Chapter 14
Evaluating the Usability of Home Healthcare Applications

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ABSTRACT

Home healthcare applications have the potential to reduce healthcare costs and improve the quality of life for elderly people who prefer to stay in their own homes instead of making frequent visits to the hospital. This requires ambient assisted living applications that fulfil relevant needs of the users; yet it also requires applications with a high level of usability in order to achieve user acceptance, especially when the target user group is elderly people. This chapter proposes a method to be used for conducting usability evaluations of smart healthcare applications. It includes a report from a usability evaluation where the method was used to evaluate a simple home healthcare application for collecting personal health data in the home. The usability evaluation demonstrates that the method presented here facilitates identification of key usability problems, while the efforts required to conduct the evaluation are considerably reduced compared to conventional methods.

INTRODUCTION

There is growing interest in devices for home healthcare applications. At world level, the life expectancy will increase from 67.2 years in 2010 to 75.4 years in 2050, and in more developed regions life expectancy will rise to 82.4 years by 2050 (UN, 2006). This has considerable consequences for healthcare budgets. The number of people with chronic illness is also increasing and due to frequent checkups at hospitals, these patients face reduced quality of life, because they have limited freedom to perform their daily activities.

The aim of smart healthcare applications for the home is to reduce healthcare costs and at the same time increase the quality of life for patients. Home healthcare applications allow patients to conduct measurements from their own home (e.g. glucose measurements for diabetes patients) and send the results to the hospital. Other applications

put even more emphasis on self-management by supporting patients in taking care of their own treatment. If home healthcare applications are successful, they will reduce the workload of the medical staff, and relieve the patients from visits to the hospital or even hospitalization (Kaufman et al., 2003).

For home healthcare applications to be successful, they must be safe and provide relevant functionality. Many researchers have studied home healthcare applications and frameworks that aid in reducing the societal and individual costs of chronically ill elderly. The focus has been on functionality and regards ubiquitous biological monitoring using mobile phones, wearable sensory devices, multi modal platforms, framework and architecture descriptions and literature reviews of effects (Eikerling, et al., 2009; Fensli and Boisen, 2008; Jaana and Paré, 2006; Pascual et al., 2008; Sasaki et al., 2009; Sashima et al., 2008; Souidene et al., 2009; Taleb et al., 2009).

There are, unfortunately, numerous examples of systems that fail despite having the right functionality, simply because the prospective users cannot use the system for its intended purpose. A problematic or incomprehensible user interface is a typical source of such problems. Usability is a measure of the extent to which prospective users are able to apply a system in their activities (Rubin, 1994). A low level of usability means that users cannot work out how to use a system, no matter how elaborate its functionality is (Nielsen, 1993).

The potential of home healthcare applications can only be realized if the usability of the applications is adequate. Thus a high level of usability is a prerequisite for achieving savings on healthcare costs and a better quality of life for patients through use of home healthcare applications. A high level of usability is particularly important when the main user group is elderly people, who may be constrained by motor, perceptual, cognitive and general health limitations (Fisk and Rogers, 2002) and, in addition, may have a low level of computer literacy.

In this chapter, we focus on the challenges of conducting usability evaluations of home healthcare applications. We present a resource-economic method for usability evaluation and illustrate its use through a case study where we evaluated quantitative and qualitative usability aspects of a home healthcare application that has elderly people as the target user group. The efforts devoted to the usability evaluation are also presented and compared with the conventional approach to usability evaluation.

BACKGROUND

Usability evaluation is the process of assessing the level of usability of an application. In the field of human-computer interaction (HCI), there is a distinction between two categories of usability evaluations: Formative and summative. The objective of a formative usability evaluation is to uncover issues in a yet unfinished user interface. This type of evaluation is also referred to as an exploratory or assessment test and may range from an evaluation of high level initial design concepts addressing issues such as support of the users mental model, basic screen navigation etc. to more detailed low level interactions. Early formative evaluations may be conducted on paper prototypes whereas later evaluations typically are conducted on implemented user interfaces. The objective of a summative usability evaluation, on the other hand, is to test compliance of system usability to a set of expressed requirements. This is done late in the development cycle on an almost completed user interface (Rubin, 1994).

The conventional approach to formative usability evaluation is typically conducted in a laboratory setting. The prospective users are being observed as they interact with a software application and/or hardware device while solving realistic task scenarios. A number of usability specialists are involved, where one is acting as a test monitor and others as data logger and technician. The test

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