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Adoption of the Personas Technique in the Open Source Software Development Process

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ABSTRACT

The growth in the number of non-developer open source software (OSS) application users and the escalating use of these applications have led to the need and interest in developing usable OSS. OSS communities do not generally know how to apply usability techniques and are unclear about which techniques to use in each activity of the development process. The aim of our research is to adopt the Personas usability technique in the PSeInt OSS project and determine the feasibility of adapting the technique for application. To do this, we participated as volunteers in the project. We used the case study research method during technique application and participation in the community. As a result, we identified adverse conditions that were an obstacle to technique application and modified the technique to make it applicable. We can conclude from our experience that these changes were helpful for applying the technique, although it was not easy to recruit OSS users to participate in usability technique application.

CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)** → **HCI design and evaluation methods** → **Usability testing**

Keywords

Open Source Software; Usability Techniques; Requirements Engineering; User Analysis; Personas.

1. INTRODUCTION

OSS has spread so swiftly that it now rivals commercial software systems [1]. OSS communities do not as yet enact standard processes capable of ensuring that the software that they develop has the attributes of good software [2]. The inadequate definition of processes, activities, tasks and techniques within OSS development has led researchers from several areas to gravitate towards this field of research with the aim of correcting this situation.

Usability is one of the key quality attributes in software development. In recent years, OSS has come to be an important part of computing. However, several authors have acknowledged that the usability of OSS is poor [3–5]. In this respect, the empirical study conducted by Raza et al. [6] reports that 60% of respondents (non-developer users) stated that poor usability is the main obstacle that OSS applications have to overcome if users are to migrate away from commercial software. On this ground, OSS projects must tackle the usability level and usability-related problems at length [5].

On one hand, the HCI field offers usability techniques whose key aim is to build usable software. However, they are applied as part of HCI methods and not within the OSS development process. On the other hand, the OSS development process focuses on source code and thus on the development of functionalities. The OSS development process has a number of features (like functionality-focused development) which prevent many of the HCI usability techniques from being adopted directly [7]. This community has now started to adopt some usability techniques. Most of the techniques taken on board by the community are for evaluating usability [7], whereas it has not adopted many techniques related to requirements analysis and design. Some techniques have been adapted ad hoc for adoption in OSS development projects [7]. Only a few research papers have reported the use of the Personas technique in OSS developments [4][8]. According to Çetyn and Gokturk [4], the information required to apply the Personas technique was gathered from descriptions provided by the OSS community and not through face-to-face interviews with user groups [9]. The paper by Faily and Lyle [8] describes four guidelines that software engineering tools should incorporate to support the design and evolution of personas. These guidelines are based on their experiences of modifying the open source CAIRIS Requirements Management tool to support design and development activities for the EU FP7 webinos Project.

This paper addresses the research problem of how to adopt the Personas usability technique within the OSS development process, and particularly within a real OSS project called PSeInt¹. To do this, we previously identified which problems had to be solved in order to be able to apply the technique.

Some authors claim that the main reasons for the generally poor usability of OSS developments are that OSS developers have tended to develop software for themselves [10] and that the development community is uninformed about who its users are [3]. The Personas technique outputs representations of end users (called personas) that are a useful guide for designing applications always with the user in mind and preventing developers from developing for themselves [11]. In other words, the technique helps to solve the above OSS development problems (developers uninformed about users developing for themselves). On this ground, we have selected the Personas usability technique for adoption in the PSeInt project.

This paper is organized as follows. Section 2 describes the research method followed to apply the usability technique. Section 3 describes the proposed solution. Section 4 discusses the results. Finally, Section 5 outlines the conclusions and future research.

¹ <http://pseint.sourceforge.net>

2. RESEARCH METHOD

In order to validate our proposal for adopting the Personas technique in OSS development projects (particularly in PSeInt), we had to volunteer for this project. This is equivalent to being members of the OSS community of volunteers. The case study is the best research method for carrying out this validation. On this ground, we followed the guidelines set out by Runenson et al. [12]. This research method is used when the phenomenon under study (in this case, the adoption of techniques with adaptations) is studied within its real-world context (in this case, OSS projects).

3. PROPOSED SOLUTION

In this section, we briefly describe the Personas usability technique applied in an OSS Project. First, we specify the characteristics of the selected OSS project (PSeInt). Second, we describe the Personas technique as prescribed by HCI, followed by the details of the changes made to this technique for application to the OSS project. Finally, we report the results of applying the Personas technique.

3.1 Case Study Design

The case study is one of the most popular forms of qualitative empirical research. A case study investigates the phenomenon of interest in its real-world context. To be exact, the phenomenon of interest for this research is the adoption of the Personas technique with adaptations, whereas the real-world context is an OSS project. We will give a general description of the procedure enacted to perform the case study. Our case study is based on the research question:

RQ: Is it possible to determine whether some adaptations of the Personas usability technique would enable its adoption in a real OSS project?

PSeInt is the selected OSS project in which the Personas technique is to be adopted. PSeInt is software that uses a simple, intuitive pseudo language written in Spanish designed to help students without programming experience to understand basic and fundamental concepts of a computational algorithm.

3.2 Changes to the Personas Usability Technique

According to HCI recommendations, the aim of the Personas technique is to output a representation of end users as guidance for application design [11]. This technique is capable of gathering, analysing and synthesizing information related to users that will interact with the software system and, therefore, help to focus software analysis and design on the features and objectives of the product end user [13]. The Personas technique cannot be applied directly in the OSS development process because the OSS community has characteristics to which the HCI world is unaccustomed, including, for example, the geographic distribution of its members all over the world, a code-centred world view, a shortage of resources and a culture that can be somewhat alien to interaction developers. Cooper et al. [11], the father of the Personas technique, and some other researchers [14][15] propose procedures for systematically creating personas. Cooper et al.'s Personas technique [11] is composed of seven steps. In the following, we will describe the first step of this technique and report the adverse conditions that are an obstacle to its adoption in OSS developments. The aim of Step 1 of the technique (Identify behavioural variables) is to identify the behavioural variables of product end users (for example, attitude towards information technologies). Cooper et al. [11] suggest that users be interviewed

to gather the necessary information from which to put together the behavioural variables. However, OSS project users are geographically distributed all around the world. Thus, this characteristic of OSS projects is an adverse condition for technique application. We have conducted a similar analysis in order to identify the adverse conditions associated with all seven steps of the Personas technique.

Table 1 summarizes the identified adverse conditions and the key adaptations proposed for Cooper et al.'s Personas technique [11]. There are two main adaptations. First, user participation is online. Second, usability experts are replaced by developers, expert users or HCI students under the supervision of a mentor. In this particular case, the expert was replaced by a group of HCI students under the supervision of a mentor. Note that these were final-year Master in Information and Communications Research and Innovation students and had taken two HCI subjects. Additionally, the students were supervised by two senior usability researchers. On this ground, there is no risk of the application of the proposed adaptation for the Personas technique having a negative impact on software quality.

Table 1. Summary of the identified adverse conditions and the proposed adaptations for the Personas technique

| Technique Steps [11] | Adverse Conditions | Proposed Adaptations |
|---|--|--|
| 1. Identify behavioural variables | • People or spaces are unavailable. | • User participation is online. |
| 2. Map interviewed subjects to behavioural variables | • The tasks associated with these steps are not specified. | • The tasks associated with each step are detailed. |
| 3. Identify significant behaviour patterns | • This requires the expertise of people familiar with the technique and usability. | • The expert may be a developer, a user experienced in the OSS project or a HCI student. |
| 4. Synthesize key characteristics and goals of personas | • The format of the document associated with this step is not specified. | • The format for the output product is specified. |
| | • This requires the expertise of people familiar with the technique and usability. | • The expert may be a developer, a user experienced in the OSS project or a HCI student (under the supervision of a mentor). |
| 5. Check for redundancy and completeness | • The tasks associated with these steps are not specified. | • The tasks associated with each step are detailed. |
| 6. Expand the description of personas attributes | • This requires the expertise of people familiar with the technique and usability. | • The expert may be a developer, a user experienced in the OSS project or a HCI student (under the supervision of a mentor). |
| 7. Define and denote type of personas | | |

Table 2 shows the tasks that are carried out for each of the steps of the adapted technique that we propose. There follows an example illustrating the tasks required to carry out the proposed adaptations for Steps 1 and 2 of the Personas technique. In Step 1, the identified obstacle to gathering information was the potential bias with respect to the characteristics of the personas to be built. In order to overcome this obstacle, we propose to administer an online survey that we have applied to two user groups: one

recruited from a community forum and the other through social networks. Thanks to this survey, we were able to gather demographic data about users, their computer literacy and information related to the use of PSeInt.

Table 2. Tasks of the adapted Personas technique steps

| Steps of the Adapted Personas Technique | Tasks |
|--|---|
| 1. Identify and map behavioural variables | 1. Administer a virtual survey to identify personas. |
| | 2. Group together the virtual survey data applied to the OSS and the social networks (SN) segments. |
| 2. Identify significant behaviour patterns from the behavioural variables in order to synthesize key characteristics and goals of personas | 3. Cluster the virtual survey data applied to the OSS and SN segments. |
| | 4. Analyse the virtual survey data on the OSS and SN segments. |
| | 5. Define personas. |
| 3. Check for redundancy and completeness | 6. Administer a virtual survey to the developer and user segments (selected at random). |
| | 7. Analyse the data from the virtual survey administered in Step 6. |
| | 8. Refine the created personas. |
| 4. Expand, describe and define personas types | 9. Designate primary and secondary personas. |

In Step 2, we believe that automated learning techniques like the k-means algorithm should be used in order to save classification time as the description of Cooper et al.'s Personas technique [11] does not specify the procedure to be enacted to group and cluster the gathered data. Other machine learning techniques (for example, CobWeb, EM) could be used to form clusters of n observations, where each observation is a group closer to the mean [16].

3.3 PSeInt Case Study Results

The process of recruiting real PSeInt users was troublesome because the project administrator did not reply to our request for cooperation. Consequently, we did not have access to an electronic mailing list of users, nor did we know which the most representative users of the applications were. In this scenario, we searched the PSeInt forum for user electronic mail addresses. Due to the low participation rate, however, we opted to promote the application in social networks. With the aim of gathering the information necessary to apply the Personas technique, we designed a survey which enabled us to identify behavioural variables related to attitude towards technology, computer literacy, application use frequency, motivation and purpose, profession or occupation. The PSeInt survey was built using Google Forms and is available for consultation online². The survey responses were classified in order to identify behavioural variables. The format of the survey items was scalar. We were, therefore, able to cluster a set of items by multiple values. We posted the PSeInt survey in an OSS forum at the SourceForge site and received only six responses over a period of seven days. In view of the low participation rate, we opted to administer the survey again, this time over social networks. The participation rate in this case was 55 users over a period of 15 days. This high concentration of responses formed a critical mass, thanks to which we were able to cluster the results and outline the personas. We used Weka software in order to analyse the responses to the PSeInt survey. In particular, we ran the k-means algorithms to

generate the clusters. K-means is a clustering method whose goal is to output two segments: cluster 1 and cluster 2. Cluster 1 is correlated to the primary and leading persona, and cluster 2 is correlated to secondary persona. The secondary persona has similar characteristics to the primary persona, save that it is related to the variables of computer literacy, tool user type and PSeInt expertise. Table 3 summarizes the variables and the dominant attribute in each cluster.

Table 3. Analysis of results using Weka software

| Variables/Attribute | Cluster 1 | Cluster 2 |
|---------------------|--------------------|--------------------|
| Age | 15-20 | 15-20 |
| Educational level | University student | University student |
| Computer literacy | Average | High |
| PSeInt user type | Beginner | Intermediate |
| PSeInt place of use | Education | Education |
| PSeInt user type | Occasional | Occasional |
| PSeInt expertise | Beginner | Advanced |

The identified primary and secondary personas are checked for redundancy and completeness. To do this, we surveyed a particular group of developers and users that represent these populations. The respondents answered questions related to the previously identified behavioural variables and a psychological test based on the Big Five model. The first survey³ is called Personas and the second survey⁴ is called Personality. Both are available online. The Personas survey was a useful instrument for validating the data gathered from the survey administered in Step 1 of the technique. Using the psychological test, we were able to examine the persona behaviour-related characteristics more thoroughly. Based on the data from the surveys and their respective analysis, we drew up the Personas foundation document. This document contains a synthesis of the key characteristics and goals of the created personas. Despite the trouble that we had recruiting real PSeInt users, the results are satisfactory because, thanks to the adaptations made to the Personas technique, we were able to validate that it is possible to adopt this technique in the selected OSS project.

4. DISCUSSION OF RESULTS

Communication with the PSeInt community was troublesome because not all the users were willing to participate in the application of the usability technique. This was evident from the low user participation rate (just six) in the survey distributed via the forum. This contrasted with users (students) recruited through social networks, who took a keen interest from the very first moment the survey was published. They even wanted to know how the technique would be applied and what it was like. During the application of the Personas technique to the PSeInt project, the key problem was user availability, as many are volunteers and had very little spare time. Apart from technique application problems, there were other difficulties regarding participant selection. These problems were mainly due to the fact that we did not manage to make contact with the project administrator. Consequently, we had no record of representative application users. In fact, we did not even have a list of users. Hence, we decided to search the SourceForge forum for users and later resorted to social networks. This is preliminary research. Therefore, more cases studies are required to validate the proposed adaptations. Note that there are other usability techniques (for example, user profiles, heuristic evaluation) that might benefit from the proposed adaptations (for

² <http://goo.gl/forms/mjBTUwYfRA>

³ <http://goo.gl/forms/yTKG7fRWdU>

⁴ <http://goo.gl/forms/ZNJWaOAfFi>

example, HCI students supervised by a mentor standing in for experts) to enhance technique adoption in the OSS development process.

5. CONCLUSIONS AND FUTURE RESEARCH

The aim of this research was to evaluate the feasibility of adopting adapted HCI usability techniques in OSS projects. To be precise, we adapted the Personas technique for application in the PSeInt project. It was by no means easy to find users to volunteer to apply the Personas technique. As mentioned, users generally have very little time, and it was hard to get them to participate without an incentive. We managed to identify the user segment or target audience through the application of the Personas technique. These user segments match up with two subgroups of university students (see Table 3), defined thanks to the information gathering material posted on social networks rather than to the participation of OSS community members (contacted through an OSS forum). We identified two main adverse conditions that are barriers to the application of Personas in OSS development projects: i) the need to have a usability expert to apply the technique, and ii) the unavailability of on-site users. In order to surmount these barriers, i) a HCI student or group of HCI students supervised by a mentor substitutes the usability expert, and ii) OSS users participate remotely, that is, through web artefacts, like online surveys. We believe that it is necessary to educate users and OSS community members generally to raise awareness of the importance of application usability and publicize existing usability techniques in order to encourage participation. As future research, we intend to conduct further case studies to adapt and apply more usability techniques in OSS projects in order to validate the proposed adaptations and study new web artefacts that can be adapted to OSS communities to improve communication.

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