

Chapter 30

Designing Smart Home Environments for Unobtrusive Monitoring for Independent Living: The Use Case of USEFIL

Homer Papadopoulos

National Center for Scientific Research (NCSR) “Demokritos”, Greece

ABSTRACT

The “Unobtrusive Smart Environments for Independent Living” EU funded project is proposing an integrated system (USEFIL system) which intends to cope with ageing problem providing advanced, affordable and unobtrusive monitoring and web communication solutions for seniors living independently. The USEFIL system enhances social care and medical service provision by exploiting “frugal” ICT solutions such as low cost “off-the-shelf” technology and unobtrusive monitoring technologies to develop services that will assist the elderly in maintaining their independence throughout their daily activities. The project adopted the Design Science Research Methodology (DSRM) to design and develop the USEFIL system because this methodology incorporates all those principles, practices, and procedures to help us meet USEFIL systems’ objectives. Aim of the paper is to demonstrate the use of the DSRM process to design an ICT solution for the case study of ICT technologies for assistive living environments for elderly people. More specifically using the theoretical lens of the Design Science Research Methodology theory the paper presents the necessary steps that have been conducted to design the USEFIL system. The USEFIL system was implemented and validated over a three year period with elderly people, their unofficial carers and doctors. Results demonstrate that the technology readily succeeds in meeting the study’s initial objectives. Although the project is still running and the design specification of the USEFIL system is under continuous update, the main modules that have been designed and realized will be presented in the paper.

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1. INTRODUCTION

The civil society has a common desire to prolong the period of independent living for elderly citizens (Prigerson, 2003), especially when they are unable to share the living arrangements with their family members. ICT technologies and unobtrusive in-home sensing technologies can maintain health and independence of older adults contributing to the ‘stay independent’ solution (Hyysalo, 2004; Stroetman, 2007). But although in-home monitoring technology can increase safety, independence and quality of life of elderly people, the adoption rates of such advancements are still low.

What it seems to be the gap between the technological and research advancements and the needs of the elderly people is the practicality of the proposed solutions where the monitoring technology must be non-intrusive and not interfere with daily living activities (Wild et al., 2008).

Following the above, the design of a desirable and practical unobtrusive monitoring system seems to be a complex task which should be based on realistic capabilities, costs, risks and benefits in order to address the health and functional needs of older adults in an ethically responsible way.

This paper describes the design, development and deployment of a novel unobtrusive low-cost ICT system based on off-the-shelf open platforms to support independent living of the elderly citizens as long as possible in their home. The end users that the USEFIL system is designed for are males and females at an age 65+ years old, with age related disabilities.

The Design Science Research Methodology (DSRM) has been followed in this work (Peffer et al. 2007; Hevner et al. 2004). We adopted the DSRM because it provides a framework that is well suited to the creation of artefacts in the Information Systems arena since it directly addresses the core role of the IT artifact as the IS discipline (Orlikowski and Iacono 2001; Benbasat and Zmud 2003). Although some good quality recent work has been released following this framework (Parsons et al. 2011; Matos et al. 2013; Bapna et al. 2013) and design science has been well defined, theorized, and actualized in the IS field (Iivari 1991; Nunamaker et al. 1991, Walls et al. 1992; March and Smith 1995) still scholars face confusion and misunderstanding of DSRMs’ central ideas and goals Gregor and Hevner (2013). We hope that this paper will help in the direction of promotion of DSRM as a very well-constructed method to validate the design and the actual deployment of the IT solutions and artifacts.

The rest of the paper is structured following the main activities of the DSRM methodology. Section 2 reports on the problem identification and motivation and presents the definition of the objectives for a solution, Section 3 describes the design and development, Section 4 discusses the demonstration and evaluation and Section 5 concludes the activity of Communication which is, partly happening in the writing of this paper. Finally Section 6 discusses and concludes the paper.

2. PROBLEM IDENTIFICATION AND MOTIVATION

2.1. Problem-Centered Approach

The major problem that has been identified and triggered the design of the USEFIL system concerned the increase of the ageing population which requires affordable care while staying independent in their home. The design of the USEFIL system wanted to address a narrower research question: *“Is it possible to use the latest developments in consumer devices – smart TV sets, smart watches, kinnect, advancements in vision analysis, tablets and smart phones - to create an acceptable unobtrusive monitoring system*

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