Available online at www.sciencedirect.com

ScienceDirect

Procedia Manufacturing 3 (2015) 5631 – 5638

Procedia MANUFACTURING

6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015

Ergonomics design of healthcare NFC-based system

Danco Davcev[a]*, Goran Jakimovski[b]

[a]*Faculty of Computer Science and Engineering, Skopje, Macedonia*
[b]*Faculty of Electrical Engineering and Information Technology, Skopje, Macedonia*

Abstract

Implementing a software system that modifies the work habit of employees can often lead to disapproval of the system and potentially make their jobs worse. This is often the case when implementing new healthcare system in medical centers, where the system is intended to help medical personnel and patients, but due to bad implementation or miscommunication leads to bad healthcare system. In this paper we are using ergonomic factors in order to improve the design of the proposed NFC-based healthcare system. Using these factors, modifications can be made to the system in order to provide better user experience and better healthcare.

Peer-review under responsibility of AHFE Conference
Keywords:Cloud; Ergonomics; healthcare; Medical; NFC

1. Introduction

As Near Field Communication (NFC) becomes standard equipment in personal mobile devices, it can be used to provide fast information for authentication, emergency medical information and access to medical history of patients. This means that patients equipped with NFC devices can securely access the medical mobile cloud with simple proximity of their NFC, [1]. Furthermore, patients can schedule appointments as described in [2], while medical personnel can access their patient's entire medical history and update it with current diagnosis using their NFC. As new technology is often denied by users, we are using Quality of Experience (QoE) metrics[3] to evaluate the patients' and medical personnel's experience. In this paper, we are testing the system on users and using their experience as a performance evaluation of the system, [3]. As NFC cards are equipped with internal memory,

* Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000 .
*E-mail address:*dancodavcev@gmail.com

Peer-review under responsibility of AHFE Conference
doi:10.1016/j.promfg.2015.07.770

patients can have critical information stored on their NFC card for fast access in critical situations. This information can vary and can be configurable. Information such as blood type and allergies can be stored as critical fast access data. Also, information such as critical CAT scans, insulin injections, diabetes or disproof of medicine due to belief, [4], can be beneficial to emergency medical personnel. The paper is organized as follows. In Section 2, the architecture of the proposed system is presented, along with points of access and usage of the NFC card for authentication and authorization. Section 3 presents two applications of the system, where users (patients and medical personnel alike) interact using the healthcare cloud system to perform scans and application of the NFC fast-access stored information. Section 4, using the applications presented in Section 3, presents our ergonomics analysis based on QoE metrics. Section 4 also presents test case scenarios and results of the users of the system beyond the applications presented in Section 3, where using QoE metrics, patients and medical personnel alike can express their experience of using the system. Section 5 concludes the paper based on results from Section 4.

2. Architecture of proposed system

The NFC-based mobile medical cloud architecture is a fully integrated cloud system for tracking, analyzing, storing and providing on-demand medical information to patients and medical personnel. Using the NFC all-in-one medical card, users authenticate to the system using NFC ID. Users can be patients, medical personnel or external entities that require information from the system. Each user, using their NFC-enabled mobile device, can require access to the system and according to his permission, execute a request *(upload or download medical information, perform tests, scans and online analysis)*. On the other hand, the system communicates with medical equipmentvia internet or intranet. Figure 1 illustrates the concept of the system.

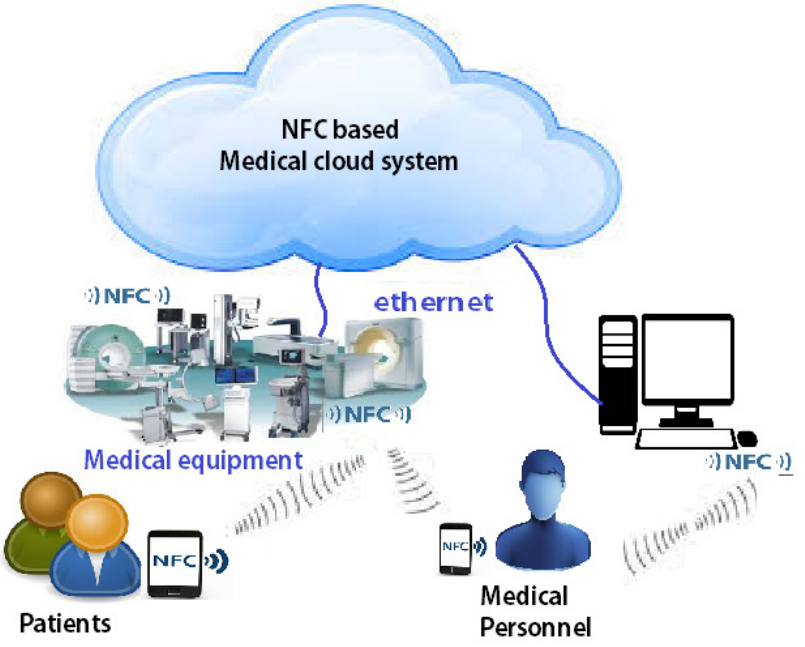

Figure 1 Medical mobile cloud system architecture

The users of the system are the patients, doctors, nurses, specialists, paramedics and external entities that were grant monitored access to certain medical records, [4]. The system is patient-centric, which means that each action taken, relates to patient's medical history or healthcare. Each patient is equipped with all-in-one medical card and is identified in the system with it. Patients can view their medical history, insert symptoms that they had during the day or schedule an appointment at their doctor or some specialist. Before taking an action, the patient has to identify himself in the system using the NFC card. This means that the patient, using a device (laptop, smart phone, tablet,