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A Pilot Empirical Study of Applying a Usability Technique in an Open Source Software Project

Lucrecia Llerena¹, John W. Castro¹, Silvia T. Acuña¹

¹Depto de Ingeniería Informática, Universidad Autónoma de Madrid, Madrid, Spain

¹lucrecia.llerena@estudiante.uam.es, ¹john.castro@alumni.uam.es, ¹silvia.acunna@uam.es

ABSTRACT

Context: The growth in the number of non-technical open source software (OSS) application users and the escalating use of these applications have redoubled the need for, and interest in, developing usable OSS. OSS communities are unclear about which techniques to use in each development process activity. **Objective:** The aim of our research is to adapt a usability technique (visual brainstorming) to an OSS project and evaluate the feasibility of its application. **Method:** We used the case study research method to investigate technique application and participation in a project. To do this, we participated as volunteers in the HistoryCal project. **Results:** We identified adverse conditions that were an obstacle to technique application (like it was not easy to recruit OSS users to participate) and modified the technique to make it applicable. **Conclusion:** We conclude that these changes were helpful for applying the technique using web artifacts like blogs.

Keywords

Open Source Software; Usability Techniques; Visual Brainstorming.

1. Introduction

A common complaint about OSS applications is their poor usability, and efforts carried out to adopt usability research often come up against a number of difficulties (e.g., developers do not have an understanding of usability, there is a shortage of resources to focus on usability issues) [1]. On one hand, the human-computer interaction (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 feature development. Usability technique definition and integration into OSS projects is a complicated and underresearched process [2]. Some researchers suggest that usability techniques should be reconceptualized, but they do not explain how the OSS community should go about adaptation. Also, the issues to be taken into account to adopt usability techniques in OSS developments are unclear. Studies of the adoption of usability activities in the OSS development context have not addressed visual brainstorming (VB) as a usability method in the OSS context specifically on a single-developer OSS project. The VB technique involves idea-sketches used to explore alternative designs. A few studies have reported the application of the visual brainstorming (VB) technique in OSS projects [2][3]. In the Carrot2 project, the original application was redesigned according to its target end users. This project adopted the VB technique to generate ideas for designing the new interface [3]. This technique was applied as prescribed by HCI [3]. However, the VB technique reported by Terry et al. [2] was adapted for adoption to develop a bit map graphics application. In the adapted technique, ideas were gathered using a wiki instead of at face-to-face meetings as established by HCI. The wiki meant that anybody involved in the project could put forward their interface design ideas. This technique is widely used in non-OSS developments for improving application usability [4]. For example, Aryana et al. [5] used the VB technique to solve smartphone app usability problems related to cultural issues in Iran and Turkey. We address the research problem of how to adopt the VB usability technique [4] within a real small single-developer OSS project called HistoryCal. The precise research question is: Is it feasible to apply the proposed VB technique in the OSS HistoryCal project? To answer this question, we previously identified the problems that had to be solved in order to apply the technique. We chose VB because the use of this technique in the user interface (UI) design process has several benefits: it generates creative ideas for solving specific problems with positive results, it supports conceptual design by generating metaphors for UI architectures and providing new ways to implement old functionalities [4]. This paper is organized as follows. Section 2 describes the proposed solution. Section 3 analyzes technique application and discusses the results. Finally, Section 4 outlines the validity threats and the conclusions.

2. Proposed Solution

We used a case study as the qualitative research method to validate our research [6]. We use a non-experimental design, since we do not randomly assign subjects or control the groups. From a case study, we learn about the experiences of applying usability techniques adapted to OSS projects. This research method is used when the phenomenon under investigation (the adoption of the adapted VB usability technique) is studied within its real setting (the HistoryCal OSS project). In our research, we collect qualitative data (texts, images,

documents)^{1,2}. Small project teams in particular have little information about what techniques they have at their disposal for improving usability [8]. We start by looking at what happens in a real-world scenario and then we describe what happens when we apply the adapted techniques to improve application usability [6]. HistoryCal is a calculator designed to work with different world calendar schemes, calculating date ranges and ages based on these calendars. As shown in Figure 1(a), HistoryCal’s graphical UI has a lot of room for improvement. At the same time, it is a project of special interest since popular office suites do not usually include a date converter. HistoryCal is a small project with a single developer, who plays the role of both developer and administrator. This is an interesting project for conducting a pilot study before embarking on a larger-scale empirical study of the application of VB in OSS development. Generally, usability techniques cannot be applied directly, that is, as prescribed by HCI, in OSS development projects because the OSS community has characteristics that are uncommon in the HCI world, like, for example, the worldwide geographic distribution of its members, a code-focused vision of the world and limited resources [1]. Additionally, a key characteristic of many OSS communities is that their members (i.e., developers and real end users) collaborate voluntarily [1]. As a result, the recruitment and retention of new real end users to report usability issues is a critical success factor for a OSS project [7]. This means that usability issues are less likely to be reported in an OSS project with few contributors. This point is important since most OSS projects are one-developer projects, while the large and well-known OSS projects typically have a dedicated usability or UX team. Although there are many highly professionalized open source communities (e.g., Linux, OpenStack, Mozilla, Ubuntu), our research focuses exclusively on small projects with limited resources. Earlier research has already addressed usability activities in larger OSS projects, whereas there is a shortage of similar studies concerning small-sized OSS projects. Besides, OSS has some characteristics in common with other types of software development like global software development (GSD), where collaborative members with cultural differences are separated by distance and work in different time zones. Therefore, the proposed adaptations could be extrapolated to deal with some of the negative issues facing the GSD field. Even though usability techniques demand conditions that, as a rule, OSS projects cannot meet, the techniques can be adapted to bring them into line with the idiosyncrasy of the OSS world [2]. There are different procedures for applying the VB technique. Although they are all very similar, the procedure proposed by Wilson [4] is a good option for user-centered development processes because it gives a simple description of the steps for applying this technique, which are not specified by any of the researched procedures. According to Wilson [4], this technique is composed of four steps. Table 1 summarizes the steps, identified adverse conditions and proposed adaptations for the VB technique [4]. There are two adaptations. First, real end users participate online through web artifacts (e.g., a blog). Second, the usability expert is substituted by a HCI student or group of students under the supervision of a mentor. In this case, the expert was replaced by a HCI student supervised by a mentor. Rajanen [8] studied the practical implications of the participation of HCI students in OSS projects with satisfactory results. The above adaptations preserve the key characteristics of the technique, such as the construction of new and better ideas based on proposals by others and the preference for visual concepts for problem solving.

Table 1. Steps, adverse conditions and proposed adaptations

Steps [4]	Adverse conditions	Proposed adaptations
1. Users meet to apply the technique	User participation at face-to-face meetings is required.	Participants post comments on their and other people’s interface designs in web artifacts (e.g., blog), and also uploading their designs.
2. Users submit their design tips (in the form of mock-ups)	Users are located at different geographical sites.	
3. Participants evaluate the designs	Participants are not at the same geographical location.	
4. An expert designs the final interface	A usability expert specializing in the technique is required.	The expert is replaced by a HCI student or group of students supervised by a mentor.

3. Analysis of VB technique application

In order to conduct our research, we asked the project administrator for permission to apply the VB technique to the HistoryCal project. The administrator was not very familiar with usability issues in the software development process. While he was acquainted with the concept of usability, his knowledge of usability techniques was limited. The project did not have a usability manager. Additionally, the administrator had not considered usability criteria in the design of the HistoryCal UI. We had difficulties recruiting real end users to participate in technique application because the developer did not have a list of HistoryCal user emails. As we did not have access to this list of real end users, we posted messages on the project forum, webpage and LinkedIn, inviting users to participate in the application of the VB technique. Finally, only five responses were

¹ <https://historycalhci.wordpress.com>

² <https://historycalhcies.wordpress.com>

received from all the contacted users: two users highlighted that they had trouble understanding how the application worked and that an example should be added, such as the input date in the selected format, another user suggested adding a calendar as an input data picker control, the fourth user proposed adding a feature to calculate dates prior to our era, and the fifth user underlined that the application should be internationalized. A group of three to four people is the ideal number for applying the VB technique [4]. In this case, we recruited five OSS users. This is a large enough number of users to be able to apply the VB technique. The VB technique was applied by creating two blogs on the WordPress platform: one in English¹ and the other in Spanish². We built two versions of the blog because not all the recruited users were fluent in English and the developer did not understand Spanish. When the users (all native Spanish speakers) submitted their design tips or comments by email to one of the authors of this paper, they were translated into English and published on both blogs. Then, the developer examined and responded to/commented on the tips or comments. All this feedback was published on the blog. Users were not asked to perform a particular task with the HistoryCal tool. Additionally, the developer responses/comments were translated and published on the Spanish blog. There is no risk of getting a low quality translation of these comments because they were validated by a bilingual member of the research team.

4. Discussion of Results

By applying the VB technique to the HistoryCal project, we were able to confirm that it is very hard to get a representative set of real end users [9] because of the characteristics of this type of small project. However, our experience of participating in large projects (e.g., OpenOffice Writer) has revealed that it is very difficult to recruit real end users to participate in the application of usability techniques in OSS projects generally. We had banked on the OSS project leader keeping a list of e-mails of representative real end users, but this was not the case. The fact that OSS developers are unacquainted with the profile of their users is a problem that has already been detected and that we again experienced in this case. Although the VB technique only requires a few participants, we expected a higher participation rate. We believe that user participation in the application of the VB technique was low on the following grounds: users do not have the time that it usually takes to design an interface, users are unfamiliar with graphic design issues, and there are no incentives to encourage participation in the application of the proposed technique. Note that these are not necessarily OSS issues, nor are they issues related to VB as a method. Even so, with the VB technique adaptation, we were able to gather alternative user interface designs by creating a blog. The interface proposed as result of applying this technique is shown in Figure 1(b). This interface was created based on the inputs of users and the feedback received by the application developer.

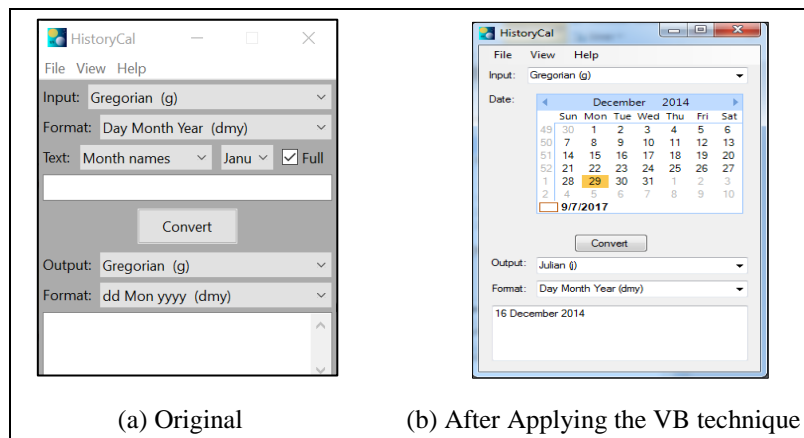


Figure 1. HistoryCal Interface

The HistoryCal project is currently active. Even though it is a small project, we still think that the findings are valuable for our research. We believe that the contributions of this research are especially valuable for projects of this type because they do not have enough resources to apply certain usability techniques (e.g., they do not have usability experts), and developers do not have a list of representative real end users for technique application. Within the OSS projects, blogs are the most frequently used web artifact to facilitate open discussion and maintain communication across a distributed community of members [10]. Indeed, the proposed solution to use a blog proved to be a viable option for adapting the VB technique in the HistoryCal project. Note that we tested the feasibility of adopting usability techniques in OSS projects adapted using web artifacts (i.e., a blog) and not the effectiveness of blog use as such. The two main lessons that we have learned from applying the VB technique are as follows: (i) the awareness of OSS project administrators of the impact of the issues dealt with by HCI on the development of usable software should be raised because they could motivate

users to participate in the application of usability techniques, (ii) the administrator(s) of an OSS project should provide incentives to encourage users to participate in external initiatives like usability technique application. A possible example would be public acknowledgement for users who make contributions towards improving the application interaction design in a project website section.

5. Validity threats

We have identified three threats. Regarding construct validity, only one researcher analyzed the proposals/comments posted by the real end users on the blog. This researcher proposed an improved UI. These improvements were based on user comments. Even though the user suggestions were published on the blog, they were not validated by the project administrator, that is, not all the possible feedback was gathered before designing the final UI. With regard to internal validity, the student's knowledge of HCI might have had a positive or negative impact on usability technique application in the HistoryCal case study. However, the HCI student is competent as a substitute usability expert thanks to the knowledge acquired during his studies (MSc in Usability Engineering). Finally, as far as external validity is concerned, the key limitation of our study is the number of case studies, that is, this is exploratory research. Therefore, more cases studies are required to validate the proposed adaptations. However, the preliminary results provide a basis on which to perform other case studies.

6. Conclusion

The goal of this research was to evaluate the feasibility of adopting HCI usability techniques in OSS projects. In particular, we adapted the VB usability technique for application in the HistoryCal project. Through adaptation, we were able to account for some OSS development characteristics that pose an obstacle to the application of the techniques as per HCI recommendations. It is not easy to recruit users registered in the community to voluntarily participate in OSS usability projects, that is, it was hard to get registered project users, users participating in project forums or mailing list subscribers to participate in technique application. The developer was receptive and interested in participating and receiving the results of the VB technique application to improve his software, possibly because a feature of OSS culture is to be as open as possible to external contributions regarding any issue (including usability) that can benefit project development. We believe that, in order to improve the integration of usability techniques in OSS projects, the OSS community has to start attaching importance to and raising awareness about the repercussions that the issues addressed by the HCI field have on software development. Additionally, as HCI techniques need to be adapted to overcome the adverse conditions for adoption in OSS development projects, the OSS community also has to broaden its view of software development in order to consider usability and not focus exclusively on feature development. In the future, we aim to conduct further case studies to adapt and apply other usability techniques.

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References

1. Lisowska A, Amstutz T, Lalanne D. A Usability Refactoring Process for Large-Scale Open Source Projects. Proc. CHI Conf Ext Abstr Hum Factors Comput Syst - CHI EA. 2017; 1135–43.
2. Terry M, Kay M, Lafreniere B. Perceptions and Practices of Usability in the FoSS Community. In: Conf. on Human Factors in Computing Systems CHI. ACM; 2010; 999–1008.
3. Osiński S, Weiss D. Introducing usability practices to OSS. IFIP. 2007; 234(d): 313–8.
4. Wilson C. Brainstorming and Beyond: A User-Centered Design Method. Morgan Kaufmann, 2013.
5. Aryana B, Clemmensen T, Boks C. Users' participation in requirements gathering for smart phones applications in emerging markets. Univers Access Inf Soc. 2015; 14(2): 265–80.
6. Runeson P, Host M, Rainer A, Regnell B. Case Study Research in Software Engineering: Guidelines and Examples. Wiley. John Wiley & Sons, 2012.
7. Crowston K, Wei K, Howison J, Wiggins A. Free/Libre open-source software development: What We Know and What We Do Not Know. ACM Comput Surv. 2012; 44(2): 1–35.
8. Rajanen M, Iivari N, Kesitalo E. Introducing Usability Activities into Open Source Software Development Projects: A Participative Approach. In: NordiCHI '12. ACM; 2012. p. 683–92.
9. Raza A, Capretz LF, Ahmed F. An Open Source Usability Maturity Model (OS-UMM). J Comput Hum Behav. 2012; 28(4): 1109–1121.
10. Pagano D, Maalej W. How do open source communities blog? Emp Soft Eng. 2013; 18(6): 1090–124.