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# EMPOWERED OR DISEMPOWERED? AN ANALYSIS OF USABILITY PRACTITIONERS' INTERVENTIONS IN OPEN SOURCE PROJECTS

## Original research chapter

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## Abstract

Worker and workplace empowerment have been enduring topics in psychological research. Recently, due to the advancements in technology and communication, new forms and types of work and organizing have emerged and challenged the traditional understandings of power and empowerment. Open source software (OSS) communities are one example of such new types of organization and collaboration. OSS communities have been celebrated as democratic, participatory and egalitarian settings where people voluntarily, freely and collaboratively develop software to serve their needs as well as the needs of others. In this paper we show that OSS communities indeed nurture empowerment in several senses. However, we also show that OSS communities pose several challenges to empowerment. As an example, we analyze numerous usability interventions in OSS development, in which usability practitioners have offered their expertise to OSS projects. We show that the usability practitioners have been empowered in certain cases and senses, but that they have also encountered numerous challenges as regards their empowerment. Moreover, we argue that critical theories on empowerment provide additional, valuable insights on empowerment in OSS development as well as elsewhere. We propose a comprehensive framework on empowerment, suitable for studies on empowerment in OSS communities as well as in other online communities and forms of distributed or online collaboration.

# 1. Introduction

Worker and workplace empowerment have been discussed for decades within a number of disciplines such as in psychology, and organization and management studies (see e.g., Conger & Kanungo 1988, Hardy & Leiba-O'Sullivan 1998, Spreitzer 1995, Thomas & Velthouse 1990). It has already been acknowledged that empowerment is a complex concept with a variety of meanings attached to it (Conger & Kanungo 1988, Hardy & Leiba-O'Sullivan 1998, Spreitzer 1995, Thomas & Velthouse 1990). Moreover, recently, due to the advancements in technology and communication, new forms and types of work and organizing have emerged and challenged the traditional understandings of worker power and empowerment. In this chapter, we examine one example of such a new type of organization and collaboration - open source software (OSS) communities. They have been celebrated as democratic, participatory and egalitarian settings where people voluntarily, freely and collaboratively develop software to serve their needs as well as the needs of others. In this chapter we show that OSS communities indeed nurture empowerment in several senses, while they also pose many challenges to empowerment.

OSS communities are a significant example of new forms of organization and collaboration: they represent an influential recent development in the current software landscape (Fitzgerald 2006). Estimating the overall influence of OSS projects and software, solutions and services they have developed is difficult as these can be usually downloaded freely and from numerous alternative mirror sites and peer-to-peer networks. Some sources have estimated that the adoption of OSS resulted in savings of about 60 billion dollars to consumers already in 2008 and have identified the value of these OSS products, solutions and services to be about 6% of the total value of the software and services in the world (Standish Group 2008). There are over twenty source code repositories and other resources used by OSS projects for development and distribution of OSS software. SourceForge is one of the oldest, most well-known and largest web-based source code repository and is one of the leading resource for OSS development and distribution. With about 3,7 million registered developers and over 430,000 OSS development projects, the total number of users in all projects combined is estimated to be more than 46 million, and there are more than two million downloads from project repositories every day (SourceForge.net). The size of an individual OSS development project may vary from one developer coding and using the application by him/herself to massive OSS development projects spanning decades and having hundreds of developers (e.g., Linux, LibreOffice, Firefox, Blender). The latest version of Firefox browser has an estimated 4,64% market share, while LibreOffice office application suite has an estimated 200 million active LibreOffice users.

All this shows that OSS is a significant development also from the perspective of ordinary users - OSS is not relevant for the technologically savvy developer population only. Indeed, concerns for OSS usability have been raised. User experience (UX) and usability are at the heart of Human Computer Interaction (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"). From the usability perspective, the software, applications and services developed by OSS projects tend to be useful in any case as OSS developers usually are motivated to develop the solutions to serve their own needs. Therefore, from the usability standpoint these solutions have at least a minimum level of usability, though usability as a

concept has not traditionally been one of the major concerns of OSS developers, most of them not being familiar with usability as a concept, or its theories, processes, guidelines or methods in the first place. However, there is an ever-increasing number of OSS solutions with high number of non-technical users. For example, most of the users of some of the most popular OSS solutions, such as the Firefox browser and the Apache web-server, are not able to adapt the solution to their needs or to fix or report defects, such as usability problems (Giuri et al. 2004). Unfortunately, the current status of usability activities in OSS projects and the usability of OSS still tends to be quite poor, even though research has identified the need of improving OSS usability for more than a decade (e.g., Cetin et al. 2007, Iivari 2008, Nichols & Twidale 2003, Nichols & Twidale 2006, Zhao & Deek 2005, Zhao & Deek 2006, Rajanen 2011, Raza et al. 2012, Rajanen & Iivari 2015, Dawood et al. 2019).

OSS usability research is motivated to introduce usability and its improvement methods, processes and the user-centered mindset into the OSS development context. Improving OSS usability and bringing usability activities into OSS development have not been researched much, even though some recent studies have identified usability activities that have already been used in OSS projects (Andreasen et al. 2006, Bach & Carroll 2009, Bach et al. 2009, Rajanen & Iivari 2015, Rajanen et al. 2011, Rajanen 2011, Rajanen et al. 2012, Terry et al. 2010). Such good progress appears, however, to be rather slow. We claim many reasons for that relate to empowerment of the usability practitioners in OSS development. Most OSS core developers are technically oriented and there is a lack of skilled and available usability practitioners for OSS development projects. Furthermore, even if there were such usability practitioners available, the problem would be to identify and find the OSS development projects that are in need of usability improvement activities and to gain access to the OSS development projects and plan and conduct the usability activities in such a way that they have an impact on the development. There are OSS development projects in need of usability expertise and usability practitioners willing to contribute to such projects; but unless the OSS development projects realize they need to integrate these usability improvement activities into their development roadmap, and unless the usability practitioners find these projects and find a way to convince the core developers of the importance of usability, these two worlds will never fully meet. Next a theoretical treatment of this complexity is offered with the theoretical lens of empowerment. Rajanen & Iivari (2015) have already conducted an analysis of empowerment of usability practitioners in OSS development, but the study had a limited scope on empowerment, while this chapter addresses empowerment of usability work in the OSS development context in a much more comprehensive manner.

The paper is structured as follows. The next section discusses the complex concept of empowerment both from mainstream management and critical perspectives. The following section reviews related research on OSS development and usability in OSS development as well as proposes a theoretical lens on empowerment that will be utilized in the empirical analysis of a set of usability interventions conducted in the OSS development context. The empirical illustrations show cases of empowerment of usability practitioners in OSS development as well as cases of the lack thereof. The results are discussed from the perspectives of OSS development, OSS usability and empowerment. As a result, this paper proposes a comprehensive framework on empowerment, suitable for studies on empowerment in OSS communities as well as in other online communities and forms of distributed or online collaboration.

## 2. Perspectives on Empowerment

### 2.1. Mainstream Perspectives on Power and Empowerment

There is a lot of literature addressing psychological empowerment in the context of workplace. In this context, it is often connected with management practices or techniques that aim at increasing worker motivation, worker self-efficacy, and/or worker power and authority, and as a consequence organizational effectiveness, productivity and/or innovation (Conger & Kanungo 1988, Hardy & Leiba-O'Sullivan 1998, Spreitzer 1995, Thomas & Velthouse 1990). However, as mentioned, empowerment is a complex concept with a number of distinctions attached to it.

There is a distinction between empowerment as a relational and motivational construct (Conger & Kanungo 1988). The relational view on empowerment considers power as control or power over something, e.g., over decision-making process, over resources (e.g., information, education, financial) and their mobilization or over meanings-making in organizations (Hardy & Leiba-O'Sullivan 1998). Empowerment, hence, is seen as delegation or sharing of such power to less powerful ones (Conger & Kanungo 1988, Hardy & Leiba-O'Sullivan 1998). Overall, empowerment is here considered as delegation or sharing of power between people – a view common in management and organizational studies (Conger & Kanungo 1988, Hardy & Leiba-O'Sullivan 1998).

Other researchers advocate motivational perspective on empowerment that has been advocated in the psychological literature (Conger & Kanungo 1988). Empowerment is here approached as increased self-determination, personal efficacy or intrinsic task motivation (Conger & Kanungo 1988, Thomas & Velthouse 1990). Hence, empowerment is seen as motivational and internal to individuals, it is connected with an intrinsic need of self-determination and self-efficacy, and it needs to be seen as enabling rather than delegating (Conger & Kanungo 1988, Hardy & Leiba-O'Sullivan 1998, Thomas & Velthouse 1990). Empowerment practices within this perspective entail open communication and inspirational goal setting for increased commitment and involvement (Conger & Kanungo 1988, Hardy & Leiba-O'Sullivan 1998, Thomas & Velthouse 1990).

As for the motivational view, Thomas and Velthouse's cognitive model on empowerment, viewing empowerment as increased intrinsic task motivation that "involves positively valued experiences that individuals derive directly from a task" (Thomas & Velthouse 1990: 668), has been widely utilized in the literature. The model maintains that four cognitions (task assessments) form the basis of empowerment: sense of impact, competence, meaningfulness, and choice (Thomas & Velthouse 1990):

1. Impact refers to individual's sense of his or her ability of making a difference in the task in question, i.e., how much an individual can influence strategic, administrative, or operating outcomes;
2. Competence equals individual's self-efficacy to accomplish the task, i.e., his or her beliefs in his or her capability to perform the activities with skill;

3. Meaningfulness refers to individuals caring of the task at hand and the value of the goal or purpose of the task judged in relation to the individual's own ideals or standards;
  4. Choice refers to self-determination related to one's behavior, i.e., in having a choice in regulating or initiating activities
- (Thomas & Velthouse 1990, see also Spreitzer 1995).

However, in addition to these views, a critical perspective on empowerment has also been introduced in the literature. This will be discussed next.

## 2.2. Critical Perspectives on Power and Empowerment

In the literature adopting a critical perspective to empowerment, the above understandings of empowerment are labeled as mainstream or management view and it is argued that empowerment addressed within this view should actually not be considered as empowerment at all. Various strands within the critical perspective can be identified. They derive inspiration from critical research tradition, for example from the works of Habermas, Foucault or Freire (Hardy & Leiba-O'Sullivan 1998, Fulton 1997). Habermas and Freire strongly emphasize the need of the oppressed to critically reveal, reflect on and combat the distorting historical, social and political forces oppressing them (Freire 2000, Fulton 1997, Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). Freire's Critical Pedagogy places emphasis on education in the liberation of the oppressed (Freire 2000). Habermasian tradition highlights the significance of ideal speech situation in true emancipation, which requires that meaningful forms of life are available for everyone as well as justice, freedom and material well-being – which requires rational communication as well as critical evaluation of validity claims of our communication (Hirschheim & Klein 1989, Klein & Hirschheim 1993, Päivärinta 2001, Stahl 2004). Foucauldian tradition, on the other hand, can be argued of questioning the possibility of true empowerment and instead maintaining that power is all-encompassing and we are all prisoners of the prevailing discourses of power, including the critical researchers among others, while acknowledging that positive effects may still be generated through local struggles (Hardy & Leiba-O'Sullivan 1998).

Overall, power is in the critical empowerment literature seen as ideological, economical, and structural, if not as all-encompassing. Empowerment, then again, requires those in less powerful positions, i.e., those marginalized, dominated, or oppressed, to overcome or combat such marginalization, domination or oppression (Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). This requires that they become aware of the forces oppressing them and take action to change the status quo (Freire 2000, Fulton 1997, Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). It is emphasized that empowerment cannot be done or given to but it must be taken by the power weak, they must empower themselves – it is their task to liberate themselves as well as their oppressors (Freire 2000, Hardy & Leiba-O'Sullivan 1998), while empowerment can also aim at empowering others (Freire 2000, Fulton 1997, Päivärinta 2001).

Empowerment in the critical sense concerns not only individuals, but also collectives. “In the broadest sense, empowerment refers to individuals, families, organizations, and communities gaining control and mastery, within the social, economic, and political contexts of their lives, in order to improve equity and quality of life” (Jennings et al. 2006, p. 32, see also Rappaport 1987, Zimmerman 1995). At the individual level, motivational aspects such as self-efficacy, self-determination, capacity-building, personal control, and a proactive approach to life (Jennings et al. 2006, Zimmerman 1995) are underscored. Collective empowerment involves more broadly enhancing community members’ skills and offering them support for improving their well-being and quality of life (Jennings et al. 2006, Zimmerman 1995). Hence, empowerment should not be an individual level issue only, but it always should include active engagement in one’s community as well as the acknowledgement of the socio-political context and the aim at making a change (Zimmerman 1995).

The complexity of empowerment is acknowledged within the critical perspective. Empowerment entails both the relational and motivational aspects, and it may concern gaining power over resources, decision-making processes and/or meanings (Hardy & Leiba-O’Sullivan 1998). Empowerment needs to be considered both from intrapersonal (motivation, self-efficacy, competence), interactional (community, sociopolitical issues: critical awareness and understanding, skill development, resource mobilization) and behavioral (actual action aiming to make a change) perspectives – they are all needed: individual capabilities, understanding of the system and action taking (Zimmerman 1995). Empowerment can be approached both as a process and outcome, while the process perspective is essential (Fulton 1997, Rappaport 1987, Zimmerman 1995). Empowering process enables people to control their destinies and influence decisions affecting their lives, whereas empowered outcomes are the consequences of empowering processes (Zimmerman 1995). Altogether, it is emphasized that empowerment is a highly complex multilevel phenomenon that needs to be placed into its historical and cultural context, seen as dynamically evolving in time and always depending on the people involved (Rappaport 1987, Zimmerman 1995).

Jennings and colleagues have developed an extensive model on critical empowerment. This model emphasizes seven significant elements:

1. A welcoming and safe environment is required, where participants feel valued, respected, encouraged, and supported.
2. Meaningful participation and engagement is significant, i.e., there needs to be opportunities to engage in meaningful activities through which authentic contributions can be made.
3. Participation in community affairs is important; this involves development of valuable leadership and participatory skills. Significant is that the activities are relevant for the participants own lives, they are interesting and exciting, they challenge the participants and they are real – all this enables them to “master their own interests, develop skills, and gain confidence” (Jennings et al. 2006 p. 43).
4. Equitable power-sharing is stressed, while important are also opportunities for the participants to take on leadership roles. This also requires gaining increased decision-making power and influence.

5. Engagement in critical reflection on interpersonal and sociopolitical processes is imperative in critical empowerment: both conscious and unconscious constraints need to be reflected upon, the participants need to understand the problematic structures, processes, values and practices that they aim at changing.
  6. Participation in sociopolitical processes to affect change is another essential feature of critical empowerment: one needs to take action as well, not only to critically reflect on the status quo. Participants need to take action to empower themselves as well as others. Development of social responsibility is important, too; hence, not only personal problems are to be addressed. This is related to the last aspect as follows.
  7. Integrated individual- and community-level empowerment, which directs attention to aiming at positive changes at both individual and community levels.
- (Jennings et al. 2006).

Equipped with these varying perspectives on empowerment, usability interventions in OSS development will be analyzed. Next, related research addressing OSS development and usability in OSS development will be reviewed.

### 3. Empowerment in Open Source Software Development

#### 3.1. Characterizing OSS Development

OSS development relies on individuals who are motivated and skilled to develop solutions for their own personal needs, while also offering voluntarily these solutions for the use and further development by other persons and communities. The community development model and the basic values of OSS development, such as altruism, gift giving, reciprocity and sharing, motivate developers to do this (von Hippel 2001, von Hippel & Krogh 2003). This discussion positions OSS development projects as participatory and egalitarian settings where people are empowered to collaboratively develop software to serve their own needs as well as the needs of others. However, this facade of egalitarianism does not show the whole picture and the research has paid less attention to the other side of the coin, to address the aspects of power and politics that are intertwined into any human activity, including also the OSS development. This section will review literature that has indicated important issues as regards power and politics in OSS development.

Altogether, it is important to remember that there is indeed a long history and important ideological underpinnings regarding OSS development. The Free Software movement was launched in 1983 as a social and political movement to advocate what are seen as basic freedoms of 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 (Himanen 2001, Ljungberg 2000). 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 (Himanen 2001, Ljungberg 2000). 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 (Himanen 2001, Rolandsson et al. 2009).

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 (Ljungberg 2000). 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 (Feller & Fitzgerald 2000, Mockus et al. 2000). These developers form the core of the onion. They're 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 (Aberdour 2007). It is the end users in particular whose interests the usability practitioners aim to represent.

The onion layers as described above also indicate the power of decision participants in each layer. End users, as well as usability practitioners representing them, are very likely to remain on the outer layer of the onion, which has been a concern for HCI researchers addressing the topic (Bach & Carroll 2010, Bach et al. 2009, Moghaddam et al. 2011, Terry et al 2010, Rajanen & Iivari 2010, Rajanen 2011).

However, the OSS projects are not 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 (de Laat 2007). 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 with important and innovative contributions are given developer or core developer status, by agreement of the developers or community as a whole. (Aberdour 2007, Ljungberg 2000, Raymond 1999).

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. Further key motivational factors are the status, fame, reputation, and recognition that a contribution can create for a developer (Aberdour 2007, Raymond 1999).

It has been pointed out that in order to become an accepted contributor or even 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 (Von Krogh et al. 2003). 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 (Ikonen et al. 2010, de Laat 2007, Robbins 2005). Although OSS development is strongly transparent and visible for all, there remains a strong notion of ownership (Aberdour 2007, Himanen 2001). Decision making core developers typically have their own—often unwritten—vision of the project, and others are obliged to follow it, if they want to contribute to the project. 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 (Aberdour 2007, Ikonen et al. 2010, Mockus et al. 2000, Rajanen & Iivari 2013).

Interestingly, it is not only the software that is controlled by OSS developers: studies have also identified a surprising amount of control exercised in OSS projects in other ways (Di Tullio & Staples 2013, Gallivan 2001, Ikonen et al. 2010). Various kinds of governance configurations have been identified (Di Tullio & Staples 2013). 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 (Di Tullio & Staples 2013, Ikonen et al. 2010). Certain rules and procedures are expected to be followed, and peer pressure and self-criticism prevail in OSS development (Ikonen et al. 2010). It has been even argued that the openness of OSS projects enables 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 (Ikonen et al. 2010).

All this indicates that power and politics feature in OSS development, too. Next, literature addressing particularly usability in OSS development is discussed.

### 3.2. Usability in OSS Development

In a sense, the existence of power and politics in OSS development has already been acknowledged in the existing HCI research on OSS usability, as researchers have encountered numerous problems when trying to introduce and ensure usability or UX in OSS development. Studies have indicated that it may be challenging to integrate heavyweight usability methodologies with OSS development, given the latter's background of voluntary developers "scratching their own itch" (Benson et al. 2004, Bødker et al. 2007, Nichols & Twidale, 2003, Rajanen & Iivari 2013). 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., Andreasen et al. 2006, Moghaddam et al. 2011, Terry et al. 2010). Usability practitioners should be capable of demonstrating their merits and contribution to the overall development, too (Bach & Carroll 2010, Bach et al. 2009, Bach & Twidale 2010, Moghaddam et al. 2011, Terry et al. 2010, Rajanen 2011, Rajanen & Iivari 2015). However, usability merits and contributions are not necessarily valued by OSS developers (Bach & Carroll 2010, Bach et al. 2009, Bach & Twidale 2010, Moghaddam

et al. 2011, Terry et al. 2010, Rajanen & Iivari 2015). Usability practitioners may need to utilize a variety of lobbying, persuasion, communication, and bullying strategies in order to succeed (Bach & Twidale 2010, Moghaddam et al. 2011, Rajanen 2011, Rajanen et al. 2011, Rajanen et al. 2013, Rajanen & Iivari 2015).

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 article addresses this gap by presenting a comprehensive theoretical framework on empowerment through which to make sense of the power dynamics involved in the field of OSS usability.

### 3.3. Theoretical Lens on Empowerment in This Chapter

We consider Thomas and Velthouse’s (1990) widely utilized cognitive model on empowerment as a suitable basis for making sense of empowerment as regards OSS usability. The model has already been utilized to make sense of empowerment in the context of online communities and distributed online collaboration: Deng et al. (2016) have utilized the model and propose four types of empowerment in the crowd working context. Table 1 captures the four types of crowd worker empowerment.

**Table 1. Four types of crowd worker empowerment (Deng et al. 2016)**

Type of crowd worker empowerment	Definition
<i>Meaning</i>	The job activities are personally meaningful to me.
<i>Self-determination</i>	I can decide on my own how to go about doing the work.
<i>Impact</i>	I have a significant influence on others.
<i>Competence</i>	I am confident about my skills and capabilities to do the work.

This framework reveals crowd worker empowerment as a multifaceted concept that theorists have approached in various ways. In the first type of empowerment, meaning, the personal experience of empowerment is a result of having an access to open work opportunities, which the person finds valuable either through financial (crowd worker makes extra income), cognitive (crowd worker feels productive or mentally challenged by the tasks) or experiential (feeling enjoyment and excitement by being engaged with the task) aspect. In the second type of empowerment, self-determination, empowerment is gained through the autonomous nature of the crowd worker tasks, being free to choose what, when, where and how to work. The third type of crowd worker empowerment, impact, arises from the value to oneself when making an impact on others and on the society in general, contributing something for the greater good and being part of a larger purpose. Finally, the fourth type of empowerment, competence, ensues from the value of having an access to different types of micro tasks, which improve proficiency, analytical skills, articulation and self-awareness (Deng et al. 2016, based on Thomas and Velthouse 1990).

This theoretical model with these four types of crowd worker empowerment 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 a clear and

established position in the research literature, indicated by many citations of this paper and a top-level publication forum as well as by the highly appreciated original model. Second, it has already been utilized in technology related research, though it has not been used in the OSS development context. Third, the framework of empowerment types provides a comprehensive approach to empowerment in a context of crowdsourcing and crowd working, which are similar by nature to the OSS development context and contributing to OSS projects. Fourth, the framework enables us to reveal interesting parallels and differences in the OSS context to the crowdsourcing and crowd working, and this framework was easy to apply to our data. Therefore, the framework by Deng et al. (2016) provides a comprehensive and easily applicable lens for our analysis.

However, the critical perspective to empowerment is also to be acknowledged. Even if the empirical data on OSS usability does not offer much evidence of empowerment emerging in usability interventions in OSS development in the sense of critical perspective, this perspective acts as an important reminder of forms of empowerment that still should be strived at, also in OSS development. This perspective maintains that power is ideological, economical, and structural, while empowerment requires those in less powerful positions, i.e., those marginalized, dominated, or oppressed, to take action to overcome or combat such marginalization, domination or oppression (Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). This requires that they become aware of the forces oppressing them as well as take action to change the status quo (Freire 2000, Fulton 1997, Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). Empowerment cannot be done or given to but it must be taken by the power weak themselves, they must empower themselves – it is their task to liberate themselves as well as their oppressors (Freire 2000, Hardy & Leiba-O'Sullivan 1998). Moreover, empowerment in the critical sense concerns not only individuals, but collectives (Jennings et al. 2006, Rappaport 1987, Zimmerman 1995). Safe and welcoming environment and everyone's meaningful participation and engagement are highlighted. Engagement in critical reflection on interpersonal and sociopolitical processes is imperative: both conscious and unconscious constraints need to be reflected upon, the participants need to understand the problematic structures, processes, values and practices that they aim at changing. Participation in sociopolitical processes to affect change is another essential feature of critical empowerment: one needs to take action as well, not only to critically reflect on the status quo. Development of social responsibility is important: not only personal problems are to be addressed but one should aim at positive changes at both individual and community levels. (Jennings et al. 2006).

## 4. Research Design

This research is part of a larger research program (UKKOSS) aiming to find, theorize and test ways for usability and UX practitioners to offer their expertise to OSS development. Within this research program, suitable methods for introducing usability and UX activities into small, medium and large OSS development projects have been experimented with by 20 different student usability teams doing usability work in OSS case projects for over 10 years. The authors have guided these student usability teams in organizing the usability interventions with different strategies, methods, and outcomes in OSS case projects across different domains, technologies, communities and cultures (see Rajanen & Iivari 2010, Rajanen et al. 2011, Rajanen 2011, Rajanen et al. 2012, Rajanen & Iivari

2013, Iivari et al. 2014, Rajanen & Iivari 2015a, Rajanen 2015, Rajanen & Iivari 2015b, Rajanen et al. 2015). The student usability teams communicated with their allocated OSS case projects and tried to introduce usability activities for them in various communication means and strategies. The members of these student usability teams had backgrounds from at least two previous courses on usability evaluation methods (e.g., heuristic evaluation, usability testing) providing both theoretical and hands-on expertise on these evaluation methods, as well as the general user-centered design process and philosophy, and user interface design. Each student usability team consisted of three to five students working 200-300 hours each in planning, carrying out, and communicating the usability activities, following up the impact of these usability activities and the communicated importance of usability on the developers and community of these OSS projects. Additionally, the student usability teams collected rich empirical data and wrote project reports.

In this article, we analyze the data which was collected from ten OSS case projects (named in this chapter as Case 1, Case 2, ..., Case 10). These empirical cases and their usability intervention strategies are briefly introduced as follows. Some of these cases have been introduced in more detail in Rajanen et al. 2011, Rajanen 2011, Rajanen & Iivari 2015.

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.

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, 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.

Case 6 was developing a cross-platform image editor targeted at non-technical end users with no programming skills. The OSS project started originally in 1996, and the developers had changed over time. The project was a large scale OSS project, with many subprojects for developing plugins and localization. The usability team followed this OSS project for five months, while conducting usability testing and heuristic evaluation. In addition, the usability team did comprehensive translation and localisation effort, as this kind of work was requested by the developers, it was valued by the community, and the usability team had the skills and expertise to do this kind of work in order to gain merit within this community and to have more impact for their usability work.

Case 7 was developing a vector graphics editor targeted at non-technical amateur, semi-professional and professional graphic designers with no programming skills. The OSS project started in 2003 and the project was large in size with over 80 developers and estimated 70,000 full-time users. The usability team followed this OSS project for five months, while conducting standard usability evaluation work, such as usability testing and heuristic evaluation. Furthermore, the usability team designed based on the results of the usability evaluation an improved set of icons to one part of the software, as the existing icons were thought to be confusing and of poor quality by the community and the users, and they caused frequent problems in the usability tests. The results of the usability work and the redesigned icons were communicated to the developers and the community.

Case 8 was developing a project management software targeted to non-technical users as well as small and medium sized businesses. The OSS project started in 2010 and it had 30 developers and approximately 100,000 users. The usability team observed this project for six months, while carrying out standard usability testing and heuristic analysis. The usability team wrote several reports about usability problems and their suggestions for changes to fix those problems, and they were in close communication with the developers.

Case 9 was developing an e-book software, which was targeted to general public in need of an e-book reading software, with no requirements of technical or programming skills. The OSS project started in 2006 and it had 17 developers and an estimated number of 3,200,000 users. The usability team observed this project for four months and conducted the usability tests and heuristic evaluations. The usability team communicated their usability findings as well as their re-design suggestions to the developers.

Case 10 was a revisit after two years to the same OSS project as in Case 5 with a new usability team. This time the usability team concentrated their efforts on improving a tutorial that was found to be incomprehensible and frustrating for novice users. The team conducted usability tests to the old tutorial to find its problems and used this data as well as their game design and development skills to design and code a new tutorial for the game. The usability team submitted the finished code for the new tutorial to the code repository of this OSS project. The developers reviewed the new tutorial and accepted it.

The collected empirical data included both deliverables by the usability teams as well as collected online material specific to each OSS case project. These materials included qualitative and quantitative data from project website, discussion forum posts, IRC chat discussion logs, commit messages in the code repositories, and emails between the developers and the student usability team members. The deliverables by the student usability teams consisted of different kinds of usability activity plans and reports, as well as documents related to the project management. The collected data was versatile and useful, and enabled us to conduct our analysis from the viewpoint of empowerment using the framework by Deng et al. (2016). This framework was adopted after the data collection as a post-hoc analysis of existing data that was collected during more than ten years, and therefore the framework did not guide the data collection process. Hence, the collected data and material was examined and analyzed using the empowerment framework introduced in section 3.3 as a sensitizing device years after the data collection.

## 5. Empirical Illustrations

In all the examined cases, the usability team conducted both expert usability evaluations and empirical usability tests with users. 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 empowerment-related issues arising in the projects, which are reported below.

### 5.1. Meaning

Our analysis of the cases shows that in the sense of meaning, usability practitioners were truly empowered in the OSS cases. They felt proud, excited and enthusiastic about their work and contribution to OSS development. However, our analysis also shows that unfortunately there were many challenges in their work, despite the strong personal meaningfulness experienced by the usability practitioners.

For example, in Case 1 the developers 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. Therefore, it can be argued that even though the usability team was very enthusiastic and felt empowered through the usability work being cognitively and experientially meaningful, this felt empowerment was not actually impactful, as the developers did not see any meaning in this kind of work and belittled it.

Moreover, in Case 3 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, even though all other major alternatives used a de facto standard user interface and all the users in usability tests strongly preferred the de facto standard. 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 also an example of an overt conflict between the core developer and the usability team that offered their help and the usability team having a false sense of empowerment through feeling productive and excited by their hard efforts of usability work, which was then negated by the developers who did not consider such work meaningful.

Also positive cases can still be identified. In Case 5, 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. This person wanted to learn more about this kind of coding and design, as well as to participate in the community discussions and to improve his skills as a user. By this invitation to the development team, this person was able to access and affect design decision making in the project.

## 5.2. Self-Determination

Our analysis of the cases shows also that self-determination as an aspect of empowerment pictured strong in OSS usability interventions. The usability teams were free to concentrate on the topics and tasks they wished. However, our analysis also shows that sometimes this was very problematic from the viewpoint of their work.

As for the successful cases, 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 of games, as outlined in the usability cost-benefit literature (see Rajanen 2006) and the game usability literature (see Rajanen & Marghescu 2006, Rajanen & Rajanen 2017). On the whole, the

community seemed to become interested in the usability effort and to appreciate the help provided by the usability team. The usability team could freely decide what usability work they would do, when to do it and how. 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. This case offers an example of a usability team gaining access to the OSS project and truly having an impact there, through their voluntary and self-chosen usability evaluation work. 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.

In Case 6 the usability team decided to further gain merit in the OSS community by choosing to try to solve a specific challenging problem in the software and succeeding in it. Some of the team members had some expertise required in this problem and the other usability team members were keen to learn the required skills and knowledge. The usability team succeeded in gaining merit through this kind of voluntary work, which was identified by the developers as something that should be addressed, but was not assigned to anybody.

Problems can also be identified in the cases, however. In Case 9, the OSS community and the developers did not expect the findings and suggestions made by the usability team to make any difference in developing the OSS e-book software. Also it was clear that the community and developers wanted the usability team to stay as outsiders and did not expect the usability team to contribute directly to any of the changes. As the creator stated “keep in mind that all proposed changes have to be developed by someone” and “Most likely some (proposed usability improvements) will be acted on and some not.” Therefore, even though the usability team had in principle the autonomy to decide what, when, where, and how they would do their usability work, in practice the OSS developers and the community negated their autonomy of work.

### 5.3. Impact

In all the examined projects, the main issue at stake in the intervention concerned the usability team’s ability to impact decision-making. 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 practitioners. 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 not always able to impact the decision making.

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.

In Case 2, the usability team was successful on having an impact, as 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.

In Case 3, the project did not have any specific official communication channel or small group of persons to contact about usability work. 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 and their work did not even catch the attention of the decision-making core developers, and hence the usability team was unable to influence the OSS. Nominally, the usability team had access to open work opportunities and hence a possibility of empowerment through impact, but even though the work was done, it was not recognized by the authority.

In Case 4, 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.

Case 5 was 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.

These merits and recognition, as well as one member of the usability team becoming a developer in this OSS project, indicate that the work of the usability team as a whole had a substantial impact.

In Case 6, interestingly, while the project was an overall success, some individual usability efforts were not noticed by the developers and thus did not have as big of an impact as other similar usability work had been. This lack of recognition in one time and full recognition in other time for similar work was identified to originate from the overall schedule of that OSS project and the developers. When the developers were busy with the next release of the software, they stopped noticing and caring about new usability issues or improved user interface designs that were reported by the usability team. Therefore, in the OSS context, usability work can be either a success or failure depending of the time and circumstances of that particular OSS community and developers. This also highlights the challenges around self-determination in OSS development: usability teams are free to do whatever they wish whenever they wish, but poorly scheduled interventions may totally lack an impact.

In Case 10, the usability team worked on improving the 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, using their skills, competence and expertise in game development and as gamers. This new version of the tutorial performed well in usability tests and the developers and the community overall were very enthusiastic about it. However, after some time the creator of the original tutorial reverted it back to the previous version in the next major release. This is an example of a higher authority effectively nullifying the work of the usability workers, who had been using their comprehensive competence on both usability work and game design. 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.

#### 5.4. Competence

The empirical analysis also brought up the significance of competence in the cases. The usability teams were student teams, but they became appreciated resources in many cases, which was important from the viewpoint of felt competence of the usability practitioners as well as from the perspective of the impact of their work. Moreover, the work of the usability team also developed the actual competence of the usability practitioners in many ways through practical work experience. However, evidence of problems with competence could also be located and those resulted also in challenges in usability work.

Positive responses towards the usability teams' competence could be identified from several cases, despite the teams being student teams. In Case 2, the developers and community were grateful for the usability competence that the usability team offered to them. They recognized that, while the usability as a concept was not so familiar to them, it was something valuable and competent people offering their expertise on the topic were welcome, no

matter who they were, what their skills and competence were, and more importantly, they did consider the student usability team as fully competent resource in usability work. In OSS development context names, titles, credentials and CV are far less important than competence, time and enthusiasm that an individual can bring to that OSS community.

In Case 6 the usability team conducted comprehensive translation and localization effort in addition to their usability work, as the translation and localization work was specifically requested by the developers and valued by the community and users, and the usability team had the required skills and expertise to do this kind of work, as two members of the usability team had previous experience on such localization work. This extra work on translation and localization was to gain merit within this community and to have more impact for the usability work. In the end, the usability team was successful in both of their efforts, as the successful work in localization was appreciated by the developers and the community, and through this gained merit also the usability work was recognized and effective.

Likewise, in Case 7, the usability team used their experience and expertise in graphical design to create an improved set of icons to one part of the software, as the existing icons were considered as being confusing and of poor quality by the community and the users. Also in this case, the usability team could use their existing expertise and their successful design of new icons were welcomed by the community and therefore also their usability work had an effect.

In Case 8, the usability team managed to gain merit and recognition through their dedicated usability work. As a result, the development team praised the usability team for their skills and achievements, as well as their contribution to the quality of the software. The core development team even invited the usability team to visit them, and as this proved to be not possible, they sent instead small box of gifts to the usability team as a token of their gratitude.

Problematic cases could still be identified. In Case 9, the reception of the OSS community was at first aggressive as they questioned the research methods and the usability methods suggested by the usability team as well as the expertise and knowledge of the usability team, some OSS developers stating that the software's "usability or learning curve is basically unimportant, because there is no viable alternative." When one of the usability team member tried to participate in the conversation, it turned again to questioning the competence and chosen methods of the usability team. Thus, the usability team decided to keep a low profile and let the community continue their discussion.

## 6. Discussion

Empowerment has been an enduring topic within a number of disciplines. It has long ago been acknowledged that empowerment is a complex concept with a variety of views and definitions. This chapter scrutinized empowerment in the context of OSS development, and more particularly in the context of OSS usability. The chapter acknowledged empowerment in several senses as well as showed that at the same time OSS development can be a highly empowering setting as well as pose numerous challenges for empowerment. The findings have implications on research on OSS development, OSS usability and empowerment.

The literature review on OSS development revealed that OSS development indeed nurtures empowerment, and in several senses. In OSS development, individuals are encouraged and enabled to develop software to serve their own needs and the needs of the others. The values and spirit of OSS development can be argued of aiming at empowering individuals vis a vis commercial software development (see e.g., Himanen 2001, Ljungberg 2000, Rolandsson et al. 2009, von Hippel 2001, von Hippel & Krogh 2003). We argue that empowerment in the critical sense can be connected with OSS development: the oppressed are taking action to combat their oppressors, aiming at liberating themselves as well as the others. However, this is not the entire picture. There are also problematic issues in OSS development from the perspective of empowerment.

The OSS literature shows that in OSS projects there are power and politics involved. The projects have leaders, governance structures, decision-making processes and core groups having lots of power vis a vis other participants. There is meritocracy in OSS projects and not everyone's contributions are treated equally. One has to show the merits and offer value contributions to the community to become an acknowledged member of the community (see e.g., Aberdour 2007, Feller & Fitzgerald 2000, Mockus et al. 2000). All this indicates that certain individuals are for sure empowered in OSS development, while there may be a huge group of individuals disempowered in OSS development as well: they may lack the skills or knowledge appreciated and they may be prevented from contributing or be entirely ignored (see also Rajanen et al. 2015). And even for those who may have the skills or knowledge, the barrier of entry into an OSS community has proven to be in many cases prohibitively high (Balali et al. 2018).

Research on OSS usability has already revealed that usability practitioners may have difficulties in demonstrating their merits, convincing the decision-makers of the value of their work and having any impact on OSS development (Bach & Carroll 2010, Bach et al. 2009, Bach & Twidale 2010, Moghaddam et al. 2011, Terry et al. 2010, Rajanen 2011, Rajanen & Iivari 2015). Our empirical analysis corroborated these findings. In our cases, the usability practitioners encountered numerous challenges particularly in having an impact: in having any changes in the software based on their work. Lack of impact shows clear evidence of lack of empowerment: impact is one significant aspect of empowerment (see Deng et al. 2016, Thomas and Velthouse 1990).

Then again, our analysis showed clear signs of empowerment of usability practitioners in other senses. In the sense of meaning (Deng et al. 2016, Thomas and Velthouse 1990), usability practitioners were empowered in the cases.

They felt proud, excited and enthusiastic about their work and contribution to OSS development. However, our analysis also revealed that despite the strong personal meaningfulness experienced by the usability practitioners, there were many challenges in their work and how the OSS developers and community perceived the meaningfulness of their work. Challenges can also be associated with self-determination, another aspect of empowerment (Deng et al. 2016, Thomas and Velthouse 1990). The usability teams were allowed to decide what they wanted to do and when. However, the analysis showed that sometimes this was very problematic from the viewpoint of their work: poorly scheduled interventions may become totally ignored by the OSS projects. The empirical analysis also brought up the significance of competence (Deng et al. 2016, Thomas and Velthouse 1990) in the cases. The usability teams were student teams, but they became appreciated resources in many cases, which was important from the viewpoint of the experienced competence of the usability practitioners as well as from the perspective of the impact of their work. However, evidence of problems with competence could also be located and those resulted also in challenges in usability work.

For those interested in the empowerment of usability practitioners in OSS development, this chapter highlights the importance of impact. Our chapter shows that in OSS development, there seems to be little problems in usability practitioners experiencing their work as meaningful, in self-determination in their usability work or in building and feeling of competence, even as student usability practitioners, but all these become meaningless if their work has no actual impact on the software. This chapter indicates that in OSS development there actually is a great risk involved with self-determination: usability practitioners are free to carry out usability work, even to make changes to the actual source code, but the core developers may entirely ignore their contribution. We assume that in the longer run this easily results in less experienced meaningfulness among the usability practitioners, potentially also reducing their own perceived competence in their work, too. Then again, OSS projects offer an exciting setting for building of competence for novice usability practitioners, among other practitioners. OSS developers seem to appreciate any useful contribution, no matter with what title or degree it was produced. However, having an actual impact is an aspect of empowerment clearly most critical in the context of OSS usability.

This chapter has also highlighted the importance of critical perspective on empowerment. It was already brought up that the critical variant can be connected with the overall spirit and mindset of OSS. For empowerment of usability practitioners or other marginalized individuals or groups in OSS development, this chapter leaves many questions open still. The literature maintains that it is important that the oppressed liberate themselves from oppression by themselves (e.g., Freire 2000, Fulton 1997, Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). Usability practitioners, in a sense, aim at that - liberation of themselves as well as the users in OSS development. However, what more could they do to what has been done already - this is an open issue. The literature on empowerment advises us that the following issues might be considered. One issue is awareness raising: the marginalized, oppressed or dominated should become aware of the forces oppressing them after which action to change the status quo should be taken (Freire 2000, Fulton 1997, Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). For usability practitioners, this may be a challenging task in OSS projects, but open discussion may be attempted to be aroused. The critical perspective also highlights the collective level. At the individual level, motivational aspects such as self-efficacy, self-determination, capacity-building, personal control, and a proactive

approach to life (Jennings et al. 2006, Zimmerman 1995) are to be aroused, but collective empowerment involves more broadly enhancing community members' skills and offering them support for improving their well-being and quality of life (Jennings et al. 2006, Zimmerman 1995). For usability practitioners, again, this is a challenging task. The community here entails ordinary users and fellow usability practitioners, whose competence building and proactive approach towards better software should be aroused. For this to happen, a welcoming and safe environment is required as well as opportunities for meaningful participation and engagement (Jennings et al. 2006). Many of these issues cannot be ensured by the usability practitioners alone, but collaboration with OSS communities is needed. They all should engage together in critical reflection in which both conscious and unconscious constraints for empowerment and equality are reflected upon and action to make a change is collaboratively taken (Jennings et al. 2006).

As a result of the empirical study and the literature, we propose a framework on empowerment that includes, in addition to the aspects proposed by Thomas and Velthouse (1990) and Deng and others (2016), ingredients of critical empowerment from Jennings et al. (2006) (see Table 2).

Table 2 underscores empowerment both at individual and collective levels. It highlights the significance of impact and decision-making power, in line with our empirical results, but it also acknowledges other significant aspects of empowerment: motivational ones (Conger & Kanungo 1988, Thomas and Velthouse 1990, Deng et al. 2016), as well as critical ones (Freire 2000, Fulton 1997, Hardy & Leiba-O'Sullivan 1998, Jennings et al. 2006). Empowerment can be approached both as a process and outcome, while the process perspective is essential (Fulton 1997, Rappaport 1987, Zimmerman 1995). In line with the critical perspective, we wish to highlight the empowering process rather than the outcome (Zimmerman 1995). Altogether, in line with this literature we stress that empowerment is a highly complex multilevel phenomenon that needs to be placed into its historical and cultural context, seen as dynamically evolving in time and always depending on the people involved (Rappaport 1987, Zimmerman 1995).

**Table 2. Proposed framework on empowerment**

Type of empowerment	Definition	Source
Meaning	The job activities are personally meaningful to me.	Deng et al. (2016)
Self-determination	I can decide on how and when to go about doing the work.	
Impact	I have a significant influence on others.	
Competence	I am confident about my skills and capabilities to do the work.	
Social responsibility	I aim at ensuring that individuals, families, organizations, and communities gain control and mastery, within the social, economic, and political contexts of their lives in order to improve equity and quality of life.	Rajanen & Iivari 2019 (this chapter), inspired by Jennings et al. (2006)
Participation and engagement	I work towards building a welcoming and safe environment with meaningful activities for participants and their competence building.	
Power sharing	I work towards equal power sharing among the participants.	
Critical reflection	I engage in and arouse critical reflection on the oppressing conditions of the status quo, on associated sociopolitical processes, on the problematic structures, processes, values and practices involved.	
Action taking	I engage in and arouse in taking action to liberate the oppressed.	

### 6.1. Implications for Research

This chapter contributes to the research on OSS development, OSS usability and empowerment by offering a comprehensive framework on the aspects of empowerment. We particularly see it as suitable for research in the contexts of OSS communities, online communities, and distributed collaboration, while it likely fits other contexts as well. Other researchers working in different kinds of social and political contexts are warmly welcomed to explore the framework: it should be useful for making sense of different forms of empowerment or the lack thereof, but also for advocating empowerment of various kinds of marginalized groups or communities.

Furthermore, this chapter contributes particularly to HCI research by highlighting the successes and failures of usability work empowerment in OSS development context. The value of the framework is in its ability to map both empirical data from numerous empirical cases and theoretical literature on empowerment. This chapter brings us one step closer to understanding the barriers and success factors in the usability practitioner participation in the OSS development context. Such participation is needed in order to improve the status of usability and user experience of the OSS solutions.

### 6.2. Implications for Practice

This chapter will help usability practitioners to understand better the complex issue of usability work in OSS development context; power and politics involved, different forms of empowerment to be aimed at, and barriers that can be encountered when usability practitioners want to contribute to OSS projects. By becoming aware of the types of empowerment, usability practitioners can better adapt their strategies of contributing to OSS projects

and thus maximizing the possibility of their impact and empowerment, and minimizing the possibility of conflict and encountering barriers. The usability practitioners need to gain access to and influence in OSS communities. They also need to acquire and deploy valued types of resources and forms of work in order to succeed. They may even need to take part in the management of meaning in the projects: to initiate consciousness-raising and legitimation campaigns that aim at challenging established, negative notions of usability.

### 6.3. Limitations

The student involvement in the research process where students take the role of usability experts can be seen as a limitation of the study in terms of ecological validity. However, the usability work in these projects was conducted within a project course for Master students and the authors planned and closely supervised the work of the student usability teams. Furthermore, the students had knowledge and expertise of usability work from many university courses, and students from this field are typically involved in OSS development projects as developers, contributors, and community members. It can be argued that the results would have remained the same even if professional usability people had been involved, because the OSS developer culture places more value on the functionality of code than on interaction design (Green et al. 2009) and more value to contributing to the community than to titles or formal positions.

### 6.4. Paths for Future Work

Further empirical and theoretical research is still necessary regarding empowerment, power, and marginalization of voluntary contributors in OSS development context as well as in other online collaboration contexts. 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, 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 (Von Krogh et al. 2003) in order to gain essential access, merits and influence, but it is an open question what these feature gifts could be in the case of usability work.

The study by Deng et al. (2016) also identified the types of crowd worker marginalization, however these were not addressed in this paper, as the focus was on empowerment. Future studies should also look at marginalization of OSS contributors and community members. In addition, future work should address the perception and understanding of usability by OSS developers, contributors and community members.

Usability work is part of the user-centered design paradigm (Rogers et al. 2011) and is conducted in a systematic way (Marghescu 2009) that ideally is integrated in early stages of software development (see e.g., Iivari 2010, Rajanen D. et al. 2017). Future studies and interventions should also focus on integrating usability work from the beginning of OSS projects and investigate how empowerment and marginalization will manifest in those situations.

## Conclusion

Worker and workplace empowerment have been enduring topics in psychological research. Recently, due to the advancements in technology and communication, new forms and types of work and organizing have emerged and challenged the traditional understandings of power and empowerment. Open source software (OSS) communities are one example of such new types of organization and collaboration. In this chapter numerous usability interventions in the OSS development context were analyzed with the theoretical lens on empowerment. OSS communities have been celebrated as democratic, participatory and egalitarian settings where people voluntarily, freely and collaboratively develop software to serve their needs as well as the needs of others. This chapter showed that OSS communities indeed nurture empowerment in several senses. However, the chapter also revealed that the OSS communities pose several challenges for empowerment. Additionally, the chapter highlighted the value of critical theories on empowerment: they provide additional, valuable insights on empowerment in OSS development as well as elsewhere. The chapter showed that depending on the view of empowerment, usability practitioners can be considered as empowered and disempowered at the same time. As a result, a comprehensive framework on empowerment, suitable for studies on empowerment in OSS communities as well as in other online communities and forms of distributed or online collaboration, was proposed.

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