

User-Centred Design for Elderly Patients with Low Digital Literacy

Emilija Stojmenova¹, Tomaž Žohar², Dejan Dinevski³

¹Iskratel, Ltd., Kranj, Slovenia

²Telekom, Ltd, Ljubljana, Slovenia

³University of Maribor, Slovenia

stojmenova@iskratel.si

Abstract. As a result of being familiar with the benefits of e-Health, Telekom Slovenia and the Faculty of Medicine from the University of Maribor have worked together on an e-Health project. In order to achieve a high and effective user adoption of e-Health services, a user-centred design approach was employed in the project. This paper describes how well-known conventional UCD methods could be modified to support researchers in carrying out their user studies with people having a low digital literacy.

1 Introduction

In recent years, the number of Internet users worldwide has dramatically increased. People around the world are using the Internet for various purposes. Some of those purposes are also health-related. The term e-Health was first introduced in the late 1990s as a new term to describe the combined use of information and communication technologies (ICT), especially the Internet, in the health sector (Mitchell 1999). Various studies have concluded that e-Health is effective in terms of significant cost reduction for patients and the health system, increased health-service efficiency and user satisfaction, reduced travel times, and increased technical usability (Gartner 2009, European Commission, Stroetmann et al. 2009).

Being familiar with all the benefits of e-Health, Telekom Slovenia and the Faculty of Medicine from the University of Maribor and other partners are working on an e-Health project, which is shown in Figure 1. The project group is developing various e-Health services that are based on modern ICT solutions and will be available on several screens, such as: television, personal computer, smart-phone and tablet. Depending on the purpose of use, the specificity and utility, the e-Health services in the project can be roughly divided into three groups:

- Social-care services for easy and safe independent living at home for older adults;
- Services for the remote monitoring of patients with chronic diseases, for home-care or for general-practice care;
- Fully integrated hospital solutions, solutions for sheltered housing and senior living institutions.



Figure 1. e- Health project: the process of the fully integrated health-care delivery

One of the main dilemmas about e-Health and its adoption among users is associated with people that have a low digital literacy – elderly people in particular. They are often afraid or are not able to use new technology, such as personal computers, smart phones and other intelligent digital devices (Gregor et al. 2002 and Stojmenova et al. 2012). Most of the current systems, software in particular, are traditionally designed for younger people with a high digital literacy (Newell and Gregor 2002). As a result, such software can be either difficult or impossible to use by the elderly and other people with a low digital literacy. Various guidelines exist to support user-interface design for elderly

people. However, designers cannot rely only on guidelines, but need to involve the elderly users of the products and/or applications throughout the design process. Numerous user-centred design (UCD) methods and techniques are well known and widely used. Nevertheless, conventional UCD methods and techniques are not completely appropriate for a large diversity of elderly users. Part of this problem lies in the differing user characteristics, languages, cultures, environments and motivations among the vast number of users.

An important part of the e-Health project was to find out how age-related issues - such as, vision, hearing and cognition and other characteristics of the elderly people – such as, psychosocial skills, self-efficiency, communication, expectations, experiences, learning styles and preferences affect the conventional UCD methodologies. This paper describes how broadly known conventional UCD methods could be modified to support researchers for carrying out their user studies with elderly people with low digital literacy for e-health applications.

2 User-centred design methods

The term user-centred design (UCD) represents a design philosophy and a process in which the needs, wants, and limitations of an end user of a product or application are given extensive attention at each stage of the design process. One of the best known guides in implementing the UCD approach in practice is ISO 13407, which defines standards that support the design, development and evaluation of usable products (Bevan 2009b). The standard represents a general reference and describes five main activities for a software life cycle: plan the human centred process, specify the context of use, specify user and organizational requirements; and produce design solutions.

Taking into account described activities in ISO 13407, the criteria for selecting methods in UCD (Bevan 2009a) and the Usability planner tool (Ferre et al. 2010), for the purpose of the e-Health project, the following methods were considered:

- Wants and needs analysis. It is quick and inexpensive, brainstorming method for gathering data about users' wants and needs from multiple users simultaneously.
- Focus group. It is a group of six to ten people, who are brought together to discuss their experiences or opinions about a topic presented by the researcher.
- Card sorting. Involves writing objects that are in – or proposed to be, in the product or application on cards and asking users to sort cards into meaningful groups.
- Personal and group interviews. It is one of the most frequently used methods for gathering user requirements.
- Surveys (SUS and AttrakDiff).

3 User-centred design and elderly people

Elderly people represent a very diverse group. For appropriate UCD methods adaption it is necessary to firstly conduct a study on the characteristics of elderly people and to find some important common characteristics that make these people different from the other groups of people. User researchers have to analyse those characteristics and consider them in their user studies. In our previous work we used findings from such studies along with various guidelines to design health applications (Stojmenova et al. 2012, Pustišek et al. 2011, Guna et al. 2011). However, in this project, we have chosen a different approach. We will analyse the findings from the user study and look for the findings' impacts on the selected UCD methods.

4 Modifications for the elderly people

Even though gathering requirements from elderly people is vital for user adoption of a product or application, eliciting requirements from the elderly is considerably more difficult than it is from other groups of people (Eisma et al. 2004). For example, most of the elderly people have not used e-health services. When asking them questions about their wants, needs and expectations from the service they are not familiar with, they will not always know what they would really like. Additionally, when presenting them a single option for the service, they might have problems estimating whether they like the option or not. Another problem that might appear with elderly people is they can be reluctant to complain or criticise products. Elderly people often think that not liking a presented option might be understood as an inappropriate behaviour to the researcher.

In order to get valuable results for what our intended users want and need from the e-health services, we will present study participants some basic use-scenarios of several e-health services, so that they would get acquainted with them. We will clearly explain them that we will not be offended if they do not like the service or do not find it usable. Afterwards we will make some stories and ask users to play a certain role.

For example: Imagine you are cooking dinner in the kitchen. In the meantime, you hear the news started on TV, which is in the living-room. Since you do not want to miss any important news, you go to the living-room to turn the volume up. When you return to the kitchen you see a fire started. What will you do? What do you need?

Presenting the service in a real case scenario makes it easier for study participants to think about it and express their options.

Several authors reported (Dickinson et al. 2007) it is not easy to keep a focus group of elderly people focused on the subject being discussed. Unfamiliar environments and social meetings with unfamiliar people may exhaust users really

quickly. To overcome such problems we will conduct the focus group for the e-health services in participants' premises, where they are in a familiar and safe environment. Focus group participants will be selected among relatives and friends i.e. they will know each-other from before. This will provide an atmosphere in which participants will be encouraged to value their own opinions, express themselves honestly, and enjoy their experience.

Traditionally, when doing card sorting, users are asked to sort cards with pieces of information or tasks into meaningful groups. In order to make the method easier and more inspiring, we will introduce some game elements in the card sorting method. For example for an e-health service named MedReminder the modified card sorting technique will include a set of ten cards, each labelled with a different decision, such as: enter medicine name, watch the nurse, call a relative etc. Every participant will receive a set of ten cards. The researcher will then describe possible case, for example: got new medicine, need instructions for the medicine, or emergency. Afterwards the researcher will ask the participants to select five or fewer cards and rank them according to their importance in the specific case. All selected cards will be then put on the table anonymously for participants, respecting the order of importance of the cards in each pile. For each case, the cards will be photographed together in order to analyse occurrence and order frequencies.

Widely used interviews present a guided conversation in which the researcher seeks information from the user depend a lot upon users' self-reporting skills. Elder people with little experience with modern technology may find it difficult to identify and report anything other than a general impression, such as "I think this is complicated". Confusion among older beginners is often general, poorly reported and non-specific. To overcome this kind of problems, we will make sure that study participants have appropriate technology close to hand. For example, a TV set where the MedReminder service will be available. This will allow study participants to demonstrate their use of MedReminder, which is much easier than trying to describe it with words.

Questionnaires are another type of method, regularly used by researchers when conducting user studies. The problem that appears with elder people is they are more likely to use "don't know" responses to questions that have complex syntax or are semantically complex (Dickinson et al. 2007). Additionally, most of the questionnaires include technical terminology that elderly people do not use in their everyday lives and because of that are not familiar with it.

For example, the fifth item in the SUS questionnaire is:

I found the various functions in this system were well integrated.

To obtain usable results, we will modify both questionnaires (SUS and AttrakDiff) in a way that we will use terminology understandable by the elderly. Furthermore, we will try to use sentences and questions that are syntactical and

semantically simple. After the modification, the fifth item from the SUS questionnaire will be:

I found various functions in MedReminder are well connected together.

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