SMARTER LIVES 2018

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Modern technology can help elderly persons to live longer, autonomous and mobile in the familiar environment and to relieve the social and care system. In the course of the conference and fair SMARTER LIVES, researchers and representatives of business and politics meet once a year to interexchange knowledge about the topic “Innovative solutions for an ageing society”.

The practice forum in 2018 took place on February 20th at the University of Innsbruck and provided room for AAL solution providers to present their AAL solutions and smart care products to an audience of important end-user groups. Next to this fair, there was also a diverse program of presentations by representatives of economy, research and politics. The focus of the lectures and discussions were the question of cost-benefit analyses as well as financing from public side regarding AAL solutions.

Prior to the SMARTER LIVES event, a „Call for Papers” was published with the goal to contribute to a scientific debate concerning the topic Active and Assisted Living (AAL). The “Call for Papers” aimed at both theoretical as well as practice-oriented contributions. Contributions were accepted only in English language. After submission deadline, the contributions were reviewed by an external program committee with explicit competencies in the field of research. After the review, the authors had the chance to integrate the feedback given by the program committee into their contributions. During the SMARTER LIVES event there were possibilities to interexchange feedback and ideas about the contributions at the “scientific roundtable”, which was located next to the exhibition area. This led to a quality assured variety of contributions from the perspective of theoretical and applied research approaches. Selected contributions are published in the proceedings at hand. The proceedings can be separated into 3 thematic areas.

Insights from research approaches in AAL pilot projects

The first part contains insights from AAL pilot regions from different stages of the project lifecycle. After the discussion of study designs and critical aspects regarding end-user involvement in AAL projects [1], the research approach of a multidimensional re-

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quirements analysis is presented [2]. Furthermore an outline of a project is given, which aims to research, innovate, explore and validate new interaction paradigms and platforms for future generations of personalized virtual coaches to assist elderly people living independently at and around their home [3]. The part I of the proceedings at hand concludes with final evaluation results from a pre-post study of an Austrian pilot region [4].

Smart Home in the context of AAL

Various contributions dealt with the topic of Smart Home technologies in the context of AAL: After a general examination how users perceive smart home technologies and what are the challenges they believe the market still needs to overcome in order to reach a greater customer adoption [5], an usability study on conducting video calls on a Smart TV by elderly users [6] is presented. Bridging the gap from Smart Home to AAL solutions is realized by a report on the results from an ongoing research aiming to elaborate a replicable and scalable home design model [7]. The final contribution in this thematic field is the presentation of a research approach to make smart home and assistive solutions adaptable to the individual end-user's needs by a Multimodal Interface Presentation Meta-model [8].

Looking out of the box - interdisciplinary topics in the field of AAL

The final thematic area covers diverse interdisciplinary but highly relevant topics in the field of AAL. There is a presentation of a study that explores the mental model of time and discusses the need to integrate those insights into the design of user interfaces [9]. Furthermore, core topics regarding AAL, such as the possibilities for public funding and financing to scale up the usage of AAL solutions [10], as well as the consideration of ethical aspects within AAL projects are discussed [11].

Acknowledegments

We would like to thank all the authors for their valuable contribution and the program committee for their reviews. We hope that the selection of contributions can provide an interesting insight on AAL-relevant research and development methods as well as new application or research ideas.

SMARTER LIVES is organised by the AAL Competence Network of the Institute for Strategic Management, Marketing and Tourism at the University of Innsbruck. It is realized in cooperation with the MCI Management Center Innsbruck as well as the Standortagentur Tirol. It is the aim to put potentials of technological developments in the context of Active and Assisted Living and the big challenges of the demographic change. We aim to support the network between relevant stakeholders, such as technology

providers, social and care institutions, opinion leaders and research representatives. A special thanks goes to the University of Innsbruck, for providing the location for the SMARTER LIVES 2018 and the colleagues of Standortagentur Tirol and MCI Management Center Innsbruck for their support in organizing the event.

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Part I:

Insights from research approaches in AAL pilot projects

Study designs and critical aspects of end user integration to AAL projects

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Abstract

Decreased autonomy and self-determination in their day to day lives are increasingly becoming concerns amongst the elderly generation and their social environment. Individual restraints in physical, psychological or cognitive areas exacerbate the situation and often result in elderlies giving up their usual living conditions, routines and environment in order to get the required support in daily life activities. Quality of life of older people suffers according to that development, as many national and international study results demonstrate. AAL (active and assistive living) programs aim at establishing (technological) solutions to support people aged over 60 years in maintaining an active and autonomous health status on multidimensional areas. User integration is crucial for technological developments according to the needs of the target group. Furthermore, ethical dimensions as well as existing barriers have to be considered and the benefit for users must be clear. Methods and experiences of user integration in the Viennese testing region for AAL systems (project WAALTeR, funded by benefit, FFG, Austria) as well in the project My-AHA (My active and healthy ageing, funded by the EU in the Horizon 2020 program) will be examined in this paper. A sophisticated, field-tested system for ethical considerations is introduced. In a further step, the benefits of AAL solutions according to health determinants is demonstrated.

User integration in AAL projects

In order to develop marketable AAL technologies, solutions and services it is essential to integrate different end user groups into the development process from the very beginning. Trial sites as well as further business planning and exploitation of tools and services require a deep analysis of primary, secondary and tertiary end user groups. Meeting the needs and stating clear benefits for target groups is a crucial issue which make the difference between a nice to have but not demanded feature on the market and a marketable device or technology which meets market demands. Primary end user groups (PEU) include people aged over 60 years, which are the main target group for any developed AAL technology or service. Secondary end users (SEU) are relatives, friends, formal or informal carers or other people within the PEU direct environ-

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ment. Tertiary end users (TEU) are often defined as organisations operating in the health sector, industrial players or other organisations involved in installing, developing and servicing AAL related tools [1]. The following graphic shows relations between participants of the health system according to their relational strength. This concept provides insight in the potential dynamics of different players by using the relationship between patient and physician as a central focus point. The PEU can therefore be described as the core of the system. The SEU has the strongest connection to the core while the TEU (e.g. health insurance) has a relatively weak impact on an individual health. Even if a health insurance company or organisation is paying for the health interventions, the direct influence on the PEU is estimated to be low.

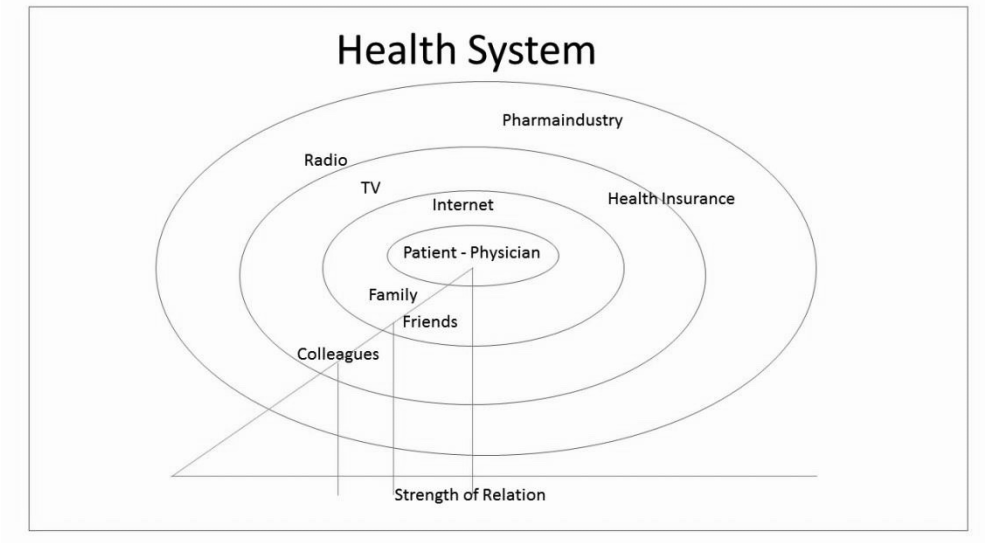

Figure 1: Health System [2]

This concept of relations can be further used to understand technical developments for senior users within the social context of technology use. Any service or device in this sector targets the needs and requirements of the user and has to be embedded in a real life situation of a person. This is a relevant issue in terms of socio-technical systems. Developments have to be designed and evaluated not just for their basic technological functions but also in the context of use and adaptation by the PEUs. For the evaluation of AAL solutions, the dimensions of usability and user experience as well as effects on health determinants have to be considered. In addition, the impact on the quality of life of the PEU is a crucial evaluation criterion to gain insights in possible improvements of seniors' everyday life by integrating technology. This demands a study design that allows for a clear distinction of effects.

In the last years it has become even more important to conduct studies according to scientifically approved standards in order to gain validated results and therefore meet

quality criteria of AAL developments. Therefore, national and international studies (such as West-AAL [3], ReAAL [4], ExPact [5]) have been conducted using validated tools and a huge number of test persons in long time trials in an attempt to actively include users in the designing and developing processes. Applications address different areas of everyday life of the PEU such as mobility, nutrition, smart home and further supportive systems, security and first aid as well as avoidance of cognitive decline and prevention and reduction of frailty. A special focus has been placed on the interoperability of systems and tools which were originally developed more as stand-alone solutions with the goal of creating all-round supportive packages for the end user groups and being able to offer a broad range of possible services. Thus the overall quality of life of PEU, as well as of people surrounding them (SEU, TEU), shall be improved. During the developments as well as for successful integration of outcomes, it is necessary to prove the efficacy of proposed solutions and provide evidence of clear causality that the proposed intervention is having a positive and targeted effect. Methodologies for providing such evidence are highly valuable for the uptake of results after a project phase. One of many methods to indicate clear effects are (quasi-)experimental settings with control groups.

Experimental study design: RCTs as a scientific standard

To meet scientific standard, randomized control trials (RCTs) following an experimental study design to test effects of AAL tools and services have become the most common methodological approach. RCTs require the allocation of participants randomly to either study or control groups. Participants of the study group are provided with technologies and interventions according to the AAL research project design. Recruitment processes raise attention to benefits that AAL support might create in everyday life and motivate people (PEU) to participate on the study. Still, large RCTs require a number of people out of the main target group to be involved which are not provided with AAL technology or interventions but are referred to on any effect that tested devices or services show – the control group. Both groups are often made up of the same number of participants and equally important to the study as they make it possible to analyse effects and outcomes according to scientific guidelines [6].
In the following, the experiences of two projects (WAALTer and My-AHA) a practical example for such an RCT design shall be given.

Prior to starting the trial, recruitment actions must be undertaken. This can be done by newsletter, posts on social media or more traditional media, announcements etc. This information provides a rough overview about the benefits and aims for the target group and a contact option, so people can express their interest and request further information.
Interested persons are informed about the project in detail and can decide to participate by themselves. They need to sign a so-called informed consent which declares their free decision and includes main instructions, restrictions and rules of the study. After passing the first screening (baseline) containing questionnaires to measure inclusion

and exclusion criteria in the dimensions of lifestyle, health, mobility etc. they are randomly allocated to either study or control group. Stratified randomization includes the allocation of the groups randomly but with regard to an equal appearance of previously defined variable settings to reach a balance in both groups [7]. In AAL projects, RCTs are often conducted for a long time period of 12 to 18 months. After baseline screening, several appointments for measurements (questionnaires, tests) are set during the RCT to collect relevant data on changes in behaviour, use and health effects. This includes monitoring improvements of primary outcome criteria but also monitoring for adverse effects (e.g. appearance of higher fall frequency). People leaving the study groups are called “drop outs”. Drop outs for any reason are usually handled by using the last data collected as a reference for any other measurement time point (last observation carried forward: LOCF) [8]. These cases need to be documented including the reason for dropping out and which measurements are affected through the LOCF.

Differences in randomization can have an impact on the outcome. Other systems of randomization are block randomisation, stratified randomisation and covariate adaptive randomisation [9]. All of these options have pros and cons. The simple randomisation is the baseline for all of these forms and a valid option for working with larger groups of participants.

Alongside the RCT, the following methods also have a high impact in this field of research:

- Non-randomized controlled studies
- Ex post facto experiments (relies on existing data)
- Observational study (relies on existing data)
- Case Studies (explorative)

Studies such as WAALTeR and My-AHA favour the use of an RCT over the other options because the scale and scope of impact can be evaluated holistically. As an RCT follows a very clear concept, the results are equally clear as outcomes and effects can clearly be attributed to the interventions. The setting follows a protocol that is defined prior to any actions in the RCT and all interventions and assessments must be clearly defined beforehand. Therefore, an RCT can be considered as a very intensive and time consuming method in the planning, but allows – if executed properly – useable and reliable results.

Motivating control groups in RCTs

A main question which must be answered prior to implementation of the RCT is the definition of a benefit of the study to the control group. A major concern for researchers is the drop-out rate within the control group and how to successfully communicate that if a person is allocated to the control arm, they will not be able to benefit from the interventions being offered. One solution is the blinded and double blinded design for RCTs. As this works out well for medical studies, for social studies and AAL-Projects, it has

turned out to be essential to keep mechanisms transparent from the very beginning and inform participants before any informed consent for participation is signed. It is a challenge to keep people motivated to participate on the study for the whole runtime of an RCT if they do not perceive any direct benefits by sharing their personal data with the project research team. First of all, people need to be informed about the process of a randomized control trial which follows an experimental design. Furthermore, incentives have to be created to keep interest high although AAL tools are not provided. Concerns about the stability of control groups might involve the non-participation or exit of testing persons as soon as they are randomly allocated to the control group or after a short time period. On the other hand it has to be assured that any incentive given does not have a direct effect on the defined primary outcome of the study. Therefore informative events are advised, support can be provided for control arm study participants who already own technical devices and require a little assistance. Vouchers for events or services can also be dedicated to the members of the control group to be redeemed after the RCT has been completed. Informative events should also be opened members of both groups (control and study group) and arranged in a highly attractive way. It is important to raise awareness about the participation in the study regardless of allocation to a group and the contribution of control group members to further development of the society as a whole.

Study design for WAALTeR

WAALTeR stands for Viennese testing region of AAL systems and is funded by the Austrian ministry of transport, innovation and technology in the benefit program. The consortium is led by Urban Innovation – Smart City Agency Vienna and conducted by a project team of 10 partner organisations including end user organisations such as the Johanniter Austria, Wiener Sozialdienste or Fond Soziales Wien as well as technological and scientific partners. The project runs from 2017 to 2019 and includes a randomized controlled trial (RCT) over 18 months with 83 testing households and 35 control households in Vienna. End users are above 60 years old, are still performing an active and autonomous lifestyle, but might take supportive services e.g. from care institutions. The technology includes tablet applications in different areas such as mobility, social networks, calendars and health information as well as further optional components such as a fall detector, mobile emergency or telemedicine devices. Interested persons are invited to info-cafes where they can inform themselves about the project setting and are then screened using validated tools such as WHOQoL (World Health Organisation – Quality of Life) [9], MMSE (Mini Mental State Examination) [10] or BMPN (Balanced measure of psychological needs) [11] and ARC (ARC's Self-Determination Scale) [12] to analyse if they meet the inclusion criteria to participate in the trial. In order to adhere to scientific standards the group allocation of the end users will be randomized. During the trial, end users will be asked about their opinion on the tested tools and services as well as screened about behavioural or health related changes and compared to the results of the control group screenings to show effects of the system. Support will be