

# End-to-End Infrastructure for Usability Evaluation of eHealth Applications and Services

Martin Gerdes, Berglind Smaradottir, Rune Fensli

Department of Information and Communication Systems, University of Agder, Norway

## Abstract

*eHealth technologies are widely used in collaborative health care services involving multiple different user groups. A very important aspect of the design and development of such applications is the ease-of-use and user-friendliness of the user interface for the end-users. Usability testing is performed in a simulation or real environment to ensure that the system is adapted to the specific needs of the different end-users and to evaluate the interaction between users and system.*

*The aim of this paper is to present an infrastructure for end-to-end usability testing of eHealth technologies in a controlled environment simulating both the Point-of-Care and the Health and Care Service Provider. The primary focus is on the requirements and technical aspects of the test infrastructure itself, but on top of that also a trial project is presented where the proposed usability testing infrastructure has been used and validated.*

## Keywords:

eHealth, health informatics, usability evaluation, end-to-end test infrastructure, point-of-care, user centered design

## Introduction

eHealth applications and services are designed for the exchange of information between different collaborating user groups of the same system, utilizing certain information and communication technologies (ICT) [1].

The reference system that sets the framework for the usability evaluation system discussed in this paper is illustrated in Figure 1. One of the major aspects is the collaboration between a patient in his point-of-care environment (e.g. his private home) and certain health and care service providers (as e.g. a specialized nurse in a telemedical central, a general practitioner, or a medical specialist in a hospital). Collaboration means in this context, that certain information about the medical and health status of the patient as well as about his current living context is made available to the health and care service providers via dedicated eHealth installations, applications and services. For that the information has to be transmitted through communication and health information system (HIS) infrastructures by means of information and communication technology (ICT). In turn this information shall enable the health and care service providers to provide optimal health and care support to the patient in an efficient and cost effective manner. For that the same eHealth infrastructure is utilized to get in contact with the patient, and to assist him with information, general sup-

port, and with dedicated treatment recommendations as e.g. medication changes.

The most important requirement on such a collaborative eHealth system should be the *usability* of the system for all involved user groups. In order to support the patient to derive the health and care related information required by the staff in the telemedical central, the design of all involved eHealth devices and user interfaces of applications have for example to consider physical and mental limitations of the patient. On the other side it has to be taken into account that health and care personnel have to take care for many individual patients. Consequently, the design of the user interfaces of the eHealth services used by the health and care service providers have to consider for example an intuitive and optimal presentation of relevant and important information.

In this paper we present a usability test infrastructure addressing this utmost important requirement. It consists of an environment simulating both a point-of-care and a typical health and care service provider, and it allows performing end-to-end usability tests of applications and services for all involved user groups through a controlled health and care information system. The primary scope is on the technical aspects of the usability test infrastructure, from a health informatics and ICT perspective.

Following this introduction, a rough overview of the *state-of-the-art* of related usability testing infrastructures will be given. The section on *end-to-end infrastructure for usability evaluation* discusses first the identified requirements on the targeted usability testing infrastructure, and presents then the details of the different parts of the proposed infrastructure. Subsequently a trial system for the realization and verification of the proposed usability testing infrastructure is presented. That system was developed under the umbrella of the 3-year European funded project United4Health [2] for the usability evaluation of eHealth technologies.

## State-of-the-art

eHealth applications and services have multiple user groups, and there is a need for systems supporting collaborative work across organizational borders of health care services. However, the development of such systems is a complex process.

The overall objective of usability evaluation is to improve both the interaction design between all involved users as well as the user interfaces of eHealth applications and services [3-5].











