

## Encouraging for Enculturation – An Enquiry on the Effort of Usability Specialists Entering OSS Projects

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### Abstract

*Open source software (OSS) has increased its importance during recent years. The significance of OSS usability has been acknowledged; however, usability work, albeit carried out, doesn't necessarily have any impact on the OSS under development. This paper examines how the impact of usability work can be increased in OSS projects. Through cross-case analysis, seven OSS development cases including usability work were examined and characteristics contributing to usability work having an impact identified. The analysis indicates that for increasing the impact of usability work, enculturation of usability specialists is important. Enculturation happens naturally when usability specialists take part in the project from the very beginning, but in OSS development this is uncommon. Otherwise, usability specialists need to place extra effort on enculturation, which in our data involved various kinds of practices relating to 1) understanding the product under development, 2) finding motivation for usability and 3) locating and targeting the decision-makers.*

### Keywords

Usability, open source software, enculturation, cross-case analysis

### INTRODUCTION

Open Source Software (OSS) has entered our everyday life and the practice of developing information technology (IT) in organizations. OSS is usually defined using licensing terms that enable everyone to read, modify, and redistribute source code. OSS development relies on communities of people working together without rigid structures and bindings (Raymond 1999). Today, these communities vary in size and type: they range from one-man projects to projects with thousands of developers and millions of users. Also company involvement in OSS projects is increasingly common; a company may, for example, simply exploit OSS as part of their products or--on the other extreme--release all their software under an OSS license (e.g. Fitzgerald 2006).

Usability specialists are recommended for taking care of usability in software development (Iivari 2006a; Nielsen 1993; Rosson and Carroll 2002; Schaffer 2004). Their work involves usability design and evaluation. Usability design includes understanding and specifying the intended users, their goals and tasks and the context of use as well as user task redesign and human computer interaction (HCI) design (Nielsen 1993; Rosson and Carroll 2002; Schaffer 2004). Usability evaluation, on the other hand, is needed for providing feedback to improve the design and for assessing whether the objectives have been achieved (Rubin 1994). Usability evaluation can be empirical, i.e. done together with users, such as in usability testing, or done solely by experts such as usability specialists, heuristic evaluation being a widely known method (Nielsen 1993; Rubin 1994). However, although the importance of usability has been acknowledged in research and in industry, there have been problems in usability specialists having any impact on the solution under developed (Boivie et al. 2006; Bødker and Buur 2002; Iivari 2006a).

Moreover, usability has not been a major concern in OSS development, as traditionally OSS developers have created OSS to serve their own needs. However, recently OSS has become very popular and people not having any interest to develop it have started using it. Because of this, OSS usability has become relevant. Nevertheless, OSS usability tends still to be quite poor, especially in small OSS projects without company involvement (Cetin et al. 2007; Moghaddam et al. 2011; Rajanen et al. 2011). Moreover, usability specialists, if taking part in OSS projects, tend to be isolated, alienated and without the power of decision (Andreasen et al. 2006; Benson et al. 2004; Bødker et al. 2007; Cetin et al. 2007, Rajanen et al. 2011). Hence, the difficulties of usability specialists having any impact on the solution under development seem to prevail also in the OSS development context, not only in the commercial software development context. In this paper we consider the ability of the usability specialists to have an impact on the solution as pivotal although also as very difficult to achieve, in OSS development as well as elsewhere. This paper examines factors contributing to usability work having an impact in the OSS development context.

The empirical findings of the paper lead to advocating a culture oriented approach for usability specialists in OSS projects. This kind of a perspective has been almost entirely neglected in the OSS literature, although it has already been indicated that OSS culture might hinder usability work (Back and Twidale 2010; Benson et al. 2004; Bødker et al. 2007; Nichols and Twidale 2003; Teny et al. 2010; Zhao and Deek 2005). Furthermore, research in the commercial software development context has shown that cultural context may be a highly influential factor affecting usability work and usability work should be tailored to fit the context (Iivari 2006b; Iivari 2010). This paper examines this tailoring through the concept of enculturation that is recommended in this paper for usability specialists entering OSS projects.

The paper is organized as follows. The next section presents our theoretical framework. The third section offers methodological information of the empirical research carried out, the fourth section outlining the main results. The fifth section discusses their implications and limitations and identifies paths for future work.

## **THEORETICAL FRAMEWORK**

Although the culture oriented lens has not been widely utilized in OSS research, there is an existing body of research addressing OSS development that can be connected with culture. This research stream has examined how and why people become members of OSS communities and identified “joining scripts” that capture the level and type of activity that are needed when one enters and gains legitimacy in OSS communities (Von Krogh et al. 2003). This research stream relies on research on communities of practice that describes this process through the notion of legitimate peripheral participation: new members start as peripheral members but nevertheless contribute to meaningful tasks from the perspective of the community (Lave and Wenger 1991; Wenger 1998).

There is also literature on enculturation and acculturation produced within various kinds of disciplines that addresses the issue of entering new communities or social groups. Brown and colleagues characterize enculturation following way: "From a very early age and throughout their lives, people, consciously or unconsciously, adopt the behavior and belief systems of new social groups. Given the chance to observe and practice in situ the behavior of members of a culture, people pick up relevant jargon, imitate behavior, and gradually start to act in accordance with its norms. These cultural practices are often recondite and extremely complex. Nonetheless, given the opportunity to observe and practice them, people adopt them with great success." (Brown et al. 1989: 34) Brown and colleagues (1989) maintain that culture always frames the activities of a domain. The meanings and purposes of activities are socially constructed by cultural members. Enculturation refers to gaining an implicit sense of those meanings and purposes.

However, these frameworks do not exactly fit our context of usability specialists entering OSS communities, as the frameworks assume that new members wish to become masters of the OSS development practice, while this is not the goal in our context. Instead, usability specialists wish to be able to collaborate with OSS developers and in doing so to impact the solution under development. Within the OSS usability literature the interest has until now mainly been on suggesting methods for usability work: i.e. for usability design and evaluation. Additionally, the OSS literature has indicated that OSS culture might be at odds with usability work: it might be difficult to combine heavy-weight usability methodologies and processes with OSS development model with voluntary developers 'scathing their own itch' (Benson et al. 2004; Bødker et al. 2007; Nichols and Twidale 2003; Zhao and Deek 2005). Additionally, there is meritocracy in OSS projects: one achieves status and reputation by showing competence and contribution in technical development (Andreassen et al. 2006), while for usability specialists it might be difficult to show the merits and contribution (Bach and Carroll 2009; Back et al. 2009; Moghaddam et al. 2011). It is this kind of cultural context the usability specialists are attempting to enter into. However, the issue of culture has not been discussed in any more depth in the OSS literature.

Research within commercial software development context, on the other hand, has already shown that there is no one-size-fits-all in relation to usability work, but instead one should tailor it to fit the particular development context (Iivari 2006b; Iivari 2010). Particularly, researchers have argued that usability work should be compatible with the cultural context in order to succeed (Iivari 2006b; Iivari 2010). The notion of enculturation of usability specialists (Iivari 2006b; Iivari 2010) has been used here in the way that suits very well our purposes. Enculturation here involves usability specialists learning how it is appropriate to talk and behave in the context in question, including appropriate ways of approaching, talking about and advertising usability work. Enculturation thus involves usability specialists modifying their work so that it becomes compatible with the practices and values of the context into which it is introduced. Usability work is thereby culturally modified to fit the development context. The OSS literature remains nearly silent about this matter, although it has already been suggested that there are cultural issues hindering usability work (Back and Twidale 2010; Benson et al. 2004; Bødker et al. 2007; Nichols and Twidale 2003; Teny et al. 2010; Zhao and Deek 2005) and that usability specialists should try to infiltrate into the OSS community in which they wish to operate (Rajanen et al. 2011; Rajanen et al. 2012). This paper examines enculturation of usability specialists in OSS projects, focusing especially on the ways through which this has been accomplished.

## RESEARCH DESIGN

This paper relies on cross-case analysis involving seven cases in which usability work has been carried out in OSS projects (Table 1).

Table 1. OSS case projects

Case	Size	Application	Company	Research material
A	~30 developers, medium to large user base (<16.000)	Media	-	Project's online material (website, discussion forum, IRC, email), usability reports, project reports
B	~15 developers, small user base (<1000)	Game	-	Project's online material (website, discussion forum, IRC, email), usability reports, project reports
C	~40 developers, very large user base (>800.000)	3D content creation	-	Project's online material (website, discussion forum, IRC, email), usability reports, project reports
D	~15 developers, small user base (~1000)	Game	-	Project's online material (website, discussion forum, IRC, email), usability reports, project reports
E	1 developer, small user base (>1000)	Communication	-	Project's online material (website, discussion forum, IRC, email)
F	<10 developers, small user base	Music	2 SW companies	Email, usability reports, project reports
G	>10 developers in the company, potentially large user base	Media	1 SW company	Theme interviews, blogs, memos from meetings, OSS projects' online material

These studies offer a multifarious collection of data on OSS projects in which usability work has been carried out. The projects are all relatively small as is usual in the OSS scene (Krishnamurthy 2002). Small-to-medium-sized projects are considered as challenging as they do not likely possess usability knowledge or skills. Alternatively, three cases represent situations in which companies are involved, which is a trend becoming increasingly popular. In these cases the companies are offering resources for usability work, which has been mentioned as a benefit of company involvement also in the literature (Benson et al. 2004; Frishberg et al. 2002; Iivari 2011; Iivari et al. 2008). All cases are very relevant from the viewpoint of usability work: they all develop applications for which there is potentially a large user base without any interest or skills to develop the software.

These seven cases differ in how the researchers were involved. In cases A, B, C, D and F two authors of the paper were 'involved researchers' (Walsham 1995) guiding university students in organizing a usability intervention. Studies A, B, C and D were part of a larger research program in which suitable methods for introducing usability work into OSS development context have been experimented with by different student usability teams doing usability work. The purpose of this research has been to find ways for usability specialists to be able to achieve an impact in OSS projects. The students involved have had usability background from at least two previous usability courses about usability evaluation (e.g. heuristic evaluation and usability testing), user-centered design, and user interface design in both theory and practice. Each student usability team consisted of three to five students working 200-300 hours each in planning the usability activities, carrying them out, communicating with the OSS project, following up the impact of these usability activities, collecting the empirical data, and writing project reports. In cases E and G, on the other hand, two authors of the paper acted as 'outside observers' (Walsham 1995) as regards usability work, observing the evolution of usability work and gathering data.

Data gathering was conducted through different methods in the cases (Table 1). The primary material for these analyses was the online data gathered from the cases. In five cases (A, B, C, D and F) the student usability teams that conducted the usability interventions produced several kinds of usability reports and documents that were included in the analysis. In the case G the primary material in the analysis was theme interviews where the interviewees were developers, managers and usability specialists involved in the company's OSS projects. Secondary material in this case consisted of blogs kept by the involved people, the websites of the associated OSS projects and field notes and memos from meetings that were held in the unit.

This data has already been analysed for various research purposes (see e.g. Iivari 2011; Iivari et al. 2008; Rajanen et al. 2011, Rajanen et al. 2012) but the previous analyses have not had the enculturation perspective. As regards

the purposes of this paper, we analysed each case carefully from the viewpoint of usability work: what usability design and evaluation included in each case. In addition, the perspective of enculturation was acknowledged: whether the usability specialists could be seen as being engaged in such activities. The literatures on usability work and enculturation were used as sensitizing devices during the analysis, even though data analysis was highly inductive. We produced case study write-ups of each case. Cross-case analysis (see Seaman 1999) was then carried out. This involved a comparison of pairs of cases to identify their variations and similarities. After the comparison of the first two cases, conclusions were drawn and supporting evidence listed. Thereafter the third case was examined and the conclusions reconsidered. All the cases were analysed this way and the end results are the conclusions that the data supported. Altogether, during the analysis we ended up in finding evidence of the constructs of “usability design”, “usability evaluation”, “impact of usability work” and “enculturation”, which became operationalized as “understanding the product”, “finding motivation for usability” and “locating and targeting the decision-makers” that all included various kinds of inductively identified practices of the usability specialists during the data analysis process. Next those will be explicated.

## EMPIRICAL INSIGHTS

### Case A: OSS project with usability intervention 1

Case A developed a media application, targeted at non-technical end-users without any programming skills or interest, for their everyday media playing needs. The project had 30 developers and other active contributors. The application had a relatively large user group, indicated by the registered members and written messages in the project forums. There were multiple methods for communication available in the project's website; e.g. mailing lists, developer blogs, wiki and many discussion forums. There was no specific usability discussion forum, so the usability issues and discussion was spread to many forums but some usability related discussions could still be traced. There were not any companies having a role in this project. The developers and community did not show much interest in usability. User critique to the user interface (UI) of the application and to the usability improvement suggestions given in the project's discussion forums were disregarded by the developers who commented that this application “is not meant to be for girlfriends”. However, the project specifically stated in the website that it wanted to target non-technical end-users.

In this case the student usability team performing the usability intervention acted as external usability consultants and did not announce the usability activities but introduced their usability findings in order to have a “wake-up call” in the OSS project (cf. Schaffer 2004). The usability team conducted two types of expert evaluations: heuristic evaluation and cognitive walkthrough, and planned and executed usability tests based on the findings from these expert evaluations. A report of usability findings was written and sent to the developers by email. As planned, this was the first contact between the developers and the usability team. The purpose was to follow the way software patches are submitted to OSS projects: just by delivering them to the core OSS developers with commit rights. This method also simulates the approach of bringing usability activities into commercial software development by hiring external usability specialists as consultants who use usability testing as a wake-up call.

At first, no kind of answer was received from the developers. Finally, the same report with the summary of the findings was posted to the project's discussion forum. In this discussion forum the developers confirmed they had received the usability report and wanted to discuss among themselves it before contacting the usability team. However, after several years no contact has been made and the usability problems identified in the report have not been fixed or discussed in the community website or discussion forums.

### Case B: OSS project with usability intervention 2

Case B developed a game targeted at non-technical end-users, who did not have any programming skills or interest, for entertainment purposes. The project had 15 listed active developers. The user population of this application seemed to be around seven hundred, based on the number of downloads of the latest version. There were multiple communication channels available in the project's website; e.g. mailing lists, wiki and discussion forums. There were no companies involved in this OSS project. The developers and the community did not show awareness of usability and there were no usability related discussions in the discussion forums. However, discussions in the communication channels revealed that the community and the developers were very open to contributions and ideas on how to improve the game.

After the failure when using the external usability consultant approach in case A, the HCI researchers wanted to have the student usability team to get to know the game and to follow the OSS project IRC channels and discussion forums for some time and try to get to know the OSS community better (e.g. who would be the best developer to contact regarding usability issues) before contacting the developers and the community and letting their intentions known. The usability team contacted the lead developer through email and offered their help in all usability related things. The lead developer did not have prior knowledge about usability but got interested when

the usability team explained the concept of usability and its potential benefits (cf. Rajanen 2006), and identified some possible areas for usability evaluation. The usability team did heuristic evaluation and usability testing for the game, being all the time in close contact with the lead developer and the community regarding their findings through the project's IRC channel. The usability team also created possible redesign solutions to fix the found usability issues and discussed them in the project IRC channel. On the whole, the help seemed to be appreciated and the awareness of the importance of usability increased in the community. The usability team wrote a usability report identifying and analysing the found usability issues in more detail and giving further suggestions for the changes to the UI to fix the problems. This report was sent by email to the core developers.

This time the core developers included the suggestions of the usability team as part of the changes to be made to the next version of the game and later these changes were implemented. Furthermore, the lead developer even contacted the usability team later on, asking for a new usability evaluation for the next major version of the game and hoped that the usability team could be a close-knit part of the development team and the game development.

### **Case C: OSS project with usability intervention 3**

Case C developed 3D content creation software that was targeted at end-users with 3D content creation skills but without any skills or interest in programming. The project had over 40 active core developers listed. The user population was very large, with one version of the application being downloaded over 800.000 times and used by many big 3D content creation companies and film studios. There was a vast number of communication channels available both in the project's website and third party websites; e.g. mailing lists, IRC channels, wikis and discussion forums. There were no companies directly involved with the development, but there were several companies and institutions sponsoring and using this software. Based on the project's online material there were no identifiable usability specialists or usability activities in this OSS project beyond designing new icons for the UI, but there were lots of usability related discussions. Some of the long-time core developers had a firm opinion that the UI must not be anything like the UI of the existing commercial 3D creation software. User critique to the UI of the application and usability improvement suggestions given in the project's communication channels were disregarded by the core developers. One of the core developer commented that usability was not something that would apply to this type of professional and complex system. However, one of the goals of this OSS project was to attract new users, highly skilled content creators, to use this software instead of the commercial alternatives.

The student usability team, formed again by the HCI researchers, got to know the software and followed the project's communication channels for a couple of weeks to get to know the proper ways of communicating, the community specific terminology, the development practices, the possible usability issues and who to contact regarding usability issues. The usability team contacted the core developers through email and developer IRC channel offering their usability expertise in a particular area of software, which had already raised discussion regarding its complicated UI and difficulties of learning and using it. However, the usability team was unable to gain access to the decision-making core developers. The usability team conducted usability testing using highly skilled 3D content creation experts that had not used the software before; these kind of skilled experts were exactly the type of new users that the OSS community wanted to attract. A problem was that a new software version was upcoming, which meant that the version the usability team was testing and redesigning could already be outdated when the first tests were conducted. However, nothing certain was known about the new version at the time, other than that some major changes to UI were expected. The team wrote several usability reports about usability problems and their suggestions for changes to the UI to fix them. These reports were published on the usability team blog and also advertised in the community IRC channels and discussion forums.

The non-decision-making core developers and the community had mixed reactions. One core developer was very supportive to the usability activities, but the other core developers and community in general ignored the usability team and the usability activities and discussions. The usability reports were downloaded about 50 times but no further discussion was generated and the usability team failed to locate and target the actual decision-makers who remained unapproachable, silent and distant. The suggested usability improvements were not implemented.

### **Case D: OSS project with usability intervention 4**

Case D again developed a game targeted at non-technical end-users without any interest or skills in programming. The project had 20 listed active developers with commit rights to the code repository. The user population was active including a forum with over 1000 active users and 50000 posts. There were no companies involved in the development. The community had a generally open and friendly atmosphere: all those who were willing to contribute to the project or interested in the game were welcomed. There were numerous communication channels available in the project's website; e.g. mailing lists, wiki and discussion forums. The developers and the community had discussed usability as an issue prior to usability team intervention and the importance of good UI supporting gameplay, reducing the unnecessary tedium from the gameplay and the support for new players were

raised among the main design goals in the development manifesto of the game. However, there were no identifiable usability specialists or usability activities in the project.

The student usability team, guided again by the HCI researchers, got to know the game and its game design and mechanics in detail. Furthermore, the team followed the project IRC channels and discussion forums for some time and tried to get to know the OSS community before contacting the developers and the community and letting their intentions known. The usability team conducted heuristic evaluation and conducted usability testing for the game. The student usability team wrote preliminary and final usability reports outlining the usability issues and their UI redesign suggestions to fix these issues. The preliminary usability report, delivered to the mailing list of the project, caused an active discussion among the developers and the community. The final usability report was delivered to the community wiki, where the developers actively commented the usability issues and the redesign suggestions to fix them. In addition, the usability team submitted code patches and game level design work, including new UI menus and a new tutorial for the game to help new players.

These contributions were received positively and they were accepted into the code repository of the project. The developers thanked the good quality of the usability reports and praised the work of the student usability team as being of professional quality. Moreover, the work of the usability team was referenced in several commit messages and one of such commit messages explicitly asked for input from the usability team. One member of the usability team was even invited to the development team and given commit rights as a result of his work in the usability team, for his contributions to the code and game design, for his active participation in discussions in the community IRC channels and for his recognized skills as a player.

#### **Case E: OSS project with usability intervention 5**

Case E developed a mobile phone communication application, which had thousands of users. The project was a one-man project without company involvement. The software had gone through two major mobile platform version changes. The application itself was used to share ideas and experiences between a small group of active users and the developer. The developer was using the application himself, and he was interested in the feedback from users. Even without specific usability activities, the application had received several positive testimonials.

When a new version of the mobile platform was in the works, the manufacturer company offered to provide usability support for the developer. The intervention did not involve money but confidential information and usability resources. The subcontracted usability team consisted of three persons: a project manager, a usability specialist, and a graphical designer. The intervention of the team included usability design, but no usability evaluation. There was email communication mostly between the developer and the usability specialist. At first, the developer recognized a need for new graphical elements but not for usability enhancements, but later, the usability specialist was active to propose various user interface ideas to the developer in the form of slide sets describing the different screens of the application.

However, the intervention was not successful: usability work did not result in any changes to the OSS. The design proposed by the usability specialist omitted application specific attributes and new user interface elements of the upcoming platform version. Despite the usability specialists being a professional, the problem was that he was not familiar with the application domain or the new version of the platform. The developer was not satisfied with the results and no interaction suggestions or graphical elements were utilized in the application.

#### **Case F: Research OSS project with usability specialists**

Case F was a research project that created an OSS mobile phone music application. It was targeted at children from 3 to 6 years old. Project partners included university groups having expertise in software development, music education, psychology or HCI, as well as two software companies. From outside of the research consortium, developers, usability specialists and graphical designers participated in the project carrying out their work as part of their university studies. Usability as an issue was acknowledged already when planning for the project, during which there were HCI researchers taking part in writing the project proposal. There was also a work package and stated goals for usability in the project plan. The main communication channel among the project participants was email. In addition, a document management system was exploited and video conferences, internet phone calls, and few face-to-face meetings between the participants were arranged.

The project team was divided into two groups representing different interests and knowledge: a technical group that consisted of people having expertise in technical development, and a human-focused group consisting of people that had expertise in HCI, music education or psychology. Few key people of these groups formed two core teams that made decisions related to the associated subject matters; technical development and issues related to users, usability and user interface. Naturally, many times decisions had implications on both issues, due to which cooperation between these core teams was needed. From the very beginning, the developers and the usability specialists communicated directly and frequently. The usability specialists did requirements elicitation

together with children, and performed heuristic evaluation and usability tests for an earlier version of the application, for early specifications and for the development versions of the application. The developers informed about the technical aspects of the platform and offered demonstrations of its capabilities.

The user interface was implemented incrementally, and the developers followed quite strictly the design of the usability specialists and asked also for more information and feedback on details regarding to the implementation. The usability specialists gave rapid feedback on new versions, which were available even weekly in the most active period. The developers accepted most of the propositions, but some were left out because those were seen to be against the mobile platform guidelines and possibilities or inconsistent with the general application plans.

### Case G: Company OSS project with usability specialists

Case G contained small mobile media application development projects inside a company that collaborated with OSS communities. The company had successfully developed products for mass consumer markets and the aim was to have quite large non-technical user population in the future also for these applications. In this hybrid case, OSS was used as a foundation to build tailored offerings. The company acted reciprocally: at least bug fixes were provided back to OSS projects. In some occasions, even the whole product was licensed under an OSS license. Usability work had been carried out for years in the company, and there was a team of professional usability specialists. Usability was seen as a competitive edge for the company.

In this case, the usability specialists were participating in the projects from the very beginning. Both usability design and usability evaluation were carried out in the projects. In the beginning of the projects, the usability specialists defined the target user group and produced use cases and early user interface designs: use cases describing the “normal use situations” and rough user interface mock-ups were produced and evaluated by the usability specialists through expert evaluations. After more detailed user interface design, also empirical usability testing was carried out in a usability laboratory. Feedback and design ideas were also gathered from OSS communities when prototypes were ready to be released for experimentation. The communication with OSS users was through mailing lists and discussion forums. The usability specialists were also actively collaborating with the developers. Many issues were dealt informally by discussing them together. The usability specialists often requested comments from developers to make sure that features were implementable. The developers also asked for usability specialists’ comments on issues that arose during the implementation.

In this case the usability specialists were allowed to heavily influence the design during the early phases of development. They also asked comments from developers and vice versa. The process was remarkably iterative at the beginning, but late changes were not preferred during the implementation phase.

### Summary of the results

We defined the concept of enculturation to involve usability specialists entering the cultural context and gaining sufficient cultural competence to be able to modify their work accordingly, while not becoming community members as such. Through cross-case analysis, we operationalized “enculturation” as “understanding the product”, “finding motivation for usability” and “locating and targeting the decision-makers” that included various kinds of practices of the usability specialists in the examined OSS projects that are summarized in table 2.

Table 2. Empirical results

Cases	Enculturation	Outcome
A – small OSS project with usability intervention	Understanding the product: - Motivating usability: - Locating and targeting the decision-makers: emailing	No changes in the OSS
B – small OSS project with usability intervention	Understanding the product: familiarizing, using Motivating usability: educating Locating and targeting the decision-makers: lurking, emailing, IRCing	Changes in the OSS
C – medium sized OSS project with usability intervention	Understanding the product: familiarizing Motivating usability: building on the existing motivation Locating and targeting the decision-makers: lurking, emailing, IRCing, blogging	No changes in the OSS
D – small OSS project with usability	Understanding the product: familiarizing, using Motivating usability: building on the existing motivation	Changes in the

intervention	Locating and targeting the decision-makers: lurking, emailing, wiki writing, committing code	OSS
E – small OSS project with usability intervention	Understanding the product: - Motivating usability: building on the existing motivation Locating and targeting the decision-makers: emailing	No changes in the OSS
F – small OSS project with usability experts	Understanding the product: participating in creating Motivating usability: educating, building on the existing motivation Locating and targeting the decision-makers: emailing, video conferencing, collaborating face-to-face	Changes in the OSS
G – small OSS project with usability experts	Understanding the product: participating in creating Motivating usability: building on the existing motivation Locating and targeting the decision-makers: collaborating face-to-face	Changes in the OSS

With regard to gaining enough understanding of the product under development, in two cases (F, G) the usability specialists were intimately involved in creating it. In most of the cases, however, an explicit familiarization was needed. In cases the product was a game (B, D), the usability specialists also used it - played the game. There was no effort in understanding the product in unsuccessful cases A and E. Moreover, in case C the product was complicated and its development status remained invisible and the usability specialists did not succeed in understanding the product well enough despite their efforts. Regarding motivating usability, in most of the cases (C, D, E, F, G) the usability specialists could rely on the existing motivation that was found in the project documentation, but in some cases (B, F) the usability specialists also placed effort on educating the developers about the benefits of usability. In unsuccessful case A, there was no attempt to motivate usability. Finally, as regards locating and targeting the decision-makers, in two cases (F, G) the usability specialists collaborated with the decision-makers face-to-face, while in other cases lurking (von Krogh et al. 2003) in the online environment was important for locating the decision-makers (B, C, D). Afterwards, more direct contact was established through various kinds of means: email, IRC, blogs, wikis and code repositories. In unsuccessful case C numerous means were used; however, the actual decision-makers were not reached due to the hierarchical project structure.

## CONCLUDING DISCUSSION

This paper utilized a culture oriented approach, which has been lacking in OSS research. Cultural issues affecting usability work have been examined in the commercial software development context (Iivari 2006b; Iivari 2010) and in OSS literature, some cultural issues have already been mentioned as hindering usability work (Andreasen et al. 2006; Bach and Carroll 2009; Back et al. 2009; Benson et al. 2004; Bødker et al. 2007; Moghaddam et al. 2011; Nichols and Twidale 2003; Teny et al. 2010; Zhao and Deek 2005), but those have not been addressed in any depth. In both commercial and OSS development contexts the problem of usability work not having any impact on the solution under development has been reported (Andreasen et al. 2006; Bach and Carroll 2009; Back et al. 2009; Benson et al. 2004; Boivie et al. 2006-Bødker et al. 2007; Cetin et al. 2007; Iivari 2006a; Moghaddam et al. 2011). This paper was interested in the ability of the usability specialists to have an impact on OSS. The paper argues that enculturation of usability specialists is essential for this to happen.

When focusing on the successful cases only, the results indicate that it is beneficial to have usability specialists involved in the development from the very beginning of the project. This was the case in the research (F) and company (G) OSS cases. In both cases the usability specialists were involved in defining the product in question and intimately knew the ones implementing the solution (i.e. the decision-makers), and usability had an appreciated position in the development. Yet, the existence of usability specialists from the very beginning of an OSS project is uncommon. OSS projects usually are initiated by developers scratching their own itch (Raymond 1999). Hence, usually usability specialists become involved later on and in this situation an extra effort on enculturation may be needed. In cases B and D, the usability specialists succeeded in having an impact on the OSS though they became involved later on. In those cases the usability specialists 1) gained enough understanding the product under development, 2) found motivation for usability and 3) located and targeted the decision-makers. The actual practices varied in the cases, however. Hence, the actual enculturation practices probably need to be figured out case by case. Based on our data, we can conclude that these specific practices were associated with usability work having an impact on the OSS in question in the sense of removing the identified usability problems. In cases A, C and E, on the other hand, there were shortcomings as regards enculturation: the usability specialists did not get to understand the product and its development status very well (A, C, E), they could not locate and target the decision-makers (C) or they did not try to motivate usability in the OSS project (A). All this implies that enculturation in the sense introduced in this paper is important.

Our results contribute to the research stream on usability in the OSS development context. The results imply that usability work is more likely to have an impact if its results are provided by encultured insiders that have modified their work accordingly. Thus, they need to enter the particular community in question and gain sufficient cultural knowledge of the product under development, of the acceptable usability motivations and of the decision-makers to be contacted. When entering OSS projects, we recommend that usability specialists utilize the OSS projects' existing online material that is altogether very important for OSS projects for communication and collaboration purposes and acts as a permanent archive of tacit knowledge for OSS projects (Scacchi 2002). We recommend the lurker position (von Krogh et al. 2003) to be initially adopted by usability specialists. Through lurking, usability specialists can learn how it is appropriate to behave in the community, also as regards usability work. They can gather information on who to contact and how as well as understanding of the current status of the product and possible motivations on its usability improvement, and then act accordingly.

As regards the limitation and paths for future work, it might be considered as a limitation that the usability specialists in five of the cases were students. On the other hand, students actually act as fully fledged developers in many OSS projects, as students many times have both development skills and time at their disposal. OSS projects do not require formal education, but instead value the ability to contribute something useful. The students were open that they were students and the developers and communities did not see this as a problem. Therefore, we argue that student usability teams can be used for introducing usability activities into OSS projects and to collect research data from these activities, if the students are selected carefully and if experienced HCI researchers or teachers supervise their work closely. Future research relying on a larger amount of cases as well as research concentrating on one particular case in depth is recommended. Studies on large and mature OSS projects could provide additional insights. A specific very successful case could be inquired in detail. In addition, a more in-depth analysis of the enculturation process could be done to understand the variety of meanings, attitudes and practices that can be associated it. Quantitative research testing our findings should also be carried out. On the other hand, through this kind of a cross-case analysis of seven cases very useful and interesting findings could also be gained: empirically grounded while still somewhat generalizable insights were generated.

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