Information Technology for Active Ageing: A Review of Theory and Practice

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Contents

Abstract

Active Ageing aims to foster a physically, mentally and socially active lifestyle as a person ages. It is a complex, multi-faceted problem that involves a variety of different actors, such as policy makers, doctors, care givers, family members, friends and, of course, older adults. This review aims to understand the role of a new actor, which increasingly plays the role of enabler and facilitator, i.e., that of the *technology provider*. The review specifically focuses on *Information Technology* (IT), with a particular emphasis on software applications, and on how IT can *prevent* decline, *compensate* for lost capabilities, aid *care*, and *enhance* existing capabilities. The analysis confirms the crucial role of IT in Active Ageing, shows that Active Ageing requires a multi-disciplinary approach, and identifies the need for better integration of hardware, software, the environment and the involved actors.

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1

Introduction

"Running is my life. I will keep running to inspire the masses" says Fauja Singh in a recent interview after announcing his retirement from running marathons[1] The surprising aspect of his statement is not so much the intention to quit running competitions but rather his age: Fauja is 102 years old and known as the oldest marathon runner of the world[2].

What Fauja is teaching us is that life does not end after retirement and that the right exercise, diet, determination and opportunities have the power to keep or even improve quality of life also when facing the burdens of age. Fauja is not only an extraordinary sportsman, he is also representative of a more general phenomenon of today's ageing society (admittedly, an exceptional one): increasingly, people do not just live longer and generally healthier, but they also keep practicing physical activities (e.g., dancing, hiking or swimming), reading to stay informed or writing themselves to inform others, engage in social relationships (also over long distances), or travelling, even in advanced age. That is,

[1] http://news.discovery.com/human/life/101-year-old-marathoner-retire-130124.htm
[2] http://en.wikipedia.org/wiki/Fauja_Singh

older adults are increasingly active and want to take part of society and to contribute to it.

Enabling this active participation as we grow old has become one of society's most important modern challenges. And this is a challenge with many sides. First, prevention of age-associated physical function decline and disabilities has gained importance and it has been pointed out that it should be the focus of society's attention Guralnik et al. [1996], Ferrucci et al. [2004]. When older adults lose their ability to move within their environments without needing assistance they are less likely to remain active in the community. Second, as we age, our health is naturally challenged and older adults face higher rates of morbidity, mortality, health care utilization and cost, next to a poorer quality of life Guralnik et al. [1994, 1995], Hardy et al. [2011]. Finally, with people living increasingly longer, our society is slowly changing its composition, adding to the complexity of the problem: the World Health Organization (WHO) estimates that "by 2025 there will be approximately 1.2 billion people worldwide over the age of 60, reaching 2.0 billion people by 2050, with 80% of them living in developing countries" WHO [2002].

Addressing these issues involves perspectives as different as health sciences, economics and politics. In healthcare, the focus is usually set on increasing the amount of years of good health as the means for extending independence and quality of life as long as possible Silveira et al. [2013]. Healthy ageing is characterized by the avoidance of disease and disability, the maintenance of high physical and cognitive function, and sustained engagement in social and productive activities de Bruin [2012]. These three components together define successful ageing Rowe and Kahn [1997]. The challenge we are facing today is how to support public health policies that would help older adults in achieving the goals of prevention with the aim to remain independent. An extended life should ideally also involve preservation of the capacity to live independently and to function well Katz et al. [1983]. That is, we need to understand how to provide effective answers to the need for specifically tailored physical activities, how to provide intellectual stimuli that keep older individuals mentally active, or how to help older adults

remain socially integrated; e.g. in touch with their family and peers. Here is where politics and public policy makers become important Satariano et al. [2012], who must recognize these needs and work toward an environment, a society and an infrastructure that facilitate life for older adults. Large support for public health policy can in this context also be allocated to technology in terms of advanced instruments for healthcare and in terms of support it can provide to the everyday activities of individuals. Technology is already permeating our everyday lives, e.g., smartphones and the Internet. Yet, many of the solutions are still targeting tech-savvy people and do not specifically focus on older adult users and their families or communities.

With this narrative review, our aim is to shed light on the role information technology (IT) might play in supporting older adults to age actively. Our goal is to understand how IT can better support an Active Ageing, which we defined as a physically, mentally and socially active lifestyle as a person ages. The review is based on the analysis of literature collected during two years of research and practice in designing IT solutions specifically tailored to the needs of older adults and includes contributions coming from Computer Science disciplines as varied as eHealth, Mobile Computing, Social Computing, Ubiquitous and Ambient Computing, Persuasive Technologies, and Human Computer Interaction; coupled with contributions coming from Human Movement Sciences, Psychology, Gerontology and international institutions (e.g. UN and WHO) reports on the topic. We provide the following contributions:

- A review of the concept of Active Ageing in light of its different definitions in literature, followed by a discussion of the challenges and design issues of IT for older adults.
- A systematic evaluation framework that brings together the different determinants that affect quality of life during the ageing process with the support IT can bring to modulate these determinants.
- A review of literature including exemplary IT services and applications that provide support for Active Ageing, using our evalua-

tion framework analyze contributions and describe their characteristics.

- A discussion of the different aspects of the state of the art and an outlook of what we believe will be the challenges and opportunities of the IT solutions for Active Ageing to come.

The remainder of this article is structured as follows: First, we discuss the effects of age and the meaning of Active Ageing. Then, in Section 3, we analyze what contributions IT in general can bring to ageing and which are the core design challenges in doing so. In Section 4, we introduce our evaluation framework. In Sections 5, 6, 7, and 8, we present the core overview of IT services and applications we have evaluated, offering also a discussion at the end of each of these sections. In Section 9 we discuss the main limitations of our review and the related works that precede and have helped to shape our own. We conclude our review summarizing the discussions we present in each section and presenting an outlook of challenges and opportunities of IT for active ageing (Section 10).

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