

Guidelines to Integrate Professional, Personal and Social Context in Interaction Design Process: Studies in Healthcare Environment

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Abstract. In this paper we're presenting the formalization of a set of guidelines to support interaction designers in their activities during the processes to design applications. We are using these guidelines in the construction phase of the design process and these strategies are being applied to support the interaction design of user's workflow, integrating professional, personal and social contexts. These strategies were used in a hospital for treatment of chronic mental illness in Brazil. During this study we observed healthcare professionals in their daily activities and with these data we developed information and communication solutions to bring new technologies into their day-by-day activities, in the way not to interrupt their routines. After some data collection and analysis we evaluated the results of our research. These analyses helped us to understand some weak points in the design process that do not simplify the integration of the different contexts in which users are naturally inserted. Thus, we proposed a set of guidelines to an interaction design process with the objective of supporting interaction designers in their work of developing natural solutions, integrating the different contexts of the users. Also, with the integration of contexts, we promote the extending of user's abilities.

Keywords: Design process · User interface · Interaction design · Non ICT user

1 Introduction

It is a difficult task to monitor the evolution and the advances of concepts, methods and applications related to information and communication technologies (ICT), which are always changing or improving. Such transformations are mainly related with user interaction with computer applications, and according to [14], the professionals who work with interaction design need continuous updating models and design approaches, especially for applications that uses new interactions technologies, such as technologies for gestures, touches, sounds, movements and others. So, the technological resources for social interaction, resources for communication and exchange

of information should be connecting seamlessly with the non-technical traditional forms [14]. In [12], the authors point out that given the technological developments it is not possible to have models of complete and stable design, because everything is in a transitional stage and that, from time to time, the models need to be adapted and created for the new reality. According to [17], this new reality needs to focus some efforts in solutions that take into account the human ability - good tools addresses human needs as they extend their abilities - is the transformation of what can be made for what you want to do.

The paper is organized as follow: Contextualization is presented in Sect. 2. Section 3 presents the observations and analysis of experiments related with the interaction design process used in healthcare environments. The guidelines and discussion are showed at Sect. 4. Section 5 presents the conclusions.

2 Contextualization

To create good interaction designs, those that allow to access characteristics and functionalities in a pleasant way [11], and to allow the adoption and appropriation process of a new technology be effective and can extend the users abilities, it is important to consider the appropriation process of technological innovation. Appropriation is the term used by [3, 4, 6] in situations where the user creates new uses for technology solutions, thereby creating new requirements that must be considered by designers. During the appropriating process, users perceive more clearly their abilities, the best way to interact with technology solutions, how to adapt them to new uses and contexts and how the users performs that in a better way.

Systems with natural interaction that support the professional's work within the dynamics of this professional, to facilitate their activities of communication and interaction with their colleagues and with the environment, leads the professional to the perception and awareness of its procedures and its working group, allowing that the professional craves for efficiency and effectiveness in their work practices. But how to account for the fact that ICT solutions permeate among professionals, integrating the contexts of personal, social and professional lives of these professionals? And how this integration of the contexts affects the interaction design process? These questions exposed gaps in the research on design processes for systems with natural interaction that integrate personal, social and professional contexts, considering worker's experiences in using ICT to promote the abilities of these professionals.

The proposal to create guidelines that support interaction designs assisting and guiding designers during the design process, development and validation of systems with natural interaction is relevant, because the guidelines uses the personal, social and professional experiences with technological resources, it uses what the user already knows to make the interaction more natural and close and may thus stimulate the development of user's abilities. For reach this goal it is necessary to integrate the different contexts in which the user is in, looking for their experience and abilities, by encouraging the use of personal devices that the user is already familiar and bringing his experience to use during the interaction design process.

3 Interaction Design Process and the Experiments in Healthcare

This project relies on a partnership between a research group of designers from Advanced Interaction Laboratory (LIA) Department of Computer Science at UFSCar (Federal University of São Carlos – São Paulo State) in Brazil and the healthcare professionals from CAIS Hospital Clemente Ferreira, a mental care hospital located at Lins (countryside of São Paulo State – Brazil). This research intended to determine how information technology can facilitate and improve healthcare professional's work, improving the communication process among them, considering the nomadic nature of their work, with long working shifts, without cause a disruption in their work routines. The groups of healthcare professionals have long periods of work time and it's very usual some small absences forced by their needs to contact family and/or friends or solve personal and social situations during work shift. So, for during the time they are looking after patients who spend long periods in hospital (and most of the patients live in the hospital while they pass through rehabilitation process/treatments), these healthcare professionals must deal with patient's situations, assisting and supporting in the day-by-day activities' routines.

The development of this project was executed using observations processes, interviews procedures, building functional scenarios, creating prototypes and doing experiments for the study of the environment and activities of healthcare professionals within the hospital: requirements were collected and analyzed, the solutions for application of ICT were proposed in the this environment and some proposed solutions were validated. A group of LIA's designers were monitored during the preparation and development of several prototypes with human and professional interactions. We observed and make some remarks of the procedures adopted by these researches during their studies for interaction design process.

Annotations and experiments were conducted and an initial scheme of interaction design was modeled during the development of various applications and technology solutions to help and support the activities of healthcare professionals in the hospital. These observations lead to organize and lay out all activities of designers during the collection of data, requirements analysis, development, implementation and evaluation of prototypes. Design activities were grouped into three cycles: Cycle 1 – Recognition; Cycle 2 – Prototyping; and Cycle 3 – Evaluation (see Fig. 1).

In the first cycle the designers defined the objects of their research, identifying the user's groups. They also created some ideas to prototype and collected all requirements. These activities were performed with techniques of participatory design and scenario-based design. Reports with interviews and observations, photos, movies, stories shading and creating scenarios were generated as artifacts by the end of this cycle. The second cycle of activities involved analysis of the collected requirements and their validation through interviews. Several prototypes were developed, refined and validated. During the validation, some solutions of interaction design were proposed and the prototypes were reevaluated. In the third cycle the designers have proposed some evaluations and usability tests, thus, several improvements were incorporated into

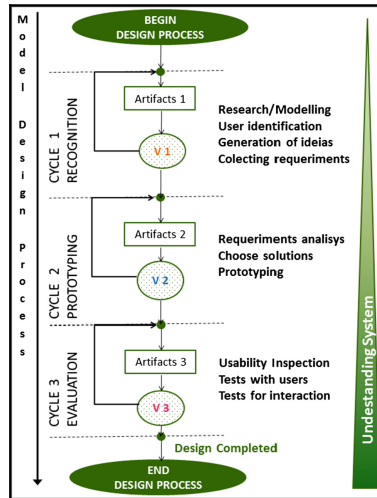


Fig. 1. Activities of interaction design

the prototypes or new prototypes were developed, considering user's skills and the technology innovations.

The first cycle of the design 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 requirements, actions in which researchers discussed the scenarios with user and analyzed the collected materials to create similar scenarios with the addition of technological innovations; and (3) evaluation (acceptance) by users, actions in which researchers and users validated the proposed scenarios. The following artifacts were generated in the first cycle: meeting minutes; drawings/diagrams on cardboard; schemes digitally represented; scenarios with technologies; textual description of scenarios; responses to questionnaires; photos and videos, description/interpretation of photos and videos (see Fig. 2). The research team involved in this first cycle reported their experiments and materials generated in dissertations and articles [1, 3–10, 15, 18, 19].

The second cycle was conducted through the following actions: (1) continuation of the activities of participatory design, grouping activities of User Centered Design (UCD), where researchers and users were in brainstorming sections performed to further data collections of scenarios defined in the previous cycle; (2) prototyping, actions in which the researchers created prototypes for the areas of Education [7, 18, 19], Nursing Care [1, 2] and Physiotherapy [5]; and (3) evaluation by users, actions in which researchers and users evaluated the developed prototypes. The following artifacts were generated in this second cycle: meeting documents; prototypes on paper; prototypes in computational tools for middle and high fidelity; textual documents, photos and videos, description/interpretation of photos and videos. (see Fig. 3). At the end of Cycle 2, the research team produced the materials: (1) the definition of shapes

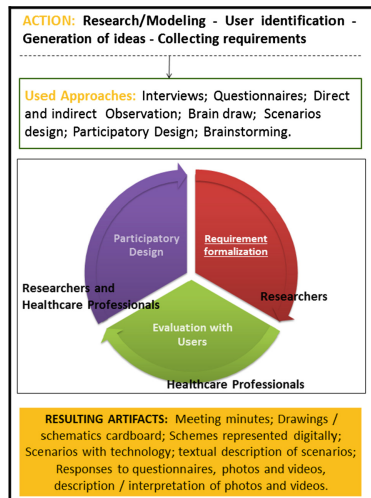


Fig. 2. Activities of Cycle 1

and objects to interact; (2) the definition of the features; and (3) the prototypes (paper and executable models).

The third cycle was conducted through the following actions: (1) enhancement of prototypes - performed from the analysis of the evaluations with users of the previous cycle to develop enhancements and new features in the creation of new prototypes; (2) preparation of assessments – the research team who developed evaluations, through questionnaires, interviews and observations to check how technological innovations and interactions were being adopted and appropriated by users in hospital; (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 collected during testing with users. Figure 4, presents the actions and artifacts generated and the result at the end of the cycle. Validations were made by researchers through discussions and improvements were proposed on the developed prototypes. User tests were executed and some data have been collected and analyzed and they are reported in published articles [1, 2, 5, 10, 18, 19].

This entire process was documented, the applications and technological resources were adopted and validated by users - it is important to note that the group of users, the healthcare professionals from the partner hospital, are not familiar with ICT in their professional activities, which makes the study most interesting in observing and understanding how applications with technological innovations are placed in the context of this work, and how the process of appropriation happens. Our observations indicated that introducing new technology cannot stop or change the workflow of healthcare professionals involved in the study, and that the proposed technology can also be used in other contexts [3, 6].

These studies involved the developing improvements at prototyping, and the evaluation and observation of these studies resulted in a new proposal in interaction design, encouraging the appropriation of technologies resources. In [3, 6], the authors

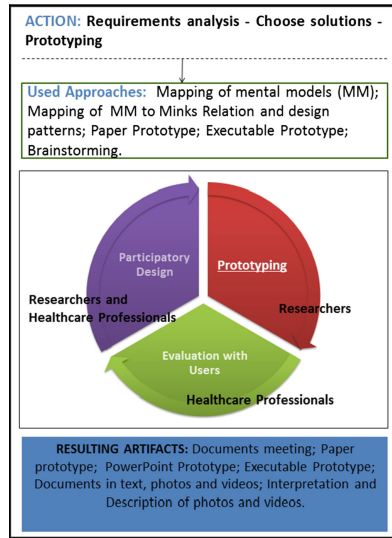


Fig. 3. Activities of Cycle 2

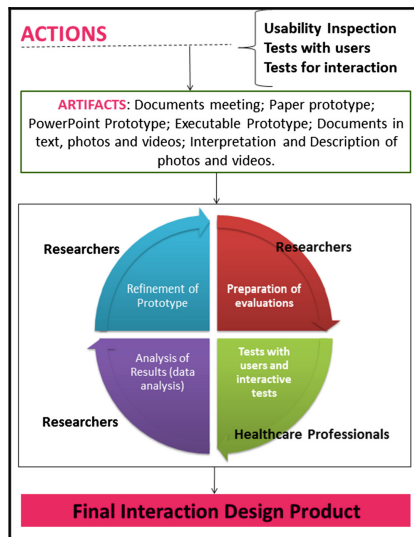


Fig. 4. Activities of Cycle 3

created an interaction design process by modifying the traditional design process: design - prototype - to assess [16]. They proposed to add iteration in the process of adoption and appropriation of technologies designed during design. They also created two new criteria for maintaining the workflow of professionals using ICT.

Based on authors [3, 6], the level of appropriation determines how the design is the natural measure that allows users to create new uses for the expected design, as well as use it in different contexts. The criteria proposed by [3] determine that the adoption of new technologies should not interrupt or interfere with the professional's tasks and the technology should be chooser to allow its appropriation in other contexts.

After all observations and studies, we have proposed a model and a prototype were developed in accordance with the activities of the three mapped and described cycles. This helped us to percept the concepts of appropriation of technologies in the workplace. The prototype, called Collab, was developed, in its first version, by [15] as part of his master degree. After initial utilization of the tool, the prototype was re-designed and a new version was deployed to use in the same partner hospital, because we noticed that professionals were using Collab mostly to exchange personal messages (messages related to patient's personal life) and to share congratulation messages (see Fig. 5 – Interacting with Collab using smartphone).

The Collab is an application to support the activities of communication and socialization among healthcare professionals, who spend long periods at work and they have, in most of the time, to help patients in their daily activities. The prototype has three features: (a) sending public messages to all or to a specific person, (b) public notification of tasks that must be performed by others and (c) notify when and who finish a task. For this, the application has been installed on a server in the hospital, to which the devices that were connected over Wi-Fi network and all healthcare professionals could access the application via any web browser, allowing professionals to use their own devices to access the application or any available tablets in the hospital. For sending messages and sending public tasks feature, we considered the existing uses of tables and whiteboards for messages that were there in the corridor of the ward a TV of 46 in. functioning as an information panel, which shows the last messages sent to all persons and pending tasks - sorted from oldest to newest. Previously, it was identified the benefits of public demonstrations to promote cooperation in health, described in [13]. They argued that public notifications, such as job boards, which are naturally used to provide task management, increase sharing of awareness, leading to a more efficient solution of the problem.

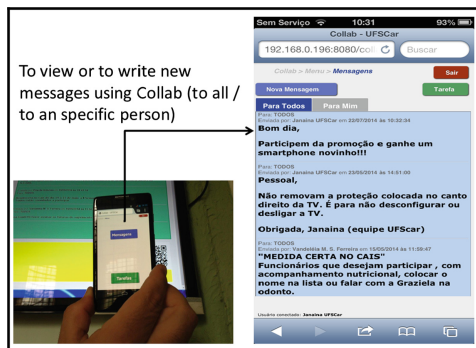


Fig. 5. Interacting with Collab using smartphone

In this work we used the public TV display to promote greater sharing of responsiveness among professionals, integrating the personal, social and professional contexts, since the data collected initially show all messages being aware and attentive to the events in the workplace. In the first two interactions with the use of Collab, many data were collected and analyzed. The results are published in [7, 17].

We realized, during the implementation of this project and through studies conducted by the LIA designers, that users need to integrate different contexts in which they live: professional, personal and social. This observation allowed us comprehend two gaps in existing models of interaction design: (1) the models do not facilitate the integration of professional, personal and social contexts in which users are included, which is essential for long term care professionals; (2) and the models do not make use or do not extend the abilities of these users regarding the use and adoption of technologies, leaving faster the appropriation of technologies.

These observations inspired us to propose a set of guidelines which will assist designers during the design process of interaction, to promote interaction of the different contexts in which users are included and to extend their abilities.

4 Guidelines and Discussion

From the analysis of Collab experiment we managed to extract 12 guidelines related to designing interactive applications to help designers integrate professional, personal and social context, and extends the user's abilities. We considered two main aspects for designing: extends user's abilities and support the integration of contexts. The guidelines were grouped in these two domains and when an interaction design process achieves these domains, technological adoption happens naturally (see Fig. 6 – Integration – Expansion – Appropriation).

These domains presents common goals of facilitating the appropriation: as the integration of contexts happens, users discover, or become aware, of the use of various technological resources and applications on the same and other contexts; and the

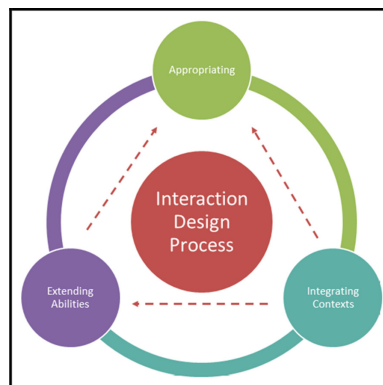


Fig. 6. Integration – Expansion – Appropriation

expansion of user abilities facilitates the use of technological resources and applications, extending the use of these. The set of 12 guidelines were formalized, grouped and classified according of two defined domains.

4.1 Guidelines to Integrating User's Context Domain

The INTEGRATING CONTEXTS domain guidelines highlight actions that guide designers on how consider all aspects of the user's context and that should be considered during the design.

GIC1. Make clear the purpose of sections design

Before starting the process of interaction design it is important to chat with the user group and explain what and how the sections will be executed. Explain how valuable the integration of personal and social context is to the choice of applications and technological resources to be adopted. Before each section of the design, you may explain which activities will be held, the duration of each and what you want to achieve at the end.

GIC2. Promote a fast socialization before the design sessions

Start the sections with an activity of socialization and encourage each participant to expose what he/she are waiting as a result of the day/week/month or to tell something new, about work or not. This socialization should be fast, 1 min for each participant may be enough. It helps to know and discover other abilities of the user or what he/she expects, not only related with technological resources. You can also use some games or dynamics.

GIC3. Ask which of the social networking (or e-communication services) user participates

Designers must know how the user interacts and communicates outside the work environment, and it can help choosing forms of interaction to be adopted. The use of communication mechanisms that user already use can be incorporated into the design, making it easier to use and motivating its use.

GIC4. Use group dynamics techniques to understand what kind of messages users usually share

It is interesting to know what kinds of messages are exchanged between users inside and/or outside work. During our experiments in [2], we realized that 75 % of messages were related to the personal or social context. The perception of this situation indicated us the requirement to incorporate personal and social contexts in the work routine of the users.

GIC5. Provide fast rest breaks between sessions of design with the user

Intervals during the sections assist to provide a moment of relaxation between the activities of the design section, but also should be used to observe user behavior. In our experiments [2, 4, 8], during the intervals between design activities, some participants used their mobile phones to check messages or calls, to make professional and personal

connections and to talk about subjects not related to work with colleagues. These observations allowed us to understand the requirement to propose a way and/or a time for social interactions among participants. And, whenever possible, offer something to eat (coffee break intervals) - it makes intervals more relaxed and affable.

GIC6. Design for appropriation

During the experiments, in brainstorm sessions and during the user testing [1, 2, 4, 5, 8–10, 19], we realized that users can appropriate the technological resources or applications if they tried new uses or have used them in other context. One case that was interested to us was the story of the physiotherapist which using your own camera in her sessions of physiotherapy took some photos, printed these photos and wrote comments about the therapy session. In the course of our experiments, she realized she could take the photos with a tablet and make notes to send to her colleagues and each could add other comments, so they could discuss a specific case. This perception provide us highlight the importance of proposing designs flexible enough to appropriation.

4.2 Guidelines to Extending User's Abilities Domain

The EXPANDING ABILITIES domain guidelines highlight actions that guide designers on how explore user's abilities in different context of uses and that should be considered during the design.

GEA1. Don't waste the user's time

The duration of design sections should be short and be prepared in advance. The goals of each design section must be clear and defined previously. When the objectives and activities are not defined, the designers are lost during the section and this can make the participants annoyed, hindering their participation.

GEA2. Ask user what technological resource he/she knows

The cell phone or smart phone model, tablet, automatic machines (ATM), TV at home – every resource that user knows how to use can help the designers and can be used in new applications. So, it is important to ask how resources are handled and in what situations.

GEA3. Ask user which application he/she uses in everyday activities

The use of applications such as task managers, electronic calendars, app to support diets or sports, can illustrate the user's abilities that he/she did not expose. Other important observation that should be noted is the readiness of the user to receive notifications and/or hints of these applications. Also the designers have to notice if the user separates or links the personal, social and professional notes when using these applications. The user's expertise with some applications can help in the acceptance and practice of new applications that use similar forms of interaction.

GEA4. Encourage communication among users and designers through new technological resources

Designers can use environments and communication applications that the user does not know, just knows a little or frequently uses. Thus, users may have the opportunity to know or learn new technologies and communications methods. And designers can notice some common practices and specific characteristics of users to incorporate them in design process.

GEA5. Observe the things user have with them

During our experiments some participants said they had no account in social networks, but when we asked about Facebook, they said they had a profile on “Face.” They did not know the term “social network”, only knew it by Facebook. Users can say they do not know a technological resource or application, but it’s very common he/she uses them without knowing, or knowing them by another name, or, also, he/she uses them in another context and another purpose. Design must use popular names, marks and try different forms to refer a technological resource or application, when they are interviewing the users.

GEA6. Program the sections of design to be done in the user’s environment of work, but do not disturb the user environment

Designers must take in consideration the working environment, in which users are included, the locations where each one performs their activities. However, the designers must not disturb other employees and their activities. In addition, designers should ensure that the design sections do not disturb the routine of the participants, not to cause embarrassment or bothered.

5 Conclusion

In this paper we presented a set of guidelines to support the interaction design process that integrate professional, personal and social context of the user, using and extending the user abilities. With Collab experiment we learned that professionals working with long term care and have long shift of work, trend to mix the professional, personal and social contexts. This warned us during the process of interaction with user’s participation, so these contexts must be taken into consideration and the abilities that users have in other contexts can be used and extended their work environment. These aspects drove the appropriation’s design and allowed greater user’s awareness in relation to its potential in the use of technological resources.

Based on these feelings and the ones we collected while the researchers of LIA were creating application at the hospital, we were able to formalize our lessons learned as a set of guidelines that are applicable to designers who want to incentive the appropriation, through the integration of professional, personal and social context and are trying to extends the abilities of the user. As future work we want to make others experiments changing the group of users of the experiment and the way to design to confirm if these guidelines can be generalized.

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