PROMOTING COMMUNICATION AND PARTICIPATION THROUGH ENACTMENTS OF INTERACTION DESIGN SOLUTIONS

A Study Case for Validating Requirements for Digital TV

Elizabeth Furtado, Albert Schilling, Fabrício Fava and Liadina Camargo

Universidade de Fortaleza – UNIFOR, CEP 60811-905 – Fortaleza – CE – Brazil

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Abstract: This paper discusses the use of theatrical techniques in two experiments to attain the following objectives of interaction design: to communicate the cross-cultural users' needs and expectations for iDTV (interactive Digital TeleVision) services and to explore new ideas in a participatory way. These two objectives are particularly important when systems are involved that are unknown to people, and professionals need to gather the requirements of such systems. In the first experiment, we showed the implication of stories told through theater in order to communicate the purposes of iDTV services to the audience. In the second experiment, we used role-playing in participatory interaction design sessions to explore new ideas with users. The results are described by discussing the strengths and weaknesses of this approach.

1 INTRODUCTION

Electronic devices and interactive systems have evolved in a very fast way. This trend has brought difficulties for professionals responsible for the development of these technologies to understand what people really need. The basic question is: professionals address users´ actual needs or they are just creating imaginary needs for people? Several techniques entail understanding these needs of a particular user group (a targeted user group). However this practice may not bring relevant outcomes if target users have little familiarity with the innovative technology. This situation leads to a need to engage targeted users in simulated situations to explore their ideas, attitude and emotions. Professionals should also focus on human needs and usage patterns to identify how current technologies are used and appropriated. These both attitudes can lead them to identify or predict needs that will emerge together with available technologies and emerging trends.

By focusing on our attention to understand and communication what people need in terms of interactive Digital TV services (iDTV), we find ways to share information between targeted users and designers and among professionals.

This paper proposes the use of theater to understand the context of users and to explore their ideas when they are taking different roles in situ in participatory design sessions. Users will be motivated to assist designers in the project of interaction of a product, being not only a source of information (saying what their expectations are, for instance), but also providing ideas to build solutions that are more appropriate to their needs. In addition, theater is also used to help designers both to communicate interaction design solutions and to evaluate the proposed design with stakeholders (members of the team, those responsible for the deployment of the iDTV services, and target users of these services).

The article is divided into six sections, described as follows: the second section presents an HCI study that discusses interaction design techniques; the third section illustrates several research questions that will be investigated during this work; sections 4 and 5 show the experiments conducted in order to explore the formulated questions; the sixth section presents the results of the experiments; lastly, the seventh section presents the final considerations of this work before the conclusion.

2 THEATER IN THE INTERACTION DESIGN

Exploring new ideas when having to design new solutions is a challenge. This is the case of sophisticated technological systems in which the domains (such as digital TV, smart home, and tangible interfaces) represent a new paradigm of interactivity. One of the reasons is that users often have difficulties in formulating their needs because they lack knowledge about the potential usages of the innovative technology. Designers must apply techniques that enable users to imagine living with the technology. The prototyping technique (such as Wizard of Oz (Dahlback et al., 1993) (Molin, 2004)) partially supports this imaginary process, because it is possible to represent some characteristics of design and simulate some functionalities before having the final product.

However, the prototyping technique is often applied to validate design alternative solutions having an exclusive focus on user interfaces (sequence and position of information) (Tohidi et al., 2006).

Professionals have also been applying prototyping techniques by matching scenarios (Carroll, 2000) and storyboards that illustrate, in a low-fidelity way, the possibilities of interaction narrated in the scenarios (Dow et al. 2006). In the scenarios, these possibilities have been described in function of the persona notion (Cooper, 2003), which allows the description of the daily patterns of user behaviors concerning a service and/or product. Scenarios have become a widely-accepted practice to describe the users' experience living with the technology (McCarthy and Wright, 2004). However there are some situations in which these practices do not capture all the nuances of the interaction. This is the case when the users' emotional reactions depend on the social environment and cultural context in which the interaction takes place.

Taking this approach of Experience Prototyping (Buchenau & Suri, 2000) into account is aimed at making it easier for designers to better evaluate the integration of the technology in the real context of use in a dynamic and holistic way, using (for instance) role-playing in experience prototyping design sessions.

The theater is a way representing the real world and, through this representation, the individual reacts, and experiments her/his own emotions, among other feelings. Howard and his colleagues (2002) have used theater to explore the interrelations between technology and situations of use. In (Newell et al., 2006), the technique of theater was used to transmit important messages about characteristics of older people. Afterwards, a video was recorded and shown in a focus group session to encourage audience (future-user) participation. We wish to use both the enactments and a recorded video as complementary artifacts to scenarios and storyboards. We believe that when scenarios of an interaction design are acted out by users in their own physical and social-cultural environment, they become very involved by pretending they are actually using the technology. Their reactions help professionals to reflect on the implications for design.

3 RESEARCH ASPECTS

We will present two experiments described in sections 4 and 5, considering two aspects: i) Communication of the possibilities of interaction with iDTV for members of the team involved in the case study described in this paper, and ii) Participation of some target users of this technology in design sessions both to explore new ideas and to validate interaction design solutions. We will explore each aforementioned aspect, presenting experiments in which the following sentences will be discussed:

1) The theater technique leads to an effective communication process of the interaction design solutions. Effective communication is understood to be a process in which the supply or exchange of information, ideas and feelings occurs, through written or spoken words, or through signs, resulting in a reciprocal comprehension and shared meaning.

2) Practitioners of theater techniques can easily observe the players' emotional reactions. The players become motivated and provide the practitioners with relevant ideas (suggestions, actions, opinions). In the context of this research, such ideas and users´ reactions help professionals to better understand the dynamic of the interaction context and to reflect on the implications for design.

The activities that will be described next are part of a process of definition of the users' needs for products that will be generated by a research project, called SAMBA (System for Advanced interactive digital television and Mobile services in BrAzil) (Blind Review). Those involved in this multi-cultural project are: Brazilian and Italian users, as well as stakeholders from 9 European and Brazilian organizations, including 2 universities.

Project SAMBA pursues the creation of a framework for enabling local communities—including low income populations—to participate in

the process of creating and accessing digital content. The main SAMBA product is Web software to produce content (called Content Creation Factory or CCF) and make it available through services that will be accessed by iDTV and/or mobile devices. Therefore, the stakeholders had to discover which services would be more interesting to the communities. Two user field studies (one in Brazil and one in Italy) were launched (Blind Review). In Brazil, the user field study took place in the town of Barreirinhas. In Italy, the user study took place in the province of Alto-Adige-South Tyrol. These places were chosen for having received financial support in previous European projects to install an electrical structure on several streets and that will be needed here (Opera, 2007).

In Italy, Digital TV is a reality, but it is not the same in Brazil. The deployment of the Brazilian Digital TV System (SBTVD) requires the preparation of broadcasters of the national digital TV for transmission. Deadlines were established to start works on transmission of TV content in this technology in the country. The expected date to access this technology in small municipalities in the northeast, as in the case of the study, is for 2010. In the Samba project, it is expected that the transmission starts in 2008. Concerning the benefits with the results of this project, we can say that the SAMBA environment developed to access content through the digital TV can be compatible with the SBTVD. It is based on some characteristics, such as the adoption of JAVA-TV of the HAVi standard, and GEM (Globally Executable MHP) specifications, which are common to both the Japanese (Standard adopted by the Brazil) and European standard (Furtado et al, 2008).

Next we will present two experiments, both occurring in Brazil: the first one concerns the communication among all the stakeholders at the laboratory site, and the second one concerns the participation of the Brazilian users and takes place in their real context of use.

4 EXPERIMENT 1

4.1 Method and Participants

In order to present the results of the Brazilian and Italian users´ studies to the stakeholders, we accomplished a meeting, which took place in the city of Fortaleza, Brazil, from July 2nd to 4th, 2007. 27 (twenty-seven) stakeholders were present, of which 8 worked on the organization of this event and 4

were responsible for the definition of the interaction design of this project.

On the first day, we initiated the presentation of a comparative analysis of the results of the studies on the topic researched (Blind Review). Next, we intended to communicate important messages about the interaction scenarios of users targeted with the iDTV services.

For this project, 4 iDTV services were identified: 1) discussion, which allows the interaction among viewers through the TV; 2) visualization of information on TV; 3) surveys, to promote the participation of the community, and 4) entertainment – manipulating digital pictures, to guarantee involvement with the digital content. The relation among scenarios and services is the following: each scenario highlighted at least one service, and one service can be pointed out in several scenarios described.

The expected contents and applications that are targeted with these iDTV services will support health and education problems. So, community-oriented applications, as the gallery-photo application, are intended to be used both by Brazilian and Italian students to build and share digital contents.

Many stakeholders were not familiar with the reality of the studied users and they had different background about DTV. Some (n=7) had not yet worked with scenarios and storyboards before.

It was necessary then to use a resource that would promote the homogenization of the language for the understanding of the purposes of the verified interaction scenarios. We invited the participants to join us at the theater.

The theater presentation was 30 minutes long. When the performance was over, there was a moment of great emotion brought on by the surprise of the artistic production. On this occasion, the actors involved in the presentation were acknowledged. Next, all the participants returned to the meeting room and a discussion was begun. To hark back to the interpreted situations, professionals used slides in which there were storyboards and scenarios associated with each play. At the end of this discussion session, a questionnaire comprised of 5 open-ended questions was applied. The questions were related to the importance of the strategy applied to the understanding of aspects of the interaction scenarios, and the services to be offered.

Only 15 participants answered the questionnaire, since the other 12 were directly involved in the interaction design and communication strategy.

4.2 Production of the Theater Script

To produce the theater script, the following steps were realized:

1. Definition of the following elements for the production of the theater performance: The script—which relates the story (the scenarios) to be interpreted—is added to interpretation resources, such as demonstration, simulation, error treatment support, help, integration and socialization. The stories to be interpreted had a narrative of approximately 15 lines;

2. Choice of actors and wardrobe. In order to take full advantage of theatrical techniques, we explored the use of theater professionals (6 actors, 1 playwright, and 1 director). Each story had an average of 3 actors, who were students from the University where this research took place and were part of a theater group. Each actor represents a persona that is used as examples of the specific public that will use the proposed system in the scenarios. There was a rehearsal of the performance with the participation of the HCI professionals (authors of this paper), the actors, the writer, and the director. Important issues were discussed in order to bring an emotional content to the narratives; and

3. Organization of the ambience, lighting, and sound. In addition, all of the audio-visual resources used to videotape the plays were installed.

4.3 Stories Communication in the Theater

The audience was comprised mostly of non-Portuguese speakers. Therefore, we choose to have a presentation in which there was no dialogue among the actors/characters. Thus, the characters expressed the entire aforementioned dynamic through soundless actions and, to aid the comprehension of the story, a narration in English described what was happening in each scene. Six different plays were presented. All of the comments were made at the end of the presentations.

Figure 1 illustrates a few passages of a story told in the theater presentation associated to certain lines of the script. A teacher (the "Antonio" persona) learns that a student (the "Junior" persona) is sick and will have to miss two weeks of classes (Figure 1.1). After some time reflecting on a way to prevent his student from missing the content given in class, Antonio decides to prepare slides of his class (Figure 1.2). After the class is over, Antonio tries to send the slides of each class over the internet, at first he has a little difficulty, but as he tries a more few times, he is able to achieve the task without the help of

another person in the scene (Figure 1.3). After being successful, the video becomes available for the entire class. Junior, who is at home sick, turns on his iDTV and finds the slides without any difficulty because he is well-acquainted with the technology (Figure 1.4).

Figure 1: Scenes presented in the theater performance.

As we mentioned before, a second experiment was performed to communicate the defined requirements to Brazilian users, which is the subject of the next section.

5 EXPERIMENT 2

5.1 Method and Participants

The activities of this experiment were performed during our second trip to the town of Barreirinhas, Brazil from October 24th to 27th, 2007. These activities aimed to: i) inform residents about the iDTV services that were chosen to be implemented based on their needs. As previously mentioned, these needs were gathered by professionals of this research from a user field study that took place 8 months prior, on the first trip (Blind Review); and ii) explore new ideas and evaluate the design proposed for these iDTV services.

This experiment included 32 (thirty-two) participants (residents and workers), who were obtained from a list prepared with the names of the participants of the experiments of the 1st trip. However some participants were added to or removed from this original list. Just 9 users participated in all studies on both trips; the others (11) participated only in this experiment. The implication of this problematic was that the professionals of this research had to repeat a presentation that showed the interaction possibilities of existing iDTV applications and an explication

about SAMBA project goals. Participants could also use these applications to understand better the technology.

We held 5 workshops. Each workshop included 5 to 9 users organized by themes (such as entertainment, communication, business, retirement, and content production).

The workshops lasted an average of 5 hours and were accomplished by 4 professionals, being 2 professionals in Usability (one of whom is the author of this paper), and 2 professionals from the area of the Cognitive Psychology. Each workshop was organized in three moments: i) Moment of reception, which consisted of a presentation of the main goals of the workshop and having as a resulting artifact the informed consent by the users; ii) Moment of presentation of the recorded video illustrating the theater performance of the first experiment; and iii) Moment of enactments, when scenarios were acted out by users in their own physical and social environment and cultural context. Participants received a script similar to the one they watched in the recorded video. In the script, they were encouraged to act out scenes using computers, cell phones, remote controls and TV sets in order to visualize content, and/or to access iDTV services or to produce content. The given script was not the same for the following reasons: i) in the plays, we had just three actors, here we had a higher number of participants; ii) the participants were motivated to explore different characteristics and needs of every other participant; iii) the content had to be related to the participants' own interests; iv) we wanted them to act out the scene in their own context of use (not in a theater building, as shown before); finally, v) we wanted them to be free and not to influence their way of thinking.

The next two sections refer respectively to users' engagement in the second and third moments, mentioned above.

5.2 Illustrating the Theater with Prototypes

Each workshop only worked with the parts of the recorded video that illustrated the scenarios in which the characters involved represented the categories of the participants in that workshop.

Figure 2 illustrates a group of participants watching the recorded video making comments and opinions on the scenes. To improve the participants' understanding of what the characters did while using a particular device, we inserted the low-fidelity prototypes into the scenes of the theatre. The prototypes did not present any graphic layout of

either iDTV applications or CCF for web. They were aimed at illustrating the functionalities visually described in the scenarios.

The prototypes were in Portuguese because they were applied in the process of validation of Brazilian users' needs. When these prototypes will be used to validate the Italian users' needs, English and Italian versions must be generated.

Figure 2: Users watching the video.

The professional who moderated the session rewound the video as often as necessary. It was not her goal to validate the user interfaces shown. This is the reason she did not encourage them to use the prototypes. The professional took notes of all the participants' opinions and reactions.

5.3 Enactments in Experience Prototyping

After the video presentation, the professionals initiated this third moment, telling participants that they will assume different roles in order to show us several real-life situations using iDTV. Specifically, it was a dual-task experiment: first they had to elaborate a script and afterwards they acted it out.

We asked them to focus on successful experiences, illustrating the benefits of this technology in their lives and for the entire community. Barreirinhas is a town that is destitute of households and other places with direct and continual contact with computers. Residents usually access the Internet through coffee shops, offices or schools. The town's socio-economic conditions generally do not favor the existence of a good communication structure (such as broadband internet access), but residents make the most sophisticated acquisitions of cell phones and TVs.

Participants were told that their cooperation was very important because the more the situations were representative of their needs and lives, the more efficient the play would be to us. Consequently, we could come back the next year with a system that would be most appropriate for them. We also said that they could improvise the way in which they

interact with the devices and/or with the other players.

Each experiment took from one to three hours, with the participation of a moderator. The participants had several rehearsals until they were satisfied. The moderator made a few interventions, only when it was necessary. Technological errors were immediately clarified, as for instance, there is no need to turn on the Set-top-box when a content producer uses the web system to create content that will be broadcast to TV afterwards. Participants performed their tasks using several resources, such as: papers, appliances, electronic devices, and prototypes.

Figure 3 depicts a scene performed by a group of teachers (participants) in a school room. They are playing two activities: first they evaluate the results of a poll (an iDTV service), which was obtained through an iDTV application. All of the school communities participated of this poll to choose the theme about the culture of the town to be studied. Then they define the strategies to describe the theme by pretending they are using the CCF.

Figure 3: Content producers playing strategies to describe content using SAMBA products.

6 RESULTS

In this section, we will describe the results by addressing the purposes of the application of theatrical techniques to communicate interaction design solutions related to the first experiment (section 4.3) and to promote participatory design related to the second experiment (section 5.3).

6.1 An Analysis of the Theater Technique as a Resource to Communicate the Purposes of Interaction Scenarios Objectively

Comments provided by the stakeholders (which were collected by applying a questionnaire after the theater presentation) were analyzed. After similar and convergent answers were separated into groups, the three categories were identified: Understanding the services to be offered; Communication Type, and Involvement with the Content. To identify the comments, the letter "S" (for Stakeholder) was adopted, enumerating it according to the quantity of people that participated in the study.

The category *Understanding the services to be offered* refers to a way of knowing and understanding, in a unique way, of the purposes, benefits, and solutions that Project SAMBA is capable of providing. The highlighted comments of S1 and S3 provided this affirmation: "It was an important point to clarify the Samba objectives" and "The scenes represent the diverse situations that the users will experience with SAMBA's products." Other participants felt as if the hypothetical situations presented in the theater performance were real, thereby establishing diverse connections with the concrete situations. The phrases: "It shows real life" and "The scenarios were quite realistic" said by S1 and S13, respectively, confirm the foregoing definition.

In the category *Communication Type,* several aspects were considered, such as objectivity and clarity of communication, in order to avoid blockage, noise and filtering-elements that characterize a type of communication that does not occur in a proper way or that is not successful in its objective of communicating. It is understood that the rhythm in which the scenarios were presented contributed to the pragmatism, objectivity, and quickness of the message. We were able to observe the valorization of these requisites by S14 and S10: "It is more direct, easy, engaging with the content than a written explanation."

Referring to the category *Involvement with the Content*, this is observed in the audience's feeling of credibility in the level of development of this study, their opinion about the characteristics of Project SAMBA, and their feeling of valorization for being part of an original study. Therefore, we point out the following comments: "I felt comfortable seeing images in action a plus words (and not just words), because it made the transmission of ideas and concepts clear, obtained during the process of defining users' needs (the results of users' field studies)" said by S7 and "It was a nice work, and I'm proud of participating of this team." said by S 11.

6.2 An Analysis of the Theater Technique to Explore New Ideas with Users

During the enactments, participants represented their ideas and behavior in an improvised and spontaneous way. We analyzed their representation and will discuss here their contribution to this project according to the following important points:

Definition of New Requirements. Participants (5) (aged from 13 to 25) that worked with the Communication theme took roles to rapidly organize a meeting with several teenagers of the town. They played using several devices, but the cell phone was the most important device for the fastest communication. Taking into account their familiarity with this technology, they interacted with several friends by sending messages that were seen on their friends' TVs. This play allowed us to gather new technological insights (such as having interaction with TV through SMS). Requirements and information expressed by users were written down for analysis and definition of priority;

Users´ Acceptance to use this Technology. In (Furtado et al, 2008), we have described an investigation about the appropriation of Digital TV by the users identifying issues related to the non acceptance, influenced by the way the technology will be owned, by the topology of the city and by the life style of the population. Human and contextual factors help them to overcome these issues as soon as the fact that this project is funded by the European Commission;

Behavior of the Players. Usually almost all of the participants acted, while a few took the role of audience. This happened particularly in the group of elderly people. From 9 participants, just 6 played roles (such as lawyers and judges nearing retirement) to represent the problematic of getting information about their retirement rights. We did not force those who wanted just to be viewers. Sometimes they contributed to the scenario being presented by giving their opinions during the rehearsals;

Improvisation. As we expected, no group tried to play a scenario following the drawings of the service prototypes. Instead they pretended to be using a SAMBA product. They wanted to be free to interpret a situation they have often and they did not feel comfortable with the details of this new way of interacting;

Sense of Responsibility. When Content producers played strategies to describe contents, they were very concerned with involving the community in the content production. They realized that content producers cannot continue to operate in the same old ways. The business model for Digital TV should be similar to the web model, in which users can create their own video and post it. The success of this play made us select this group to go on working with people of the town in order to elaborate a network of content producers, which entails a culture of convergence and;

TV in Social Spaces. Social contexts have a strong impact on the attitudes of TV viewers. In many scenes, watching TV appeared as a group activity. Viewers eat together and make comments while watching TV. This attitude shows the social value of this communication resource. We propose these results to be better explored afterwards in order to redesign interactive resources and promote interaction by groups.

7 DISCUSSION

Presenting videos to users brought a number of benefits to the project: i) it was possible to show the results of the user field study in an entertaining way, and with no travel costs to bring all of the theater professionals; and ii) it worked as a persuasion technique in function of the quality of the scenes shown in the video. These aspects encouraged participants to have this "sophisticated" TV (as they called it) in their homes.

Users were very attentive to the contexts experienced in the scenes (town, schools, hotels, etc.), and wanted to know which households, shops, organizations of Barreirinhas will get digital TV. We gave them explanations about the telecommunication infrastructure that was necessary to have in order to provide viewers with interactivity on TV and return channels. The beneficiaries have to live or work in the area having this structure.

In summary, the situated and participatory practices described herein led the participants of the second experiment to relate their real situations with imaginary solutions of iDTV services. The analysis of these practices allowed professionals to further the understanding of how the services will be used by identifying: i) what services´ characteristics (as price, credibility, social activities, etc) elicit positive emotional responses (as pleasure, happiness, acceptance) from users, ii) in which environments the services will be used (in public or private spaces), and; iii) with whom and by whom (as the potential content producers) they will be used. In addition, professionals could reflect on the implications for design. They defined new requirements that, upon

acceptance, can lead to adding new services in the product explored in design sessions.

As an open question, we can highlight that since realism is important to explore new ideas and validate a design proposal, it is important to improve our ability to gather empirical data in the most realistic settings possible. The field study presented as part of our second experiment begins to address this need by demonstrating the effectiveness of the role-playing experience *in situ*. However, it remains an open question how to improve our ability to simulate real events occurring (such as interruptions in the broadcast of a TV program) that have some influence on the users' behavior and on their difficulty in using the technology.

8 CONCLUSIONS

In this text, we argue that understanding the users' needs with technology is a difficult task to accomplish for professionals responsible for the development of innovative technologies.

We showed that feedback from users comes from different ways, and professionals should provide them with opportunities to express their emotional reactions as if the technology were part of their lives. Experience prototyping strategies matched to theatrical techniques were used and provided the professionals of this case study with useful information about users and their context of use.

We also showed how to properly communicate this understanding to the other members of the team as well as to the users themselves. Several situations were played, videotaped, and after analysis, interaction scenarios were (re-) defined, illustrated and played in participatory design sessions in an iterative way.

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