Mobile Applications for Active Aging

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Abstract. Many countries, including several European states are aging. This demographic change opens a variety of opportunities for innovation in products and services tailored to the needs of an aging population. This paper focus on how ICT-based mobile application can be used to potentiate active aging. The role that mobile computing can play in the support of everyday activities is increasingly recognized. Several countries are currently faced to the aging of their population. Therefore, it is of major importance to develop solutions that extend the time that elderly can live in their preferred environment by increasing their autonomy, comfort and mobility while limiting associated costs and the effects of a possible lack of caregiver human resources. This paper describes the state of the art of solutions for elderly population active aging through mobile applications, as well as the opportunities that mobile applications offer to improve the quality of life of the elderly and to support a cohesive and inclusive society.

Keywords: Active aging, Elderly, Mobile App, Quality of life, Economic growth.

1 Introduction

Like other countries, Portugal is currently faced to the aging of its population[1]. It is of major importance to develop solutions that extend the time that elderly can live in their preferred environment by increasing their autonomy, comfort and mobility while limiting the cost with them and the effects of a possible lack of caregiver human resources [23]. The potential impact of the successful development of solutions will be beneficial in many ways:

- from a research point of view by providing advances in this research area;
- from the specific point of view of elderly people by empowering active aging (e.g. with respect to the increase of the availability of products and services);
- from a societal point of view by proving to the elderly population the benefits of technological advances;

[1] PORDATA, *Contemporary Portugal Database*, http://www.pordata.pt/Portugal/Indicadores+de+envelhecimento-526

- from an economic point of view because it will reduce the cost associated with the care of elderly people by enabling them to stay longer at their preferred environment.

This paper aims to describe the state of arts of elderly population solutions for active aging through mobile applications.

The aging of the population is a phenomenon tendentially durable and with effect in all societies. Projections made by the Portuguese National Institute of Statistics (INE) and PORDATA data [1, 2] indicate that the population of Portugal may decrease from 10.292 million habitants in 2017 to 7. 478 million in 2080. The number of older people will increase from 2.1 to 2.8 million between 2017 and 2080. In view of the decrease of the young population, together with the increase in the elderly population, the aging rate will duplicate by 2080.

Globally, the World Health Organization (WHO) has stated that in the coming decades the world's population over 60 years old will increase from 800 million to 2 billion by 2050, making chronic diseases and well-being of the elderly population challenges of the global public health [3].

Relatively to the use of technology, according to a study of the Telecommunications Barometer of Marktest [4], the use of smartphones continues to increase among the Portuguese population. In the period between December 2015 and February 2016, there were 6.176 thousand of individuals who used smartphones, which corresponds to 68.0% of mobile phone holders. Between January and March 2016, 349 million smartphones were sold worldwide, up 3.9 percent over the same period in 2015, according to Gartner [5], a US consulting firm specializing in the technology market.

It is essential to adapt existing technology and make it simple and easy to use in line with an active aging lifestyle to increase the independence of seniors and consequently their quality of life. The technology must adapt to the everyday life of seniors in an integrated, easy and non-invasive way.

This paper intends to identify problems, difficulties and gaps in the solutions existing in the literature. The main objectives of the solutions are to improve the quality of life, in both cognitive and physical levels, enabling active aging and, always attending to the needs and particularities of the elderly in relation to the use of technologies.

This article is structured in four different sections. In the first section an introduction of the project is made. In the second section, the theoretical concepts are presented introducing the main areas addressed in this theme. The third section presents existing solutions in terms of commercial products and research publications. Finally, the last section presents the conclusions.

2 ICT in Support of Active Aging

Technology can enhance and enrich the lives of older adults, facilitating better interpersonal relationships among other benefits. However, few studies have directly examined the associations between use of technology and social, physical, and psychological health among the elderly [6].

Recent studies have shown that 22% (nearly 1.5 billion) of people around the world use the Internet regularly [7], representing the elderly group with higher utilization rate of growth in the last decade [8].
Geriatric medicine is the branch of medicine that focuses on the diagnosis, treatment and prevention of diseases in the elderly and the specific problems of aging [9]. The term Gerontology brings the contribution of several scientific areas, with the aim of creating explanatory approaches and models about human beings and their life course [10]. The gerontechnology is a related area of research helping older people to identify and attenuate the effects of modifications related to the nervous and muscular systems [11]. In 2000, Laxminarayan and Istepanian [12] defined mobile health (m-Health) as unwired telemedicine systems. In 2013 the term m-Health was defined as health care using mobile wireless technologies [13, 14]. Fig. 1 represents the typical architecture of m-Health services [15].

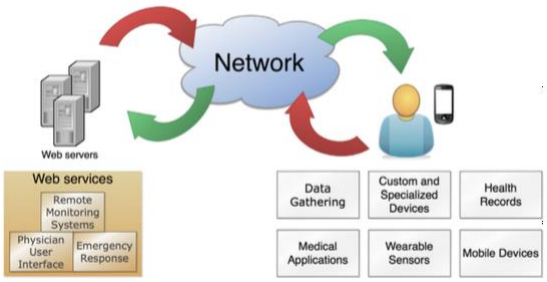

Fig. 1 - Illustration of a typical m-Health services architecture [15]

The eHealth has been a priority for the World Health Organization (WHO) since 2005, when resolution WHA58.28 was adopted: *The eHealth is the safe use of Information and Communication Technologies (ICT) in support of health and health-related areas, including health services, surveillance, literature and education, knowledge and health research* [16], as exemplified in Fig. 2 [17].

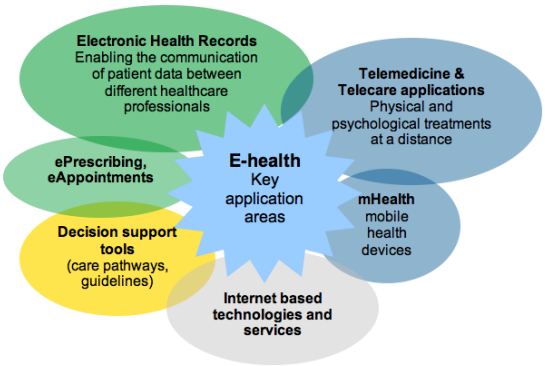

Fig. 2 - Main areas of e-Health application [17]

According to [18], e-Health is defined as any technology that allows the performance of a health-related task (exchange of patient information, electronic appointments, etc.) that is accessible on the web or allow the exchange of web-based information (for example, health portals and mobile applications).
The aging of the population, in general, can be considered as a threat to the future of the society in which we live. Increased longevity with quality of life, brings more opportunities for economic, social and cultural development as technological innovation enters the market.
A strategic vision in this area is essential to mitigate risk and seize opportunities. Figure 3 represents economic and social aspects of the active aging of the population in Europe [19, 20].

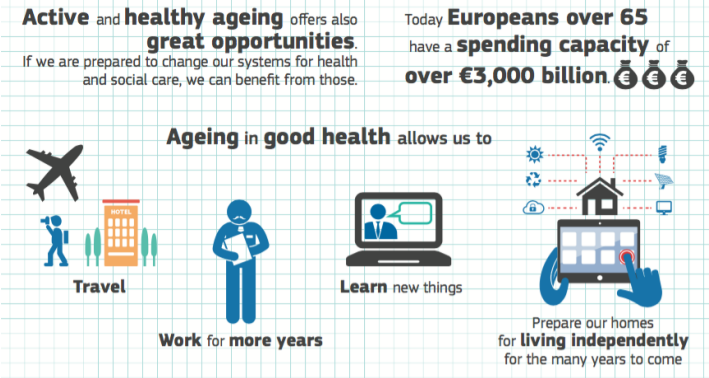

Fig. 3 - Illustration on active aging in Europe [20]

3 Existing Solutions

The focus of this section is to report innovative technological solutions with social impact that respond to problems related to active aging. Many telemedicine systems, e-Health and m-Health, are produced and successfully ensure the delivery of health care through different communication technologies [21, 22, 23, 24, 25, 25, 27].
Smartphones for Seniors (S4S), is a Portuguese R&D project, coordinated by Microsoft, which aims to provide the creation of a technology adapted to the senior population in mobile scenarios by customizing the user interfaces of the basic functions of a Smartphone [22].
Fall Risk is an application for measuring the risk of falls in the elderly, which takes advantage of the smartphone to collect data on user movements. This gauging was converted into a playful activity, turning it into a game [22].
Living Home Center (LHC), is an application to combat isolation and promote social inclusion by promoting contact between elderly people and family or friends. To achieve this goal, LHC offers a simplified way of accessing social services/networks and calendar [22].

Activity Register is an application that monitors and collects data about the user's physical activity, such as the number of steps walked, the distance traveled or their current state of activity. Porto4Ageing – FrailSurvey, is a app focusing various aspects of the life of the elderly, such as their mobility, nutrition as well as cognitive and psychosocial aspects. The results in terms of frailty status will be important for healthy aging among the elderly living in the community. It may help the lifestyle changes to prevent or reverse its fragile state [23].

The impact of the use of technologies has been very positive for the general population, and the elderly population group is being considered with the development of innovative solutions that allow an active aging, guaranteeing a better quality of life. This fulfills the guidelines of the EU countries for the elderly population community [25, 26, 27]. Aging is associated with many cognitive and physical challenges, reducing the participation in recreational activities, such as games or exercises. This can have adverse health effects and negatively influence their quality of life [28]. Recreational applications such as video motion-based games, hold the promise of providing affordable physical activity to older adults [29]. However, the design/creation of a mobile application for active aging will have to meet the specificities of the target audience. Designers and developers know the importance of engaging's target user in the design process [30] and this is even more important when those users are elderly [31]. Throughout the process of designing an application, the needs, constraints and capacities of the elderly should be considered. Research has been done on the needs and preferences of older people in relation to technologies that support physical activity [32, 33].

4 Conclusions

Portugal is currently faced to the aging of its population. It is of major importance to develop solutions that extend the time that elderly can live in their preferred environment by increasing their autonomy, comfort and mobility while limiting the cost with them and the effects of a possible lack of caregiver human resources. The potential of older people as users of smartphone or similar electronic devices, seems to be recognized by institutions, government and the European Union. This can be seen through the financing of projects that allow an active and quality-of-life aging with a considerable impact on the economy, given the significant increase of the elderly population in the coming decades. The services and applications of m-Health and e-Health offer health care anytime, anywhere, overcoming geographical and temporal barriers and provide low-cost and affordable solutions.

This paper described considerations related to elderly population needs for active aging. As future work, the authors plan to develop an ICT-based mobile solution supported by an advanced communicational infrastructure capable of exploring new services for active aging. The authors are interested in the usability of the user interface for elderly people. In the context of previous works, the authors started the development of a tool enabling task automation integrating possibly several applications. The initial research aims to simplify user interaction and integration of independent interactive systems through automation using tasks models and picture-

driven computing. The tool makes possible the creation of a new UI abstraction layer that facilitates/encourages beginners (e.g. elderly people) to interact with interactive systems [34]. Using the tool, it is possible to easily adapt and integrate several interactive systems toward specific user needs and features. Besides some limitations the authors believe this approach can make significant changes in the elderly people use of interactive systems. The authors aim to use this tool as the starting point, expanding the capabilities. The work will be pursued generalizing the approach to mobile devices, and extending to new types of interaction.

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