Spotlight on health: technical solutions and services to promote an independent and autonomous life

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ABSTRACT: From the Living Lab perspective, an essential role during the whole process of the research and development of technical solutions and services in healthcare is represented by actors and stakeholders involved. Beside multidisciplinary research and development entities, also citizens are taking part in the process of remedying societal challenges emerged due to the demographic change. Along with the primary users of such technical solutions, it is crucial to involve caregivers, family, decision makers, industry, government and insurance companies, only to name a few. The concept of a *Living Lab* in the context of cooperative research is more than just a facility - it is a methodological approach based on mutual learning and exchange, combining new technologies with the social environment. One way of pursuing the track of the Living Lab approach is to realize cooperative research projects involving all potential actors from the Active and Assisted Living and Living Lab perspective following the principles of user-centered design and aiming for a market success. In this article, we share our experience based on two cooperative research projects.

1. INTRODUCTION

The society in general but more specifically the health care sector is facing challenges due to the demographic change in Europe as the number of older people is steadily increasing [1]. In order to provide comprehensive solutions to those challenges, various approaches of technical assistance systems and accompanying services have been developed and evaluated for more than a decade within the framework of Active and Assisted Living (AAL). The research in this field strengthened the link between technology and the social environment with a special focus on the needs of the elderly led to a cross-disciplinary attention for this topic. As a direct effect, a large number of market ready technologies has emerged already, which allow manifold scenarios for potential primary users as well as stakeholders involved in treatment and support [2, 3, 4]). Despite the availability of such systems, the market success, the associated financing models as well as a transfer to standard supply models have not yet been achieved yet or at least only to a minimum extent [3].

The research community of AAL is seeking to invest on large-scale, long-term and multi-dimensional approaches and evaluations in order to provide an argumentative basis for the intended, above mentioned market success. This paper provides an insight into two funded projects aimed at developing and anchoring technical assistance systems and solutions in the health sector bringing them closer to market.

2. ACTIVE AND ASSISTED LIVING

Active and Assisted Living, a broad and versatile research field comprises concepts, methods multi-disciplinary collaboration to develop products, processes and services to meet the needs of an ageing society. The common basis for this multi-faceted research field is the combination of new technologies with the social environment, aiming for an improvement of the Quality of Life (QoL) for people, in particular focusing on the elderly. AAL can be translated as "age-appropriate assistance systems for a healthy and independent life" [1]. What the *AAL Vision Austria* also says, is, that above all, technology alone is not everything - humans are at the heart of AAL. Beside the innovative technologies, the ethical, social, ergonomic, legal and economic aspects play an essential role, means that AAL is focusing on humans in their immediate environment. The technology consequently should adapt to the needs of the user and not vice versa. In order to pursue this ideology and subsequently to implement its components, a new practice has been established, namely the Living Lab Approach.

3. THE LIVING LAB APPROACH

The term *laboratory* in this context is used beyond its common infrastructural meaning. It is defined as an approach for the cooperation between the research and the civil society, comprised of methods, instruments, infrastructure and stakeholders. In more detail, the approach provides a framework towards the integration of end users into the process of research and development of new technologies and related services. Therefore, it is crucial that beside interdisciplinary research entities, also actors from government, academia, civil society and industry are involved. The components of infrastructure, methods, activities and partnerships of the Living Lab strategy enable new approaches to cooperative user-centered research in the field AAL. The goal of the Living Lab approach is to develop practical solutions for specific societal issues. Dialogues form the basis for the conception of such solutions involving stakeholder groups, including companies, associations and providers of general services to survey the needs and identify respective regional challenges and opportunities. [5]

The whole process of the Living Lab approach has been applied by means of cooperative research projects involving all potential actors from the AAL and Living Lab perspective and following the principles of user-centered design at the Carinthia University of Applied Sciences. Clearly illustrated by the example of the ongoing projects Smart VitAALity and COOP4HEALTHCARE, the details of these processes are presented in the following sections.

4. SMART VITAALITY - CARINTHIAN PILOT REGION FOR AAL AND SMART LIVING TECHNOLOGIES

Smart VitAALity is a funded research project including a field trial realized in Carinthia with a duration of 36 months from 2017 until 2019. In the framework of the project, a trial testing of an integrated AAL system over 15 months will be realized in more than 100 households of older adults. The system architecture itself has been developed based on requirements defined together with various stakeholders. The Smart VitAALity system aims at enhancing the quality of life by implementing interdependent interventions in the domains “health” and “social participation” and combines different hard- and software components and associated services. The main hardware components for human-system interactions are a tablet computer including an optimized Smart VitAALity application

for older adults, a smart watch including an emergency button and a step counter and three health monitoring devices including blood pressure, blood sugar and bodyweight measurement devices. Smart VitAALity users can measure their vital parameters to reflect their health state for themselves or if desired, transmit their data to the central care center, a tele-monitoring component. Furthermore, the system uses five ambient sensors in each household: two motion detectors, one for the living room and one for the bedroom, and three contact sensors, one for the main entrance door, one for the toilet/ bathroom door and one for the refrigerator to provide the user feedback about the daily activity status and sleep.

The core question behind the system is how to generate benefit for the users. Within Smart VitAALity four successive and interlinked steps were applied to approach the goal to generate added value for the users:

- Definition of an overall aim that should be achieved with this particular AAL solution that has an impact on selected dimensions of subjective QoL
- Definition of the target user group, their needs and challenges in daily routine and their expected user behaviour and benefits.
- Definition of (interdependent) interventions for the target group with the potential to improve the defined QoL domains.
- Definition of soft- and hardware applications and services, for the defined interventions to support the QoL goals.

Started in spring 2018, Smart VitAAlity is tested in a one-year field trial in more than100 households of older people in the urban triangle Klagenfurt – Ferlach – Villach.

This is accompanied by an extensive theory-driven evaluation approach, realized as a controlled study (more than 100 households intervention group and more than 100 households control group), which focuses on the domains usage frequency, technology acceptance and user experience, as well as impact on defined domains of subjective quality of life and a socio-economical potential analysis. Results of the study should build an argumentative base for the transformation of individual components and services into a model of regular funding, as an important part of a sustainability strategy. Focus on a successful and sustainable economic strategy in the earliest stages of the project and even before is the essential prerequisite for the subsequent market launch of the final product and services.

5. CROSS-SECTORAL ALLIANCES FOR SMART HEALTHCARE SOLUTIONS

In order to build a base for upcoming pilot regions and anchoring existing solutions in current regionally and nationally established health-ecosystems, the strategic cooperation project COOP4HEALTHCARE is focusing on alliances for smart healthcare solutions.

The project focuses on challenges in the healthcare sector that are characterized by a shortage of medical and nursing professionals, reduced public budgets, and a concurrent rising demand for health services. Moreover, it is becoming increasingly difficult to ensure the quality of care in rural and peripheral areas. These circumstances require an increased use of technology, with particular focus on digitization and the cooperative use of European knowledge excellence. In accordance with

these requirements, the COOP4HEALTHCARE project is pursuing an improvement of healthcare services through targeted action-oriented cooperation.

As a first step, the project partners started with the collaborative work on the following three major modules:

(1) Development: the consortium aims to connect to new and innovative projects to force bidirectional mutual learning processes and to promote results across borders and in the European context.

(2) Cooperation Management: there is an attempt to systematically transfer solutions from Europe into the program area and set up stable cooperation networks.

(3) Mentoring: experienced experts and project promoters support and supervise the consortium in the cooperation area Slovenia-Austria.

For the purpose of the success of the project, the aim is to include all dimensions of the quadruple helix, where government, industry, academia and civil participants work together to drive structural changes far beyond the scope of what any one organization or person could do alone [6]. This is also reflected by the overarching goal of the COOP4HEALTHCARE project, as we measure the success by the number of continuous relations with the key audience during the whole project duration. Our thematic actions aim to reach the local, regional as well as the national public authority, infrastructure and public service providers, higher education and research, SME, business support organisation and the public.

In a next step and based on the gained experience, the COOP4HEALTHCARE project will work on the development and partial implementation of 42 cross-border pilot projects on integrated health solutions and a common strategic roadmap within the program area Slovenia-Austria.

6. CONCLUSION

A project is conceived to create shared values and benefits by including the views of all dimensions of the quadruple helix (government, industry, academia and civil participants) – from the scratch up to a marketable product. The innovation potential of an AAL solution can be determined by answering the following core questions:

- What is technically feasible?
- What do the target groups desire?
- What is marketable?

If an intersection can be identified, the potential for anchoring a particular AAL solution is given. In the specific case of Smart VitAALity, additional interlinked aspects for successfully positioning an AAL solution on the market are (1) anchoring the solution in the regional context by incorporation of carrier organizations, decision makers and potential service finances in the context of rural networks, and (2) regular discussions with supporting organizations and local/regional authorities to anchor the solution in standard processes. [7]

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