Chapter 66
Unobtrusive Smart Environments for Independent Living and the Role of Mixed Methods in Elderly Healthcare Delivery: The USEFIL Approach

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ABSTRACT

In this chapter the authors describe a novel approach to healthcare delivery for the elderly as adopted by USEFIL, a research project which uses unobtrusive, multi-parametric sensor data collection to support seniors. The system is based on everyday devices such as an in-mirror camera, smart TV, wrist-mountable personal communicator and a tablet computer strategically distributed around the house. It exploits sensor data fusion, intelligent decision support for carers, remote alerting, secure data communications and

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storage. A combined quantitative and qualitative knowledgebase was established and analysed, target groups were established among elderly prospective users and scenarios were built around each group. Use cases have been prioritised according to quantitative functional and non-functional criteria. Our research findings suggest that an unobtrusive system such as USEFIL could potentially make a significant difference in the quality of life of elderly people, improve the focus of provided healthcare and support their daily independent living activities.

INTRODUCTION

The increasing strain placed by an ageing global population on healthcare systems needs to be addressed, immediately in the case of certain nations such as Japan, Germany, Italy and Greece. Planning for maximisation of an elder's capability to live independently could be part of a technological solution, as would the next step, assisted living. The USEFIL project performs research on smart assistive and monitoring environments for this purpose, involving research and pilot study sites in Germany and Greece, two countries which are particularly affected by this global trend.

BACKGROUND

Population ageing is a global trend, primarily driven by an increase in life expectancy and decreasing fertility. The phenomenon is reflected in an increase of the population's mean and median ages, as a consequence of a rising proportion of the elderly population, defined as all people over 65 years of age. It is a phenomenon without parallel in human history, has pervasive characteristics affecting every person on the planet and is expected to be enduring: we are unlikely to ever return to the young populations that our ancestors knew (UN, 2001).

AGEING POPULATION: A EUROPEAN PERSPECTIVE

Seniors over the age of 65 are the fastest growing demographic group globally, expected to reach 1.5 billion by the year 2050, out of a total of approximately 9 billion people. Statistical data show that three out of the top four most aged populations in the world are the citizens of European countries (Beard J. R et al., 2012). In 2010 Japan had the most aged society with 23% of its population being over 65m while Italy, Germany and Greece follow it in the global ranking. Seniors in these European countries account for 21%, 20% and 19% of the total population, respectively. At the other end of the European spectrum, Slovakia, Cyprus and Ireland are the least aged European countries with an elderly percentage of 13%, 12% and 11% respectively.

By comparison the USA, the world's largest economy, has a ratio of 13% elderly citizens. The three largest emerging economies, China, India and Brazil, are among the world's least aged countries: seniors account for 8%, 5% and 7% of the population, respectively. (UK Office for National Statistics, 2011)

The implications of a rapidly ageing population are socioeconomically significant: a proportionally smaller workforce has to sustain increasing numbers of pensioners, while medical and social insur-