

User and task analysis in a home care environment

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Abstract

This paper will describe the use of a user and task analysis in the development of an interactive nursing terminal (IVT). The IVT offers digital planning and patient information to the nurse on the road. A user and task analysis is the starting point of the usability design process and helps to gain insight in the way people perform their tasks. During the user and task analysis a contextual inquiry method was used to obtain insight into the users, their tasks and their working environment. While performing contextual inquiry in a home care environment, we came across different kinds of practical barriers. In this paper, we will describe how these traditional HCI-methods can be applied to the development process of eHomeCare applications.

Key words: User and task analysis, contextual inquiry, home care

1. Introduction

An interactive nursing terminal (IVT) is developed as part of the IBBT-Coplintho project. The objective of the Coplintho project is the development and design of an ICT-platform to support patients and caregivers in a home care situation (eHomeCare environment). This eHomeCare environment will offer all actors involved in the care process of a patient, the opportunity to set up the necessary interactions, active or passive (e.g. question to a colleague), and to find the necessary and authorized information about the patient and his/her treatment. The IVT will offer up-to-date planning and patient information to the nurse on the road. To make sure that the IVT will be usable for the home care nurses, a significant research effort is spent on the usability aspects of this eHomeCare application. The IVT is developed together with a Flemish home care organization.

This paper is structured as follows. First, we will describe the different methods we have used to perform a user and task analysis. Then, we will explain how we applied these methods to a home care environment and, finally, we will present some results of the user and task analysis.

2. User and task analysis

A user and task analysis has three main focuses: the users, the tasks and the context. By performing observations in a natural working environment, a clear insight in how tasks are fulfilled can be obtained, and on the other hand, a complete set of tasks and subtasks can be detected and defined from current work methods. Users' characteristics and different context

factors are taken into account during the analysis. An insight in these issues helps to keep the users and their environment involved during the development process. By keeping the users involved during the development process, a better match between the application and the users can be achieved.

The procedure used in the user and task analysis consists of different methodologies as explained in the following. We started the user and task analysis with observations by using contextual inquiry. Contextual inquiry is a qualitative data-gathering and data-analysis method. People who are observed during a contextual inquiry are part of the target group and are selected based on some specific and relevant criteria. During a contextual inquiry these people are observed while executing their normal tasks in their natural working- or living-environment. The participants are asked to explain what they are doing [Beyer, Holtzblatt (1997)]. If a partnership is formed between the observer and the participant it is easier for the inquirer to probe for the expectations and assumptions behind the user's behaviour [Raven, Flanders (1996)]. We performed a total of 19 observations, 12 with nurses, 4 with head nurses and 3 with secretaries. We observed the nurses, head nurses and secretaries during their daily activities with the patients and in the office.

After the observations, we created personas and scenarios. Personas are life-like descriptions of one or more typical users, which are based on what has been observed during the conceptual inquiry. Personas are not real users, but are presented as individuals, and by consequence are used to represent real users during the design process [Cooper, Reimann (2003)]. A scenario is a story about a user who wants to reach a goal by using the product. A scenario also describes the actor's expectations concerning a particular system, the most critical tasks an actor wants to execute, which tasks an actor will execute frequently, etc. Each scenario contains at least one actor and one goal [Rosson, Carroll (2002); Human Factors International (2005)]. Most of the time, actors are represented by the created personas.

The last step in a user and task analysis is creating a clear overview of the tasks that need to be performed with the application to enable the users to reach their goals and envision the relations between the different tasks. Hierarchical task analysis (HTA) is a method to analyse problem-solving tasks (and therefore not just for the description of tasks). HTA is a top down approach that decomposes tasks into subtasks and sub-subtasks. The tasks that are decomposed in the HTA relate to the actions users need to perform to reach their goals rather than to the device interaction. The analysis helps to generate hypotheses concerning likely sources of actual or potential performance failure to meet the overall task goals [Annet (2004)]. To analyse the tasks performed by the users Task-Centred System Design (TCSD) was also used. In TCSD, the real tasks performed by the users are used as input to determine which tasks should be supported by the system [Greenberg (2004)]. A combination of HTA and TCSD was used to create task descriptions. An HTA is normally a hierarchy of tasks that have been set to reach a certain goal. By describing the observed tasks as in a TCSD and putting them in a hierarchy, we created a clear view of the tasks people perform to reach their goals (see Fig. 2 as an example of the graphical look of this combination). Based on this analysis, requirements for the user interface of the IVT were formulated.

3 User and task analysis in a home care setting

3.1 Contextual inquiry of home care nurses

When performing a contextual inquiry, the researcher needs to get involved in the daily work of the future users. Home care nurses work in very private situations and under a lot of time

pressure. During the observations it was often difficult to find a place where the observer was not in the way while observing the nurses actions. A home care nurse has to give her full attention to the patient. The nurse does not only fulfil medical needs, but also many social needs with regard to the patient. Interrupting the nurses during the performance of their tasks to ask additional questions about goals, intentions or expectations was not always possible. Due to these practical barriers it was not always feasible to perform the contextual inquiry as intended. Especially the inability to probe during the observations caused a lack of information. To solve this problem, the researcher wrote down all questions during the observation and asked them when they were travelling from one patient to the other [Hackos, Redish (1998)].

We started the data gathering procedure defining the selection criteria for the home care nurses we would observe. Profiles were formed according to the following selection criteria:

- Region:
 - o Big city (difficult area)
 - o Small city
 - o Suburb
 - o Rural
 - o Coast
- Role within the organisation:
 - o Regular nurse
 - o Substitute nurse
 - o Head nurse
 - o Secretary
- Experience
 - o 0-5 years
 - o 5-10 years
 - o More than 10 years

These criteria were determined in cooperation with the home care organisation. Questionnaires and points of interest were created based on information gathered during meetings with different experts from the home care organisation. According to this information different observation moments were defined: morning, afternoon and evening rounds, administrative tasks at the end of the month in the office, and patient discussions in the office. Nurses in the coastal area were observed during the summer months to capture information with regard to the effect of many temporary patients (tourists).

We spent half or a whole day with the users depending on the selected observation moment. The researcher observed the nurses during their daily rounds. During the observation, special attention was paid to the administrative tasks the nurse had to perform before, during and after the round. Extra information was gathered about the nurses' opinion according to the different administrative tasks. During the observations of the head nurses and secretaries, the researcher was seated next to the participant. Special attention was given to the interaction with the nurses on the road and on how new information was communicated to the nurses concerned. The predefined focus points (Fig. 1) were checked during the observations. If they did not come up spontaneously they were asked afterwards.

- Which nursing actions were marked in a special dossier?
- Is there time pressure during the performance of the different tasks?
- Is the participant frequently interrupted during the performance of the tasks?
- Does the participant perform different tasks at the same time (multitasking)?
- How are the different tasks performed?
- Are tasks performed in a fixed sequence?
- Is a special terminology used?

Figure 1: Focus points during the observations

After each observation a questionnaire was filled out together with the users. The questionnaire probed for the ICT experience, work experience, some existing work routines and their opinion on the upcoming change from a paper based system to a digital system.

3.2 Task analysis for the IVT

When analysing the tasks, the information gathered during the observation not always appeared to be sufficient to write good requirements. Knowledge of the medical domain and all kinds of health care policies and cultural norms is necessary when evaluating the gathered information. A basic understanding of health care policy from governmental, legal and financial perspective is crucial to write realistic requirements [Gosbee, Ritchie (1997)]. Due to all kinds of regulations it is not always possible to write the correct requirements without having to change regulations. By spending a lot of time talking to experts from the home care organisation, this lack of knowledge was partly compensated.

Three different primary personas were created based on the information from the questionnaires and the observations: a nurse with 10 or more years of working experience, a secretary and a head nurse. Three task hierarchies (Fig. 2) were made that decomposed the different main jobs, set according to the main goals of the personas, into tasks that decomposed into subtasks. For all the subtasks the different actions needed to perform these subtasks were formulated. The actions were described in three sets of task descriptions according to the three primary personas. The task descriptions describe how the actions are performed within the current system with all issues and problems related to these actions. Based on these descriptions, requirements and recommendations were formulated for the IVT.

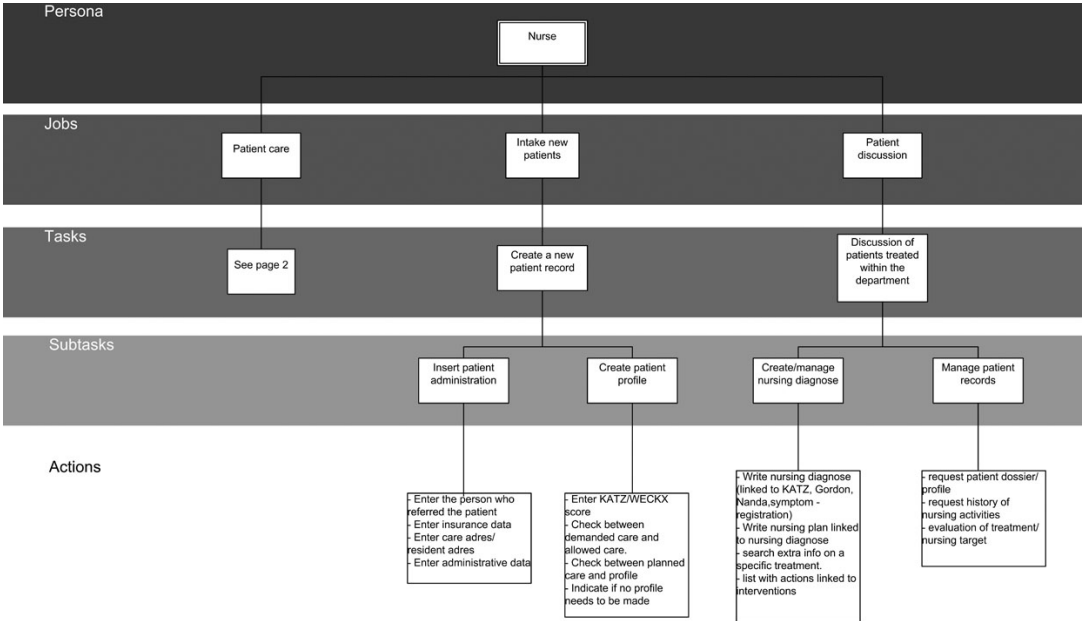


Figure 2: Part of a task hierarchy for primary persona: Nurse with more than 10 years of working experience.

4 Results of the user and task analyses

The primary persona for the nurse with 10 or more years of working experience was enhanced with a secondary persona of a nurse with less than 10 years of working experience. This distinction was based mainly on their experience with ICT applications and their attitude towards the change of a paper based system into a digital system. The nurse with 10 or more years of working experience has the least ICT experience. By making her the primary persona, she will get the main focus during the development process.

To illustrate the results of this analysis, we will first describe the way nurses work nowadays with a paper based system. The nurses receive their planning and patient information once a week from their local office. They perform their work autonomously and under a lot of time pressure. Changes to the planning can be made until the last moment, new patients can be added, existing patients can be cancelled and nursing activities can be changed. The nurses are notified of these changes by fax or mobile phone depending on the urgency. All changes are registered on the original planning (Fig. 3). This planning serves as an official register of the nursing activities performed.

The primary function of the IVT is to provide better communication between the nurses and

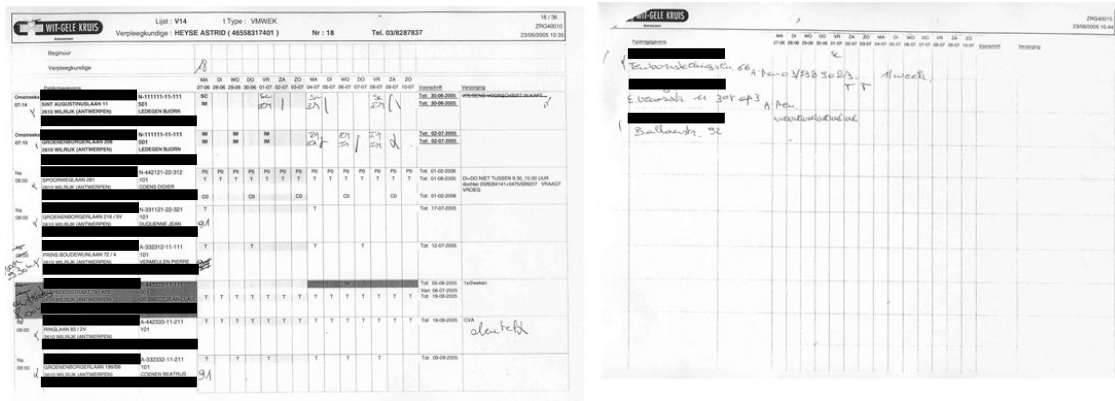


Figure 3: Example of a current work planning, with several changes.

their back offices (secretary and head nurse). The IVT must be able to receive changes to the planning at all times even if the nurse has started to work. The nurse should be notified of all changes made to the planning. Because the nurse must be able to give her full attention to the patient this notification can not interfere in the contact between the nurse and the patient. If anything changes in the future nursing activities for a patient, the nurse will communicate this to the back office and her colleagues who will visit the patient. When a nurse makes a change she must be able to add extra information to this change for her colleagues and the back office. For most of the nursing activities a prescription of a physician is needed. Nowadays, these prescriptions have a long way before them, especially renewals of existing prescriptions (Fig. 4).

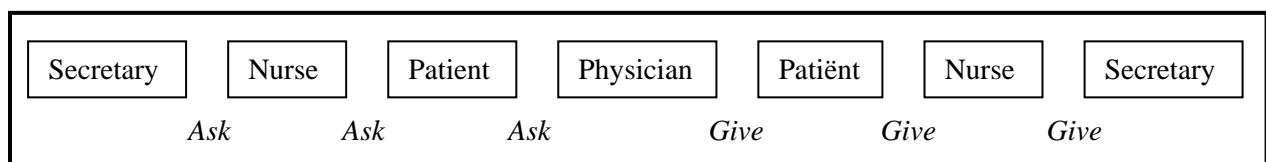


Figure 4: Steps that need to be taken to get a prescription from the physician in the office.

To avoid possible errors caused by this, the secretary should be able to ask for a renewal directly from the physician. The prescribing physician can then send a renewal through an e-prescription module directly to the secretary. However, this requirement asks for a change in legislation.

5 Conclusion

Even though we faced some difficulties using the contextual inquiry method and creating good recommendations for the IVT, the results turned out to be very helpful in the development process. This emphasizes the value of user centred design methods, especially user and task analysis, in the development of user-friendly products. To obtain good results from a task and user analysis in the health care sector Brown and Motte (1998) argue that observers should be trained in relevant terminology, physiology and protocols. The use of human factor driven development processes in e-health is emerging. The use of standard HCI methods like contextual inquiry is not always easy, but by adjusting these to become useful in a health care setting they can deliver good results and enhance the creation of usable ehealth applications.

The next steps in a human factor driven development process is an iterative process of development and user testing. This means that several user tests will be performed during the whole development phase. The first tests will be with developed prototypes and will be tested in a usability lab. Eventually, there will be user tests in the field but these will again be challenged by the specific requirements of the home care setting.

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