SCENARIO-BASED DESIGN - AN ESSENTIAL INSTRUMENT FOR AN INNOVATIVE TARGET APPLICATION
Case Report

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Abstract: Scenario-based design is a largely accepted method within the literature on Human-Computer Interaction and, for certain cases, also within the literature on Software Engineering. However, the lack of integration between these two areas, in addition to the lack of attention paid to the actual (and still quite infrequent) use of scenario-based design, stresses the need for increased emphasis on the relevance of scenario-based design applied to projects of truly innovative technological artefacts. In the present paper, we will present a case report whereby the above mentioned method, when applied to problem-analysis, led to the project of a differential user-interface environment when compared to the human process prior to the introduction of the computational application.

1 INTRODUCTION

Scenario-based design is a largely accepted method within the literature on Human-Computer Interaction (HCI) and, for certain cases, also within the literature on Software Engineering (SE) behind object oriented use-cases (Button and Sharrock, 1994; Cockburn, 1997; Sommerville, 2000; Bittner and Spence, 2002; Bezerra, 2007). However, the lack of formal, solid integration between these two areas (i.e. HCI and SE), in addition to the lack of attention paid to the actual (and still quite infrequent) use of scenario-based design, stresses the need for increased emphasis on the relevance of scenario-based design applied to projects of truly innovative technological artefacts.

A scenario is a story with characters, events, products and environments. They help the designer to explore ideas and the ramifications of design decisions in particular, concrete situations. Storyboards, one alternative representation for scenarios, are sequences of snapshots which focus on the main actions in a possible situation. By using these techniches, designers are able to move from existing (documented) to potential interactions and hence to antecipate problems. (Preece et al., 1994) Scenarios force designers to consider the range of users who will use the system and the range of activities for which they will use it. The user space is defined by the variety of users, work and environment in which the interaction will take place. Scenarios are used to male concrete

particular combinations of these dimensions. (Tognazzini, 1992 apud Preece et al., 1994) A significant number of authors claim thar scenarios help extracting requirements (Achour, 1999; B"dker, 1999; Dourish, 2001; Suchman, 1987).

In the present paper, we will present a case report whereby the focus on the development of scenario-based design applied to the activity to be supported by the application led to the project of a differential user-interface environment when compared to the human process prior to the introduction of the computational application.

The present case report concerns the activities of a non-governmental organisation of a developing country whose main objective is to lower the countrys infant mortality rates, particularly in the poorer areas. This Institution has a hierarchical structure, namely a National Coordination (which is made up of experts from several different knowledge areas, amongst which are Paediatrics, Gynaecology, Obstetrics, Epidemiology and Nutrition) and voluntary workers (community leaders). Other organisations also support the Institution such as universities, governmental organisations, as well as other non-governmental organisations in the field of health and other areas of interest and so do individual volunteers mainly researchers and technicians who dedicate part of their time to the initiatives of the Institution. All potential contributors (both individuals and enterprises) may take part in the institutional activi-

ties, with equal rights.

In addition to the organisational structure and the community leaders relentless work, what actually ensures the efficiency and effectiveness of the Institutions work is the Leaders Guide. The Leaders Guide is a technical-instructive manual divided into chapters dedicated to crucial issues concerning the fight against infant mortality and, ultimately, the achievement of full civil rights for all community members. Guided by this material, the leaders go through their communities and instruct families mainly about basic care during pregnancy and the neonatal period, as well as about the main measures against infant malnutrition. However, health and nutrition are not the only topics included in the Leaders Guide, seeing as other factors also contribute to the subhuman life some of these families lead, hence worsening any possible cases of infant malnutrition.

The National Coordination, together with community representatives, other organisations and individual volunteers, put the Leaders Guide together a couple of years ago. Due to its dynamic nature (a certain eradicated disease may afflict the population once again, or a new epidemic may call national attention), the National Coordination updates the material on a yearly basis. The updates are based upon suggestions collected throughout the previous year through personal contacts, via telephone, fax and e-mail. They also take into account the suggestions made at their Annual Conference, where the new issue of the Leaders Guide is only one of many topics on the agenda. The amount of effort put into these updates is, therefore, significant, since all suggestions obtained through several different means of communication must be compiled, after which they must be discussed and passed, one by one, during the Annual Conference. Despite the colossal amount of work it takes, these annual updates ensure the efficiency and effectiveness of the Institutions initiatives, as its Coordinators assert and reassert every year.

According to the potential users, the main problem that led to the application yet to be developed consisted of the difficulties which, in turn, comes be easily solved by WEB applications, namely the geographic distribution within such a large country (which makes it difficult for contributors to get together) and the precariousness of the means of communication available to collect all suggestions (which prevents people to contribute as often as they could). In this context, the initial objective was to develop a WEB environment for successfully collecting these suggestions.

2 METHODOLOGY

We based our methodology on the development of the scenario-based design according to the hypothetical problems and the main topic of the present project, i.e. collecting suggestions (data entry) across the country. This scenario was developed to fit both the existing human procedures pointing, additionally, to procedural hindrances not originally reported and the proposed WEB environment gradually revealing the innovative potential of the technological artefact, restating the cycle of technology evolution (Carroll, 2003).

The development of sub-scenarios associated to data entry, which in turn was made possible through the analysis of the documents associeted to the human procedures of suggestion collection already described above, dynamically delineated our methodology. Indeed, thanks to this methodology, we were able to significantly improve both the process of data entry (entry of suggestions, discussion and decision) and the product itself (the WEB application).

The methodology consisted of the following steps:

1. **Identification of the Several Elements which make up a Chapter of the Leaders Guide.** This step consisted of the exhaustive analysis of the suggestions included in the documents available. During this step, we learned that a typical chapter always contains the following elements: a title, subtitles, a biblical quotation, initial call to the leaders, the body of the text (in paragraphs), photos with keys, closing call to the leaders (see Figure 1). We also noticed that only the elements belonging to the middle of the chapters (i.e. paragraphs and photos) could be repeated and randomly interposed. Finally, all pages contained contextualisation elements, such as chapter title and page number;

2. **Identification of Suggested Actions for each Kind of Chapter Element.** At this point, we realised that for the text itself there were suggestions concerning the style, the spelling and the register of the text (such as the substitution of sentences as, for instance, Oral hygiene must be carried out with the toothbrush at an angle of 45 to the teeth, for simpler, easily understandable sentences considering the target public). As for the photos, some suggestions referred both to technical aspects (such as contrast problems) and to their content itself (as, for example, the replacement of the photo of a female leader for the photo of a male leader, so as to discourage the discrimination of men who engage themselves in the project). We associated each of the chapter elements to a set of actions, all derived from the documents on the

human procedures of data collection;

3. **"Semantic regularity" of the actions.** The main objective of this step was to complete, from the point of view of semantic expressiveness, the set of actions ascribed to each chapter element. The main reason why this step is so essential is the fact that the documents analysed were the result of one instance of the process and, therefore, were incomplete in terms of time. This is why some of the additional actions were complementary, controversial, etc.;

4. **Analysis of the Actions Ascribed to each Chapter Element so as to Determine its Relevance to other Chapter Elements.** An analogous reason justifies this step. One example is spelling correction, which is relevant not only for the body of the text, but also for titles, keys, references, etc.;

5. **Identification and Classification of other Potential Suggestion Targets.** Through this step we mainly established that, in addition to the content of the chapters, a potential suggestion target could be the thematic focus of the chapter. Furthermore, we assessed the complexity and comprehensiveness of the topics on the one hand we have topics to which more than one chapter is dedicated and, on the other hand, we have topics whose nature is interdisciplinary. Indeed, this additional insight revealed the inherent, underlying difficulty in the process of suggestion entry;

6. **Analysis of Ambiguous Suggestions made by Community Leaders during the Annual Conference.** This was one of the most relevant steps because the leaders, despite having an enormous potential to help due to their proximity to community members, are mostly poorly educated people. We found two kinds of ambiguity. The first was the omission of the action to be carried out in relation to the object mentioned, such as "branchial clef", "pregnancy card", "Gertrude, the doll" (doll used for teaching the sexual organs), all of which are noun phrases used in chapters content of the Leaders Guide. The second kind was named total ambiguity, i.e. suggestions whose objects could not be identified, such as "influence of the environment on childrens health" (nothing about that topic is mentioned in the Guide), "diet for babies over six months-old" (the Guide does not mention that either), and "How to use enriched flour". The main objective of the present step was to define which kind of information the system should display, as well as which kind of information it should required so as to minimise the occurrence of ambiguities in the virtual environment;

7. **Design of the User-interface Environment.** Based on all previous steps, we carried out this step aiming at developing a truly innovative technological tool. This way, by the end of the project, we had created a collaborative environment that offered not only a universal and ongoing suggestion posting mechanism thus fulfilling the initial objective , but also, and more importantly, new possibilities and functions which were not available in the previous process, prior to the introduction of technology.

Figure 1: Leaders Guide: Chapter Elements (*element type*).

3 PROPOSED ENVIRONMENT: A SKETCH

Taking both the abovementioned steps and the discussions with potential users, which together helped determine some of the innovative requirements associated to the main scenario (i.e. suggestion entry for the Leaders Guide updates), we sketched the environment. Our solution basically consists of the division of suggestion entry into two phases, as follows: firstly, users have to set the target object of the suggestion and, then, enter the suggestion itself. In the following sections we will describe all information and procedures that concern the process as a whole.

3.1 Setting the Target Object of the Suggestions

During this phase of target setting, we took into consideration the different object types derived from the actual suggestions in the documents available. We then came up with three possibilities, as follows: the "Table of Contents" (displayed as hypertext, enabling access to its specific components on request), the "Topic" itself and "Others" (comprising those suggestions which do not fit into the other two categories). This last type would include socio-political suggestions concerning the Leaders Guide as a whole, as well as suggestions about the work methodology itself. An instance of a suggestion that would be inserted into this last category is the following: "My impression is that the Leaders Guide instructs leaders cognitively, but fails to teach about the exact methodology through which all this knowledge can be applied to the target families". The several types of information that make up this screen are shown in Figure 2.

The interaction dynamics of the process of choosing one of the Guides components basically consists of selecting the section of interest by clicking the correspondent link in the Table of Contents. After that, the screen of the beginning of the session will be displayed, and users will be able to choose from the elements available. Once the element has been selected, the system will then display a list of suggestions under discussion, so as to avoid repetitions. Only after this discussion page has been thoroughly examined can users access the actual suggestion entry page.

If instead users choose to select a topic as the object of their suggestion, they will then be asked to select from the thematic tree in which all topics mentioned in the Leaders Guide are organised. It is essential to bear in mind that a single topic may be mentioned in more than one chapter; similarly, a single

chapter may mention more than one topic. This is why we decided to enable the Table of Contents together with the thematic menu, as an alternative. Another aspect to be taken into consideration is the interdisciplinary nature of some of the topics. In this case, the system will automatically choose the area to which the topic is most closely related. This correlation between topics and specialisation areas will be established by the head of each area within the National Coordination, aiming at correctly associating suggestions and areas to facilitate dialogue moderation once the suggestion has been posted.

Finally, based on the analysis of the suggestions collected through the human procedure, we feel that the option "Others" is paramount. Indeed, a wide range of suggestions referred to the material as a whole, to its political focus, to the work methodology within the Institution, etc.

Figure 2: Menu for setting the target object of the suggestion to be posted: information structure.

3.2 The Process of Suggestion Posting Itself

The process of suggestion posting about one of the Guides components is enabled through a screen with data entry, as shown in Figure 3.
However, when the suggestion concerns a "Topics" or belongs to the "Others" category (the latter in-

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Text suggestion:

We are all God's creatures... But are you sure all
people, particularly children, are being taken care of,
protected and educated as God would want them to
be? Can we look at the world we are building together
and say everything is OK? (replica of the object
selected in the previous step)

  Select the action                              V
  Correct spelling
  Improve the text
  Use colloquial language
  Use technical language
  Develop the idea further
  Summarise the idea
  (set of options according to the Guide's component)

  Complement your suggestion:
  (text box for free entry)

  Explain the importance of your suggestion:
  (text box for free entry)
                               Post suggestion (button)
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Figure 3: Suggestion entry screen: Information structure (*commentaries for the readers*).

cluding more reflections than actual suggestions) the system will display an open entry screen. It is important to mention that most contributions belonging to these categories are entered by both governmental and non-governmental socio-technical organisations, which means that for this case the readability is often high. Thanks to this factor, we believe that a mere reproduction of the human procedure (i.e. open entry) is relevant and justifiable.

4 CONCLUSIONS AND FUTURE WORK

In the present article, we described a case in which the use of scenarios supported by the application led to the project of a user-interface environment with a differential interaction when compared to the human procedure, prior to the introduction of technology.

Designed, at first, to solve problems of geographic extension and difficulties in enabling ongoing contributions, the environment we proposed ended up offering possibilities before inexistent, thereby characterising an innovative technological artefact.

In summary, through a methodology developed to make full use of the semantic potential of the documents on suggestion entry (prior to the introduction of technology), we created an environment capable of, amongst others things, minimising ambiguity (or at least significantly minimising the likelihood of its occurrence) in the most commonly posted suggestions

(i.e. the ones belonging to one of the Guides components); lending visibility to each suggestion posted; encouraging "democratic" debates (with ongoing access to all different users profiles, allowing users to comment on all suggestions); ensuring that a technical reply will be provided, including a justification to the author of the suggestion (visible to the entire community), thus showing respect to each individual contributor; registering suggestions, decisions and justifications (also enabling future access); generating, by the end of the systems availability period, a report with all suggestions posted, along with its respective decisions and justifications, so as to assist in the process of compilation of the new issue of the Leaders Guide.

The example described here makes it clear that scenario-based design is a feasible method for the analysis and development of real systems, constituting a differential factor in projects of innovative information systems.

As future work we can quote the systema implementation followed by an experiment with real users.

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