in terms of their socio-economic, technological & business impact on a local and global level. Among these large-scale pilots, interoperability of different layers should be accomplished among various heterogeneous platforms so as to build local IoT ecosystems on top of legacy open or proprietary IoT platforms.

Lastly, the Global+Local (GLOCAL) evaluation framework is expected to help identify, measure, understand and predict the demands and real everyday needs of the elderly and promote market growth and sustainability of the final system.

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