Power, Empowerment and Open Source Usability

Mikko Rajanen & Netta Iivari
Department of Information Processing Science, University of Oulu
P.O. BOX 3000, 90014 Oulu, Finland
firstname.lastname@oulu.fi

ABSTRACT

Open source software (OSS) projects are often seen as participatory and egalitarian settings where people collaboratively develop software to serve their needs as well as the needs of others. In this paper, however, we argue that power and politics also characterize OSS development, and that this has serious implications for OSS usability. The existing Human–Computer Interaction (HCI) research on OSS usability has already shown that power and politics play a role; this study offers a theoretical treatment of the matter. A theoretical framework on power and empowerment is utilized in analyzing empirical data on OSS usability as well as the existing body of knowledge on the topic. With the help of this framework, HCI research can address the aspects of power and empowerment in OSS usability in a more systematic and comprehensive manner.

Author Keywords

Open source software, usability, power, empowerment

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Open source software (OSS) development has become popular in recent years, and many widely used solutions are OSS (e.g., Wordpress, Mozilla Firefox, Mozilla Thunderbird, OpenOffice). OSS is software of which the source code is available for anyone to use, modify or redistribute. OSS projects, however, may vary widely in nature. For example, they range from small one-man projects—created by the developer for his or her own use—to very large projects with thousands of developers and millions of users (e.g., Linux). Some OSS projects may even involve companies [13], while most OSS projects consist of only one or very few developers [22]. OSS development relies on individuals who are motivated to develop solutions for their personal needs, but who also

voluntarily offer their solutions for use and further development by others. The community development model and the basic values of OSS development, such as gift giving, reciprocity, and sharing, motivate developers to do this [39, 40]. This discussion positions OSS projects as participatory and egalitarian settings where people collaboratively develop software to serve their own needs as well as those of others.

However, this image of egalitarianism is not the whole picture. Less attention has been paid to the other side of the coin: to the aspects of power and politics that are intertwined with any human activity, including OSS development. In a sense, this has already been acknowledged in the existing Human–Computer Interaction (HCI) research on OSS usability, as researchers have encountered numerous problems when trying to introduce and ensure usability or User Experience (UX) in OSS development. UX and usability are at the heart of HCI research and practice, which strive for high quality systems for users. Existing HCI research has already hinted that OSS culture, ideology and philosophy may hinder work on usability and UX (henceforth collectively referred to as "usability"). Studies have indicated that it may be challenging to integrate heavy-weight usability methodologies with OSS development, given the latter's background of voluntary developers "scratching their own itch" [8, 10, 29]. It has been pointed out that meritocracy is standard in OSS projects, and that one attains status and reputation by being competent in technical development (e.g., [2, 28, 38]). Usability practitioners should be capable of demonstrating their merits and contribution to the overall development, too [4, 5, 6, 28, 38]. However, these merits and contribution are not necessarily valued by OSS developers [4, 5, 6, 28, 38]. Usability practitioners may need to utilize a variety of lobbying, persuasion, and allying strategies in order to succeed [6, 28, 32, 33]. All this indicates that power and politics indeed play a role in OSS development. However, theoretical treatment of the matter is limited in HCI research, even though the phenomenon has been empirically observed in numerous studies. This paper addresses this gap by presenting a comprehensive theoretical framework on power and empowerment [16] through which to make sense of the power dynamics involved in the field of OSS usability. Moreover, the framework indicates ways in which the "power-weak", meaning the usability specialists, may be empowered to influence decision outcomes [16], in this case design

decision outcomes. It is hoped that this will also provide a valuable contribution for the OSS usability literature.

In this paper, we look at OSS development as an intriguing community-based phenomenon. Organizational science theorists have also long considered this type of OSS development as a specific way of organizing; in other words, as something more than a mere OSS license [40]. The focus of this paper is on small-to-medium sized OSS development projects that are volunteer-driven and do not have company or foundation involvement. This type of project forms the majority of OSS projects [22]. Very large OSS projects and those with company involvement may more closely resemble commercial software development in business organizations, regarding which there is already plenty of HCI research (e.g., [15, 20]). Company involvement in particular may increase this resemblance, as companies, if involved, tend to offer their usability resources and methods to the projects [2, 4, 5, 8, 38]. Nevertheless, while usability professionals have been shown to experience difficulties in both OSS and commercial settings, there are also clear differences between these settings that have implications for how usability professionals are able to have an impact on the software. The main differences can be summarized in terms of the timing of the usability development activities (in OSS, usability specialists tend to become involved much later, as usually the development starts by developers "scratching their own itch") and the management of the projects (e.g., budget and human resources allocated to usability activities). In small-to-medium sized OSS projects without company involvement, all development is conducted on a voluntary basis, and this also applies to usability activities. In this kind of situation, OSS developers can very easily dismiss the work of usability specialists. In commercial software development, the situation should be a bit better, as resources are allocated and spent on usability work, and there likely is a decision-maker overseeing to ensure that the resources are not wasted. This decision-maker may also be easier to locate and contact in a commercial software development context.

This paper is structured as follows. The next section reviews research on the role of power and politics in OSS development. The third section presents a four-dimensional model of power and empowerment to be used as a sensitizing device in the analysis. The fourth section presents the methodology of our empirical studies. The fifth section presents the empirical findings, which reveal that power struggles are evident as regards OSS usability, and suggest avenues of empowerment. The final section discusses the implications of these findings and identifies limitations and paths for future work.

POWER AND EMPOWERMENT IN OPEN SOURCE SOFTWARE DEVELOPMENT
This section will review literature that has already indicated important issues as regards power and politics in OSS

development. While there is a lack of research explicitly addressing this issue, interesting findings on the topic can still be pinpointed as having implications for OSS usability. Altogether, it is important to remember that there is indeed a long history and important ideological underpinnings in regard to OSS development. The free software movement was launched in 1983 as a social and political movement to advocate what were seen as basic freedoms for software users: freedom to run software, freedom to study software, freedom to change software in any way that the user finds necessary, and freedom to distribute copies of software with or without changes to it [17, 24]. These freedoms promote progress in technology, since much of the wasteful duplication of programming can be avoided, and effort can instead go into advancing the state of the art [17, 24]. The term "open source" was coined to rebrand the free software movement so that it would be more appealing to the commercial software industry. The Open Source Initiative was founded in 1998 to promote this new term and to advocate the open source principles (opensource.org). The members of the free software movement objected to the open source approach, and felt that by concentrating only on the openness of the source code, the important philosophical and social values regarding the basic freedoms of software users were ignored (gnu.org). Despite these differences, however, open source and free software communities share many core values [17, 36].

An OSS development project is characterized as a loosely bonded community united by strong common values, and work is organized usually by one or a few coordinators [24]. An OSS community is often depicted as an onion model, with different layers representing levels of involvement in the community. In a typical OSS community, there is a lead developer or a small group of developers forming the core team that controls the overall architectural design and course of the project [12, 27]. These developers form the core of the onion. They are often supported by "committers", who have direct write access to the project's source code, but are required to ask permission for major modifications before committing a change. "Contributors" are external developers and users who send bug reports and minor fixes for errors in the code. They do not have power to upload their modifications to the official source code repository of the project. The outer layer of the onion consists of end users, who do not participate in the community, but only use the software [1]. It is these end users in particular whose interests the usability specialists aim to represent. However, the onion layers as described above also indicate the power of decision participants in each layer. End users, as well as usability specialists representing them, are very likely remain on the outer layer of the onion, which has been a concern for HCI researchers addressing the topic [4, 5, 28, 38].

However, not all OSS projects are the same, even when considering power and decision making in OSS development. There are many variables that may have an

effect, such as the age and size of the project. Usually, at the beginning of a project, the founder of the project makes all decisions and rules regarding who can contribute and what will be included in the software. Later, she or he may relinquish some or all of her or his power to other developers, typically based on their merits. Linux, however, is a famous example of a long-term project where the initial developer still retains his rights to make final decisions, even though there are responsible persons for many areas of the code base. On the other hand, the Apache HTTP Server represents a project of which the founder is no longer in control, but that has achieved close to democratic decision making through a board of directors [23]. Hence, structures and leadership vary among OSS development projects, but smaller OSS development projects tend to have an informal, shallow, and meritocratic structure where contributors whose contributions are seen as being important or innovative are given developer or core developer status, by agreement of the developers or community as a whole. [1, 24, 34]

From the point of view of an OSS developer, "scratching one's own itch" and ideological issues have already been mentioned as motivational factors for taking part in OSS projects. A further key motivational factor is the status, fame, reputation, and recognition that a contribution can create for a developer [1, 34]. It has been pointed out that in order to become an accepted contributor or even an acknowledged member, there are joining scripts to be followed in OSS projects, implying that a developer may have to provide, for instance, *feature gifts*—whole modules or features as his contribution [41]. On the other hand, it is still up to the decision makers to assess the value of the contribution and the contributor, which often leads to a situation where only small part of the provided code is merged into the project [21, 23, 35]. Although OSS development is strongly transparent and visible for all, there remains a strong notion of ownership [1, 17]. Decisions makers typically have their own—often unwritten—vision of the project, and others are obliged to follow it. Even though OSS licenses usually allow anyone to release an alternative version of the software, there is significant prestige motivation to get one's own code contributions accepted to the original version and to become a member of the development team [1, 21, 27].

Interestingly, it is not only the software that it controlled by OSS developers: studies have also identified a surprising amount of control exercised in OSS projects in other ways [11, 14, 21]. Various kinds of governance configurations have been identified [11]. Depending on the configuration, management may be centralized, development process defined and conflict resolution managed. Different control modes and mechanisms have also been found in OSS projects: in addition to outcome control, behavioral control, clan control and self-control mechanisms are in use [11, 21]. Certain rules and procedures are expected to be followed, and peer pressure and self-criticism prevail in OSS development [21]. It has been even argued that the openness of OSS projects enables a continuous monitoring of people and their work that can be seen as an exercise of disciplinary power, in the sense of the Panopticon that Foucault often brought up in his work [21]. All this indicates that power and politics feature in OSS development, too. However, there are other disciplines within which power and politics have gained a much more thorough treatment. The following section discusses some findings from these disciplines.

THEORETICAL FRAMEWORK
In Information Technology (IT) research, power issues have already been addressed. It has been argued that one should inquire into the dominance, power, marginality and exclusions that take place in IT development and use [7]. The nature of IT development should be understood as conflicted and political [19], and the influential role of organizational politics and conflicts needs to been acknowledged. Studies [9, 19] have highlighted conflicts between users, developers and managers as widespread. HCI research has also contributed to this area by indicating that there is potential for power struggles between usability specialists and developers (e.g., [3, 15, 20, 26, 37]), including in the OSS development context [4, 5, 28, 38].

However, although widely studied topic, power is a very complex concept drawing on a multitude of definitions and approaches [16]. To make sense of and to reveal the diversity that can be associated with the concept, Hardy and Leiba-O'Sullivan [16] propose a four-dimensional model of power and empowerment. Table 1 captures the four dimensions of power and the conditions of empowerment in relation to each dimension.

	First dimension	Second dimension	Third dimension	Fourth dimension
Power of A over B	Management of resource dependencies	Management of decision-making processes	Management of meaning	None; power is embedded in the system
Interaction between A and B	Overt conflict	Overt or covert conflict	Apparent cooperation	
Reason for B's failure to influence	B is aware of the issue and able to get it to the decision	B is aware of the issue but unable to get it to the decision	B is unaware of the issue and thus has no will to resist it	Both A and B are prisoners of the prevailing discourses of power, although A may

outcomes	arena, but is unable to use power effectively to influence outcomes	arena		derive greater advantage from them
Requirements for empowerment of B	Acquisition of resources and ability to mobilize them	Ability to gain access to the decision arena	Consciousness-raising and "delegitimation" strategies to create will to resist	Empowerment in the sense of freedom from power effects is not possible, although local struggles may produce more positive experiences

Table 1. Empowerment and the Dimensions of Power [16: 462]

This framework reveals power as a multifaceted concept that theorists have approached in various ways. The framework discusses the mainstream, critical, and Foucauldian approaches to power. In the first dimension, power is exercised through the use of different kinds of resources to influence decision making, while in the second dimension, power is exercised by controlling access to decision making. These two dimensions represent the mainstream approach to power, whereas the third dimension focuses on the legitimation of power through cultural and normative assumptions. Power is here used to ensure that conflict never arises, but that the oppressed remain satisfied with the current situation. The background to this view is in the critical research tradition. Finally, the fourth dimension relies on the Foucauldian notion of power, which maintains that power is embedded in the very fabric of the system we are all living in and cannot escape from. This system heavily constrains what and how we see and think: people are prisoners of this prevailing system, although some derive greater advantages in it than others. The framework also identifies the conditions of empowerment that emerge as regards each dimension.

This theoretical model will be used as a means of making sense of our empirical data on OSS usability. Various theoretical frameworks were considered before selecting this one; the final selection was based on four considerations. First, this framework clearly has an established position in the research literature, indicated by numerous citations. Second, it has already been utilized in IT research, albeit not in the OSS development context. Third, it provides a comprehensive approach to power and empowerment, as it includes four dimensions of power based on a wide review of power-related research spanning several decades and different disciplines. Fourth, the framework enables us to reveal interesting issues in the OSS context, and was easy to apply to our data. To sum up, this framework provides a comprehensive and easily applicable lens for our analysis.

RESEARCH DESIGN
The research design of this study utilizes constructive research approaches [25], specifically the Design Science approach, which has been developed and extensively discussed within IT research [18]. This approach aims to develop new or improved ways to achieve human goals [25,

18]. An artifact is developed and evaluated for its purpose. This research is part of a larger research program aiming to find ways for usability specialists to offer their expertise to OSS development. Within this research program, suitable methods for introducing usability activities into small-to-medium sized OSS development projects have been experimented with by 14 different student usability teams doing usability work in OSS case projects over 7 years. The authors of this paper guided the student usability teams in organizing usability interventions with different strategies, methods and outcomes in OSS projects across different domains, communities and cultures. The student usability teams communicated with their allocated OSS projects and tried to introduce usability activities for them. The students conducting these usability activities had backgrounds from at least two previous courses on usability evaluation methods (e.g., heuristics 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 in an OSS project, communicating with the OSS project, following up on the impact of these usability activities, collecting empirical data, and writing project reports.

In this paper, we analyze the data collected from five OSS case projects (henceforth, Cases 1, 2, 3, 4 and 5). These empirical cases and their usability interventions are briefly introduced as follows. Case 1 was developing a media application, targeted at non-technical end users without programming skills or interest. The project was started in 2004 and had a total of about 30 developers. The usability team observed this OSS project for five months in 2007, while conducting heuristic evaluations, cognitive walkthroughs and usability testing. The usability team reported the findings in the form of a report, which was sent to the core developers and mentioned in a post in the main discussion forum of the community. Case 2 was developing a game targeted at non-technical end users. This project, started in 2003, had a total of 15 developers. The usability team observed this OSS project for five months in 2008, while performing heuristic evaluation and usability testing. The usability team was in close contact with the lead developer regarding their findings and possible redesign solutions, and also participated in discussions in the project's IRC channel. After the evaluations, the usability

team wrote a usability report, and this time included suggestions for changes to fix the identified usability problems. Case 3 was developing 3D content creation software targeted at end users with 3D content creation skills but without skills or interest in programming. The project, started in 2002, had a total of 40 more or less active developers. The usability team observed this project for six months in 2009, while carrying out usability testing and heuristic analysis and writing several reports about usability problems and their suggestions for changes to fix those problems. These reports were made available on the usability team's blog and advertised in the project's IRC channels and discussion forums. Case 4 was developing media center software, with target users of ordinary people. The project started in 2003 and had about 20 active developers. The usability team observed this OSS project for five months in 2009, while performing heuristic evaluations and usability testing. A results report was again sent to the OSS developers by email. Finally, Case 5 was developing a game targeted at non-technical end users without programming skills. This project started originally in 1995, and the development team had changed many times since then. This project had 20 currently active developers with commit rights. The usability team observed this OSS project for four months in 2010, while conducting heuristic evaluations using game usability heuristics and usability testing. The usability team wrote preliminary and final usability reports about the usability issues and their suggestions for changes to the user interface to fix them. The final usability report was delivered to the wiki of the OSS project. In addition, the usability team submitted code patches and level design work, including new user interface menus and a new tutorial for the game.

The collected empirical data included both usability teams' deliverables and online material specific to each OSS project case, including websites, discussion forum posts, IRC discussion logs, commit messages and emails. The student usability teams' deliverables consisted of different kinds of usability reports as well as project management-related documents (see the case descriptions). These data are versatile and useful, and enabled us to conduct our analysis from the viewpoint of power and empowerment using the framework by Hardy and Leiba-O'Sullivan [16]. This framework was adopted after the data collection; it did not guide the data collection process. Thus, the collected material was examined using the selected theoretical framework as a sensitizing device years after the data collection. First, instances representing power-related issues were inductively identified from the data through a data-driven analysis. Next, the concepts from the theoretical framework were employed to make sense of the identified instances. Each case project was examined from the viewpoint of usability work and what it entailed in the given case, its effectiveness in the OSS project, and the contributing factors to this effectiveness or lack of it. The data was further analyzed from the point of view of the

power and empowerment of the usability specialists. In the analysis, the second dimension of power (management of the decision-making process [16]) proved to be the most salient and easily applicable one for making sense of power and empowerment in regard to OSS usability. Hence, it was utilized as a lens and in the following section; the discussion is narrowed to the empirical findings concerning power and empowerment in the sense of this second dimension [16]. However, this does not mean that the other dimensions are not relevant. Our empirical findings hint at their relevance, together with the existing literature on the matter. This will be discussed further in the last section.

EMPIRICAL INSIGHTS

Power of A over B: Management of decision-making processes

Using the terminology of the framework on power and empowerment [16], we labeled "OSS developers with commit rights", or committers, as *A* and "usability team" as *B* in our data. In all the examined cases, the usability team conducted both expert usability evaluations and empirical usability tests. Thereafter, they analyzed the data and crafted results reports that were delivered to the OSS project in question. After the delivery, the project committers reacted to the provided solutions in different ways depending on the case. Thus it was possible for us to examine in more detail some power-related issues arising in the projects, which are reported below.

Interaction between A and B: Overt or covert conflict

There may be both overt and covert conflicts between A and B [16]. Our findings align with this: we have examples of both in our data. In Case 1, members of the project expressed some hostility towards usability overall. This could be identified in discussions in the project's forums. Some users expressed criticism towards the user interface of the application, and offered certain usability improvement suggestions. The comments were disregarded by the developers, who commented that the application "is not meant to be for girlfriends". Interestingly, the project stated on its website that it wanted to target "non-technical end users", but "girlfriends", and usability for them, were apparently beyond that scope.

In Case 3, had firm opinions among the developers regarding the user interface could be identified. Some had very strong opinions about how the user interface should compare with competitive commercial alternatives; specifically, that the user interface should not resemble these alternatives in any shape or form. User critique of the user interface of the application and usability improvement suggestions offered via the project's communication channels had been disregarded by the core developers. One of the core developers even commented to the usability team that usability was not something that would apply to this type of professional and complex system. This is an

example of an overt conflict between the core developer and the usability team that offered their help.

In Case 5, the usability team concentrated their efforts on improving a tutorial that was found to be incomprehensible and frustrating for novice users. The usability team streamlined the tutorial, cut the amount of data and descriptions presented to users, and polished the tutorial with an innovative new design. This new version performed well in usability tests and the developers and the community overall were enthusiastic about it. However, the creator of the original tutorial reverted it almost back to the previous version in the next major release. This is an example of a developer in covert conflict with a usability team. The usability team was totally unaware that the developer was unhappy with the outcome of the work of the usability team, and no public notification was provided of the change of the tutorial back to the previous version. Moreover, it seems that the community and the other developers were not even informed about the issue, while the original creator of the tutorial had the power to make such a unilateral decision. The usability team was naturally unable to react to this change in any way.

Reason for B's failure to influence outcomes: B is aware of the issue but unable to get it to the decision arena
In all the examined projects, the main issue at stake in the intervention concerned the usability team's ability to gain access to the decision-making arena. In some projects there were successes, while in others there were clear failures. In OSS development, it is argued that even if the decision making is truly transparent (e.g., happens via a public mailing list) and accessible by everyone (e.g., anyone can post), actual decision makers may not care about alternative opinions and turn a deaf ear to suggestions. Further, the decision-making process and channels are often not visible to newcomers, including usability specialists. This may be due to the core developers' desire to control the decision-making process and channels, or it may be simply because decision making in the OSS community is ad hoc in nature, and there are no processes or official channels. In the following we offer some examples from our data that show that the usability team was unable to access the decision arena, or were unable to influence decision making there despite having access.

In Case 1, the usability team sent the summary of usability findings to the developers by email, which was recognized as the main method of communicating within this community. This was the first contact between these developers and the usability team. The purpose of this approach was to mimic the way the software patches are submitted in OSS projects, where somebody writes the patch, which is then shared with the community, and the core developers either accept it into the main branch or reject it. Based on the OSS literature, it was reasoned that it would be important to fit the usability contributions into the existing procedures of the project's development. However,

the work of the usability team had no impact. At first, no answer was received from the core developers. The same report was then posted to the discussion forum of the project, upon which one of the core developers answered there that they were discussing the document internally and could comment on it later. However, there was subsequently no answer or further communication, and there are no signs of changes in the OSS that could be traced back to the usability team's intervention.

A validation test was conducted in Case 4, which involved a similar kind of OSS project and approach by the usability team, and the result was similar. The results report was sent to the developers by email. The developers replied they had received the report, but there was no further communication from their side, and the report was not mentioned in the project's discussion forums, chat, or mailing lists. Further, the OSS in question has not been changed according the results reported. These cases together indicate that the power in OSS development is in the hands of the core developers. Their exercise of power has in these instances turned out to influence negatively the usability interventions. The problem is not related to gaining access to the decision-making arena, but to having an impact there.

In Case 3, by contrast, the project did not have one specific communication channel or small group of persons to contact. The decision-making core developers could not be reached just by sending email to the project's mailing list or discussion forum. In this case, the usability team documented their activities and results in open source fashion on a website, which was promoted in community forums and IRC channels and offered to several community news sites for publication. However, there was not much traffic generated, because the posts about the usability activities and their results were quickly buried beneath other discussions and news. This case is an example where the usability team did not even catch the attention of the decision-making core developers, and hence the usability team did not gain access to the decision arena and consequently was unable to influence the OSS.

Requirements for empowerment of B: Ability to gain access to the decision arena
The cases described here also include some successes, in the sense of the usability team becoming empowered to improve the usability of the OSS. This section discusses these successes. In Case 2, initial contact between the usability team and the developers consisted mainly of exchanging emails with the most active leading core developer. This core developer was initially not even sure of what usability meant, but he welcomed help from the usability team regardless, with the idea that any kind of contribution to the OSS project and community is potentially helpful. As the relationship continued, the usability team changed their communication strategy to chatting in the IRC channel with the whole community and introducing the concept of usability, different usability

methods, potential benefits of improving usability, and potential risks of poor usability, as outlined in the usability cost-benefit literature (see [30]). On the whole, the community seemed to become interested in the usability effort and to appreciate the help provided by the usability team. After the evaluations, the usability team wrote a report and sent it by email to the core developers. The core developers included the suggestions outlined by the usability team as part of the changes to be made to the next version of the OSS. Later on, it was evidenced that these changes indeed were made. Moreover, the lead core developer later contacted the usability team and asked for another usability evaluation to be done for their new major version of the OSS. He even expressed a wish that the usability team would become a close-knit part of the development team. This case offers an example of a usability team gaining access to the decision arena of an OSS project and truly having an impact there. It can be stated that they were empowered to make changes to usability of this OSS. It seems that, in this case, they succeeded in convincing the core developers as well as the community of the value and importance of usability, which was previously an unfamiliar concept to them.

Case 5 is another success story. In this case, the usability team, after their evaluations, wrote preliminary and final usability reports; the former was delivered to the mailing list of the project and the latter to the community wiki. Even the preliminary report sparked an active discussion among the developers and the community, and the developers also actively commented on the final report. Moreover, the usability team submitted code patches and designs, including new user interface menus and a new tutorial. These contributions received a positive reception and were accepted into the code repository of the project. The developers acknowledged and were grateful for the quality of the usability reports and the work of the usability

team. Additionally, the work of the usability team was referenced in several commit messages, one of which explicitly asked for additional input from the usability team. In this case, one member of the usability team even gained commit rights to the project: he was invited to become a member of the development team. This was achieved through his work in the usability team, through his contributions to code and design, through his active participation in discussions in the community IRC channels, and through his skills as an active user of the software. Hence, in this case one member of the usability team was truly empowered to access and affect design decision making in the project.

CONCLUDING DISCUSSION
The study was motivated by the lack of theoretical work on power in the context of OSS usability, while the existing HCI research has already indicated that current OSS culture, ideology and philosophy may hinder usability work, and that it may be challenging to integrate usability with voluntary, meritocratic OSS development. However, a thorough theoretical treatment of the power and politics involved with usability in OSS development is lacking in HCI research, although the phenomenon has been empirically observed. This paper attempts to address this gap by presenting a theoretical framework on power and empowerment [16] through which to make sense of the power dynamics involved with OSS usability This section summarizes and discusses the main empirical findings derived from the second dimension of power in the theoretical framework—management of the decision-making process [16]—followed by a discussion of the implications of the other three dimensions of power. The section concludes by suggesting theoretical and practical implications of this study. Table 2 below encapsulates the main empirical findings.

	Second dimension of power
Power of OSS developers over usability specialists	Management of decision-making processes: accessing the arena, having an influence there
Interaction between OSS developers and usability specialists	Overt or covert conflicts: usability contributions denied, silenced to death or silently deleted
Reason for usability specialists' failure to influence outcomes	Usability specialists are aware of the issue and sometimes able to get it to the decision arena (gain contact with committers), but if so they are unable to influence the outcomes
Requirements for empowerment of usability specialists	Ability to gain access and have influence in the decision arena: through gaining commitment rights or gaining contact with and convincing the committers (see also [28, 32, 33])

Table 2. Empirical Findings on Empowerment and the Second Dimension of Power [16: 462] in OSS Usability

Table 2 indicates that in our data, the main challenge for the usability teams was to gain access and have an influence on decision making in the OSS projects. In three cases (1, 3, and 4), no influence was observed, while in two cases (2

and 5) the usability team succeeded in having an impact on the OSS in question. In two of the unsuccessful cases (1 and 4), gaining access to the decision arena (i.e., contacting the core developers through email) was not a problem, but

having gained this access, usability contributions were still denied or "silenced to death." Even in one of the successful cases (5), the tutorial that the usability team had successfully developed was silently deleted after a while, which eventually turned a successful case into a partial failure. In Case 4, due to the more complicated project structure and numerous communication channels, the usability team did not even gain contact with the decision-making core developers. Hence, the empowerment of usability specialists seems to require that they first gain access to the decision arena and then also become able to influence the decision makers there. Another option is that usability specialists succeed in gaining commit rights in the OSS project (i.e., become decision makers themselves), which occurred in one case (5). However, we do not recommend that all usability specialists strive to achieve this, as it would require great investment from usability specialists, who often do not possess sufficient technical knowledge and skills.

Turning to the other dimensions of power, our own empirical data offered some findings on these issues (see Table 3) in addition to the existing body of knowledge, which offers further insights. For the first dimension of power—management of resources [16]—we argue that this takes a different form in OSS development than in commercial or company contexts, because OSS resources are immaterial and nobody in the community has direct decision-making power or control over labor (although some developers may be paid [13]). On the other hand, it can be argued that the core developers have indirect power over resources through their power to plan and decide the time and contents of the next releases [31]. Even though usability specialists may have time and effort at their disposal for usability work (as opposed to commercial software development, where resources are limited by the management), they may lack other kinds of resources. They may lack the required status, merit, expertise or other types of capital in the eyes of the OSS developers [4, 5, 6, 28], and thus end up in overt (Cases 1 and 3) or covert (Case 5) conflict with developers. OSS projects operate as meritocracies, and without status and merit usability specialists may be barred from entering an OSS project altogether (e.g., some instances in Cases 1 and 3) or they may have their usability contributions denied (Cases 1 and 3), silenced (Cases 1, 3 and 4) or deleted (Case 5). In order to empower usability specialists, so that their work can have an impact, they must convince the members of the OSS project in question of the value of their contribution (Cases 2 and 5). Usability specialists have to either convince the committers of the merits of usability work (Cases 2 and 5) or become committers themselves (Case 5).

	First dimension	Third dimension	Fourth dimension
Power of OSS developers over usability specialists	Management of resources: (time, effort) expertise and status (see also [4, 5, 6, 28])	Management of meaning: the value of usability and usability specialists	None, power is embedded in the system: all parties are prisoners of the Panopticon
Interaction between OSS developers and usability specialists	Overt or covert conflict: usability specialists may be asked to not enter into OSS projects or their contributions may be denied, silenced to death or silently deleted	Apparent cooperation: usability specialists allowed to work, but usability contributions do not have influence on the OSS (e.g., silenced to death or silently deleted)	Local struggles among and between usability specialists and OSS developers
Reason for usability specialists' failure to influence outcomes	Usability specialists have time and effort at their disposal, but they may be unable to acquire the other resources (expertise and status)	Usability specialists are not even aware of how their work is treated	All parties are prisoners of the Panopticon, although committers may derive greater advantage from it
Requirements for empowerment of usability specialists	Acquisition of the resources: through showing the value of usability work and convincing the committers (see also [4, 5, 6, 28, 32, 33] or through becoming committers	Consciousness-raising and "de-legitimation" strategies to create will to resist: usability specialists are to make their problematic position visible, question this and convince the community for change	Empowerment in the sense of freedom from power effects is not possible although local struggles may produce more positive experiences also for usability specialists

Table 3. Empowerment and the First, Third and Fourth Dimensions of Power [16: 462] in OSS Usability

The third and fourth dimensions of power were also found to be highly relevant concerning OSS usability, though more empirical research on these dimensions in the context of OSS usability is needed. The third dimension of power concerns the management of meaning: those who are powerful define how things should be seen and perceived. In our context of usability, an example could be a belittling attitude to the concept, as in some instances in Cases 1 and

3. However, the exercise of this power is very subtle: on the surface there is no evidence of conflict. In the case of OSS usability, this means that usability specialists may be allowed to do their work (which applies in any case to a voluntary OSS project where the software is freely available), but their contributions may remain ignored (e.g., silenced to death or silently deleted, as in Cases 1, 3, 4 and 5). In some cases the usability team was not aware of how the OSS developers and the community perceived usability, and whether their usability contributions were valued or not (e.g., some instances in Cases 1, 3 and 4). For usability specialists to succeed, it is essential that they become aware of the underlying meanings and values that may hinder their work, and prepare for these. They should also subsequently make others aware of the issues, and convince others of their harmful nature. This may involve various kinds of lobbying, persuasion, and allying strategies [6, 28, 32, 33, 38] relying on, for example, usability cost-benefit literature (e.g., [30, 31]) or even encouragement to rebel.

The fourth dimension of power relies on Foucauldian notions of power that maintain that power is embedded in the very fabric of the system in which we live and from which we cannot escape. This applies to both OSS developers and usability specialists, who can both be seen as prisoners of the complex control and surveillance system inherent in an OSS environment, which encourages extensive peer pressure and self-control [11, 21]. It is likely that OSS developers derive more advantages from the overall system than usability specialists, but through local struggles, usability specialists may also be able to challenge the existing discourses and derive more positive experiences. However, this entire system and the societal discourses circulating around it deserve a much more thorough empirical inquiry.

This study contributes to the HCI research by offering new insights on the relationships between power, empowerment and usability work in the OSS development context. This should help HCI researchers to address these aspects of power and empowerment in OSS and other development contexts. The utilized framework addressed the multidimensional concept of power in a comprehensive manner, and indicated numerous ways through which usability specialists might become empowered. The value of the theoretical framework was illuminated in its ability to map both empirical data from the present study and extant OSS usability literature. This study can be considered as an intermediate step towards greater insight into this complex topic. There remain several complex and unexplained issues regarding power and politics in OSS usability. This paper brings us one step closer to understanding what is going on with regard to the participation of usability specialists in OSS development. This study can also be seen as addressing a gap in critical research: the study touches upon dominance, power, marginality, and exclusion in IT development, which has been called for in IT research [7, 19] and is badly lacking in HCI research [20].

Regarding implications for practice, this study should indicate to usability practitioners that, when aiming to introduce usability into OSS development, power and politics must be taken seriously into account. Because it is entirely up to the decision makers of the OSS project to assess the value of contributions and contributors, usability specialists cannot remain neutral experts outside of the power struggles and politics of OSS projects. By becoming aware of these different dimensions of power, usability work can be better adapted to the particular OSS project at hand, therefore minimizing the possibilities of conflict and failure to influence outcomes. Usability specialists need to gain access to and influence in decision arenas. They also need to acquire and deploy valued types of resources in order to succeed. They may even need to take part in the management of meaning in the project: to initiate consciousness-raising and legitimation campaigns that aim at challenging established, negative notions of usability.

Further empirical research remains necessary to see how these suggestions play out in practice, however. The ways in which power manifests in OSS projects with different structures and cultures should be investigated in more detail, as well as the crucial role of the core developers. Further, as stated earlier, in order to become an accepted contributor or even an acknowledged member in an OSS community, a potential contributor may have to provide feature gifts [41] in order to gain essential access and influence, but it is an open question what these feature gifts could be in the case of usability work.

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