

## Virtual Assistant for Healthy Aging: Benefits Perceived by Elders

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**Abstract** — We advocate for developing innovative products that help elderly people maintain their mental and physical health while aging, by enhancing their user experience. This article presents findings from our applied research activities which involve senior users throughout the development of elder-friendly virtual technologies. We describe Ella4Life, an innovative solution that supports elderly people in improving their healthy aging and emphasizing the virtual assistant role for communication, interaction, staying informed, etc. The methodological approach is based on assessing the elderly requirements in terms of perceptions and their own representation of virtual assistance. We used a qualitative method for data collection, through focus group and in-depth interviews for identifying the requirements of the elders when facing a virtual assistant. Challenged with an innovative application including a virtual assistance, the elders gave us useful information about their expectations, the main findings being presented here. The involvement of elderly users living in different countries adds further value to our work with regard to the universal benefits gained from interacting with a virtual assistant and also offers useful insights for a better adaptation/customization of the solutions for addressing their particular needs.

**Keywords**- healthy and active aging, elderly user requirement, virtual assistant

### I. INTRODUCTION

In the upcoming years, the healthy brain aging needs to be considered from an interdisciplinary theoretical and practical perspective in order to understand the complex nature of processes of cognitive aging and to improve the quality of life. While researchers [1] emphasize new approaches for integrating perspectives across disciplines in the research for better understanding cognition, health, and aging, the impact of new technologies on aging well should also be better investigated. We have to develop new solutions and products that can improve people's lives. For example, as new

technologies emerge, the combination of appropriate online education and social communities could help patients cope better with Parkinson's disease, promoting social inclusion and greater support for their wellbeing [2].

In the case of the elderly, virtual reality experiences enhance their communication and interaction taking place within a simulated environment, with auditory and visual feedback [3]. Stimulating interaction and communication skills are important because of their role in stimulating cognitive abilities. Also, virtual reality has applications in some areas of neuropsychology, psychotherapy, surgical education, post-stroke intervention, musculoskeletal recovery, pain mitigation, Alzheimer's disease [4].

There are emerging new technologies that could increase the effectiveness and quality of healthcare services across the world. The common thread between all digital implementations is that they all require human-machine interfaces [5]. The challenge is to design interfaces which will best fit the targeted users and enable smooth interaction, especially for the elderly users [6]. For instance, the idea of combining assistive technologies and personal help involving the social environment of people with dementia was well received by people with this condition [7]. On the other hand, it is important to provide easy to use friendly products with respect to multicultural differences. Even if in various European regions we have a different innovation performance score, according to the Regional Innovation Scoreboard, we have to better capitalize regional strengths that generate smarter public services [8] and focus on strengths and comparative advantages.

#### A. The background and our contribution

From the perspective of the innovative solution, it is important what benefits the product i.e. virtual assistant should provide. From the perspective of the people i.e. users, we have to focus on their behaviours, needs, and motivations.

User-research has to be mainly about defining problems not about creating solutions [9]. All user-research work aims to place the people at the centre of their solutions to-be-developed (user-centric approach). But beyond this, as products are increasingly being promoted internationally, the transnationally and intercultural usability issues become more important. Previous studies [10] evaluated the cross-cultural understanding of interface design and concluded that, for example, understanding of a website did indeed differ across people from various geographical regions i.e., North American, English, Japanese and Dutch users.

Studies about older adults' experiences [11] confirm that virtual reality was reviewed positively, yet modifications are necessary in order to facilitate an optimal user experience and provide a potential benefit for this population segment. The work on virtual assistants designed for interacting with multicultural environments is still in its pioneering stage.

This paper aims to highlight the benefits of using virtual assistance for healthy aging, tailored to multicultural environments, and to help remove barriers that potentially limit the benefits of great innovation. After the introduction, in Section 2, we present an innovative solution, Ella4Life including a virtual assistant, a cloud-centred platform supporting elderly persons to manage their health indicators, medication, chronic diseases, etc., combined with sensor-based technology. In order to improve the usability of the product, in Section 3, we focus on assessing elderly user requirements, needs, and perceived benefits. The research has an attitudinal dimension meant to understand and assess the elderly stated beliefs and requirements. The methodology describes the method, the used tools, the group of participants living in four European countries (Romania, Poland, Switzerland and the Netherlands). Qualitative insights and results are presented. In Section 4, the conclusion reveals the main representations of elderly users challenged with the innovative application including virtual assistance. Their positive attitude boosts future work aiming at developing technological products in order to improve healthy brain aging.

## II. THE PROPOSED SOLUTION: A VIRTUAL ASSISTANT

The project Ella4Life (your Virtual Personal Assistant for home and on the road), co-funded by the European AAL Joint Program (2018-2021), aimed to offer an application to help elderly, healthy or with a chronic disease or mental condition, to stay healthier and live a more pleasant life, independent and safe. Working on the project are organizations from the Netherlands, Switzerland, Poland, and Romania.

Digital Ella4Life helps elders organize their daily structure, provides personalized entertainment and helps stimulating their mental condition. Professionals carers and informal caregivers and warned in case of emergency because Ella4Life is connected with them and will inform them when such situations occur. The application provides care and cure, both for when elders are on their way outdoors as well as at home, for health and wellbeing. Ella4Life is a virtual assistant, friendly and fun to use, obtained through the integration of three technologies, Emma, Anne and sensor technology. It is

a speech-controlled system used in elder people's homes for care, medication and a healthy lifestyle. The proposed solution stimulates the elderly to communicate with the virtual assistant. Also, Ella interacts by voice recognition, in English and in local languages (upcoming work) and helps with daily activities and stimulates people mentally and physically as a 'lifestyle-coach'. As a virtual assistant, it generates a human realistic presence, sounds and other sensations that simulate the elderly's brain through communication and interaction in a domestic environment.

## III. ASSESSING ELDERLY USER REQUIREMENTS

The process of enhancing the elderly user experience is complex and starts from developing a positive attitude towards the virtual (assistance) product and focuses on benefits that can be both practical and emotional. Research on user requirements is built on the fundamental idea that the contribution of the elderly people in the design and development of the right product leads to a superior solution. User requirements analysis draws clearly articulated statements about what do users expect the virtual solution to do, and what they want, considering their needs, satisfaction, and acceptance. Furthermore, the involvement of users stimulates a positive attitude towards the acceptance of the virtual world. Country-specific requirements must be considered in order to achieve an overall acceptance, so involving people from different European countries assures the multicultural representativeness.

### A. The methodology

To make sure that we are developing the right product that the elders would benefit from, we invited seniors who are (potential) beneficiaries of the integrated solution in order to express their opinion regarding the using of a virtual assistant in daily activities or to stay in contact with the healthcare professionals and with their informal caregivers. Participating users were persons who agreed to use new technologies and were willing to use virtual assistance and interaction.

The evaluation method was based on qualitative research for understanding seniors' requirements (satisfaction, opinion, needs, etc.) in a specified context and using appropriate tools for analysing facts with a measurable approach. In particular, we used a combination of both focus groups and in-depth interviews because we intended to get a comprehensive evaluation of the benefits and everyday experiences of individual users. One important aspect analysed was the multicultural insight. The period of data collection was September – November 2018. All the responses are considered relevant (there are no wrong responses) and studied by comparing with the rest of the data to establish analytical categories. First, we focused on understanding the specific context of peoples' daily activities and after that we investigated the dimension of these characteristics. Information was analysed in order to obtain qualitative insights or through numerical comparisons for quantitative estimations, both considered as being relevant tools for

exploring new ideas and development of innovative ways for human-computer interaction.

The respondents were recruited on a voluntary basis, being persons who usually do not know each other but are able to share experiences and express their opinion. They were senior adults, potential beneficiaries of the integrated solution provided by Ella4Life, within the age category 55 years and older, male and female, healthy or with a chronic disease or mental condition. There were involved 8 persons in Romania, 7 persons in Poland, 8 persons in Switzerland and 5 persons in the Netherlands. All countries are considered developed economies, Romania and Poland being newer European Union (E.U.) member States, the Netherlands as an established member State, and Switzerland as non-member State. Only Romania is categorized as an upper-middle income, all others are high-income countries.

**B. The results**

a) Insights from **focus groups** revealed that Ella4Life solution including a virtual assistant was welcomed by elderly and seems to be very interesting because it is perceived as a real partner for elderly who need assistance and support. Elderly users were asked about the Ella4Life solution and particularly in relation to the idea of having a virtual assistant, monitoring certain health parameters and helping them with adapted suggestions and advice. About the interaction of the elderly with the virtual assistant, the perception is positive because all participants consider communication to be very important.

In Romania, elders were willing to share information and interact with others. Moreover, they valued the possibility to build a network and share information. Seniors valued the connections, the feeling of being involved and staying active. Also, they valued that it brings people together and facilitates the connection between elders, and doctors. The virtual environment can assure elderly the needed interaction. So, they agreed with the idea of interacting with a non-human assistant because interaction and communication are a

fundamental need, and elderly valued connection with others, even being virtual.

Most participants from the Netherlands valued virtual assistant and believed that most people would first want to buy the voice recognition part of the proposed solution.

Oppositely, the elders from Switzerland considered that talking to an avatar can lead to loneliness. Because the elders are no longer required to deal with others, the ability to have a coherent conversation can be lost. In communication, it is important to get the direct emotions of the other person. The use of an avatar should be limited to some previously defined time intervals per day.

b) Findings from **in-depth interviews**. In order to quantify the elder's acceptance of using Ella4Life and to better collect the personal ideas about interacting with a virtual assistant, we collected data using an in-depth interview and analysed elders' responses. Findings on acceptance to use and interact with virtual are optimistic.

The question is "How do you think that interacting with your virtual assistant will be a benefit to you?" with multiple responses possibility.

Figure 1 shows how interacting with a virtual assistant would help them in specific ways, in their opinion. Respondents appreciated that it will offer useful information in real time, as stated by 6 persons in Romania, 5 persons in Netherlands, 3 persons in Poland and 7 persons in Switzerland. Also, elders considered that interacting with a virtual assistant allows them receiving advice and coaching when needed, as mentioned by 7 persons in Romania, 2 persons in the Netherlands, 1 person in Poland and 4 persons in Switzerland. The presence of a virtual assistant would be help seniors to improve their mood when they are feeling down, as answered by 3 persons in Romania, 4 persons in the Netherlands, 1 person in Poland and 8 persons in Switzerland. Also, 5 persons in Romania, 4 persons in the Netherlands, 5 persons in Poland and 3 persons in Switzerland considered that the virtual assistant would help them stay in contact with family members and friends. Others appreciated that it would

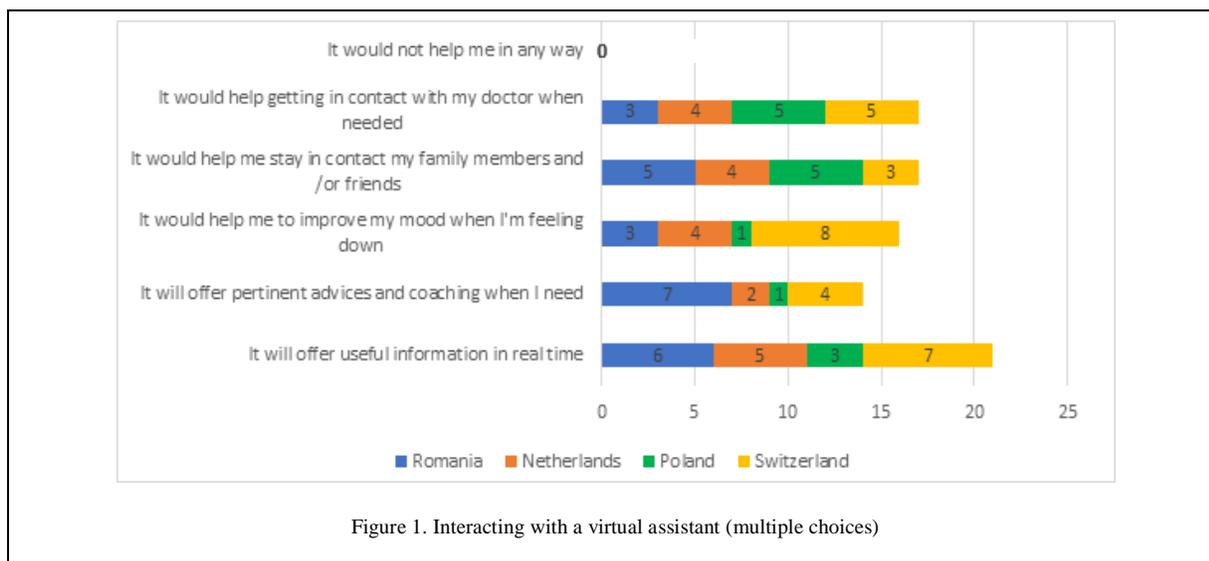


Figure 1. Interacting with a virtual assistant (multiple choices)

help them get in contact with a doctor when needed. This was the opinion of 3 persons in Romania, 4 persons in the Netherlands, 5 persons in Poland and 5 persons in Switzerland.

Overall, the elders had a positive opinion in terms of attitudes and acceptance of using the Ella4Life solution for improving their lives. In general, many people appreciated the benefits of interaction and connection, receiving advice and useful information in real time.

#### IV. CONCLUSION

Ella4Life supports elders in maintaining a healthier lifestyle and aging well. This article focuses on the involvement of the elderly in the development of Ella4Life in order to facilitate their acceptance and build a positive attitude. Research on user requirements aims to bring together insights about what they (elderly users from different countries) require this innovative solution to do, and what are the benefits, from a multicultural perspective. The results will help the specialists to improve the prototype of a superior integrated solution and offer a more qualitative product that can be used by people living in different European countries. The product will be further tested with people within the category 55 years and older in the near future. The user research on multicultural differences is essential in order to design an innovative product as a key part of the development process.

Our insights reveal that the Ella4Life solution, based on a virtual assistant, was welcomed and appears to be very interesting because elders need to stay informed, to receive news and medical advice, and to network with others. They think interacting with a virtual assistant is a pleasant activity for them, sharing information in real time. In conclusion, elders have a positive opinion in terms of attitudes and acceptance for using Ella4Life to improve their lives. Elders are aware of their needs and want to mobilize their cognitive resources for their own benefit.

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