Abstract
In this paper we present the formalization of a set of steps to guide designers in their design process activities using natural user interface (NUI) technologies for non-ICT users to support their established workflow. We are using these steps in a design process model, defining its construction phase, which is being applied to design workflow integrated ICT tool at a Brazilian chronic care hospital. During this procedure we observed the healthcare professionals in their daily activities, proposed solutions to integrate technology in their routine in a non-disruptive way and evaluated the results. These actions helped us to formalize an initial design process in order to support designer in their work of designing for natural solutions.

Author Keywords
Design process; natural user interface; user centered design; non ICT users

ACM Classification Keywords
H.5.2. User interface

General Terms
Design, Human Factors

Introduction
The research process in Natural User Interface (NUI) enabled new studies about interaction forms in information and communication technologies (ICT).
Recent researches show that interaction mechanisms by voice and gestures can facilitate the use of ICT [5, 10], especially in environments where users are not integrated with these new technologies. Furthermore, in hospital environments, healthcare professionals, because of their daily activities, are nomads and for them to use technology resources to improve performance of their activities, these resources need not to hinder mobility of these professional, and the resources have to be easy to use and provide natural interactions such as interaction by voice and gestures. Thus, developing systems based on NUI designed for hospitals seems to be a logical fit.

The concepts, methods and applications related to ICT are constantly evolving and follow the accelerated pace of these changes becomes a difficult task for interface designers, who need to create projects that fit new technologies with user’s abilities and that accounts for human values, such as value sensitive design. Value sensitive design is a theoretically grounded approach to the design of technology manner throughout the design process [9]. Such changes influence on the design process and require continuous review and updating of instruments to aid the design and production of appropriate interfaces to the abilities of users.

One of the main challenges of adopting solutions involving NUI in the hospitals is that there isn’t a design process established for applications development using NUI, especially to a very specific group of users that do not ICT on their work activities. Then, with all the changes and challenges faced by interface designers, creating a new model of the design process is relevant and this new model will help, support and facilitate the work of these professionals.

In this paper we present the initial steps for developing a model that can help designers during the creation of process using NUI for not ICT users.

**Background**

Computer-based environments can contribute health professional’s work, as well benefit their patients. The adoption of such technologies on appropriate design of computational tools for health professionals and patients may provide better support tools and devices, helping professionals in their daily activities. A significantly number of work relates experiences with technology and healthcare, but the most difficult challenge is find an appropriated process to design interfaces that can be adopted without disrupt theirs routines. It is recommended that, during design process, the users are involved. The adoptions of natural interaction mechanisms are also recommended. The concepts of Participatory Design (PD) and natural user interface are important for design processes at this context.

The PD is closely related with other Human-Computer Interaction (HCI) approaches, such as User-Centered Design (UCD), Interaction Design, Collaborative Design, Interface Design and others. However, these approaches are focused on how users interact with the product but do not involve them on the development process [7]. In this work it is necessary that users’ participation on the design process through techniques that enable user to actively participate on the definition about what will be developed. Some of the techniques that may be used are: interviews, workshops, prototype, group dynamics, drawing and scenarios.
The concept of NUI is very wide, usually related to graphical user interface and devices that recognizes and reacts to gestures, motion, touch and voice. The NUI paradigm allows improving user interaction experiences by using these devices to systems manipulation directly. The proposition of using NUI is to enable an interaction between user and the system by natural interfaces and make this interface more intuitive and closes to real-world behavior, covering several devices [10]. The users learn how to use and operate a system with NUI by interaction behaviors that they are familiar with, making them do not focusing on the interface itself but on the task to be performed. In this work it is important choose right NUI paradigm to integrated adopted technologies at the non-ICT environment.

Discussion: Building a Process Design
During the proposed design development process, which is possible using NUI in a hospital context, we have built the process model while developing technological solutions and applications to aid and support the activities of healthcare professionals in a hospital. The design process was developed at the same time as technologies and applications were being adopted and validated by users – which is important with this group of users that do not ICT users. In the preparation of design process, we observed that the introduction of new technologies cannot stop or change the workflow of healthcare professionals, and that the proposed technologies may also be used in other contexts [4] in future projects. Therefore it is necessary that the design process contemplates these observations to ensure that users pass through the phase of perceiving affordances of the developed solution so that they can envision the use of such solution when a new context of use arises [4].

In a hospital environment, researchers [6, 11, 12], including our group [3, 4], tend to follow a traditional model of three phases: prototyping, design and evaluation. In our research, we use a hybrid model of participatory design and user-centered design, including some sub-cycles within the evaluation - we noticed that healthcare professionals, partners in this project, are not familiar with the artifacts used in the design interface.

Our model for designing natural user interface, such as in user-centered design, begins with the construction phase, with processes to facilitate the adoption and subsequent appropriation of the proposed solution, as was done in the hospital. This model is described in [3, 4]. In the construction phase, activities are undertaken to facilitate the adoption of the solution and, as results we have ICT artifacts, as functional prototypes, based on the requirements elicited in the construction phase. Once users adopt the solution, the project should include an analysis of potential use in other contexts and providing mechanisms to support this appropriation. The adoption and appropriation phases are strongly related with innovation and new context can happen any time. These activities give feedback to the construction phase, which provides incremental requirements. In our observations, at construction phase proposed, we split the design process in three main cycles to formalize and detail the activities: recognition cycle, prototyping cycle and evaluation cycle. Figure 1 – Model Design Process, shows the scheme of the three main cycles of the design process in construction phase.
The first cycle of the design (Figure 2) was lead through the following actions: (1) participatory design, actions in which researchers and users conducted brainstorming sessions, interviews and dynamic with drawings of scenarios so that researchers could define the object of study, the profile of users and their work activities; (2) formalization of the requirements; and (3) evaluation (acceptance) by users.

The second cycle (Figure 3) was conducted through the following actions: (1) continuation of the activities of participatory design, grouping activities of User Centered Design (UCD; (2) prototyping, actions in which the researchers created prototypes for the areas of Education [5, 13, 14], Nursing Care [1, 2, 5] and Physiotherapy [8]; and (3) prototype evaluation by users. At the end of Cycle 2, the research team produced the materials: (1) the definition of shapes and objects to interact; (2) the definition of the features; and (3) the prototypes (paper and executable models).

The third cycle (Figure 4) was conducted through the following actions: (1) enhancement of prototypes - performed from the analysis of the evaluations with users in the previous cycle; (2) preparation of assessments – the research team, who developed evaluations, through questionnaires, interviews and observations, checked how technological innovations and interactions were being adopted and appropriated; (3) user testing - where users participated in usability tests monitored and guided by the research team; (4) analysis of results - where researchers analyze the data. Validations were made by researchers through discussions and user tests, and improvements were proposed on the developed prototypes.

The results of these cycles allowed us to propose solutions and develop prototypes that implement these solutions, to subsequently, be validated by healthcare professionals from the hospital. And we can analyzied the potential use of technological solutions in other contexts.

**Preliminary Results**

We progressed through our design processes model observing the healthcare professionals in their daily work, and these observations allow us to understand we need to adopt technologies that have no impact on their natural work. We proposed some guidelines to help the designers and some ICT solutions, with appropriated technologies for this context, and improved the healthcare professionals practices.

We have to validate the guidelines with proposed solutions, but we realized that adoption of new technologies is not necessarily adequate and NUI does not have to be used in all solutions. We observed that is more appropriate to adopt resources that professionals use in their daily activities and gradually introduce new technologies.

**References**


Figure 4. Cycle 3: Approaches, Actions and Artifacts Generated

User tests were executed and some data have been collected and analyzed and they are reported in published articles [1, 2, 8, 14].