Monetary Rewards for Open Source Software Developers

Research-in-Progress

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Abstract

Open source software (OSS) has changed the landscape and economics of software industry. Large software firms are changing their business models to incorporate OSS for long term success. As a result of greater organizational involvement in OSS, there is an increased prevalence of reward options for OSS developers. However, introducing compensation/rewards to these ideologically motivated communities may threaten their sustainability. We don't know the nature and type of rewards that would be acceptable in OSS developer community. Using grounded theory methodology, we extracted the concepts regarding developers’ perception of rewards in OSS community and how developers prefer to be compensated. This paper contributes to the literature of open source software development by (1) providing in depth examination of the developers’ intention to work on the OSS project if compensated (2) providing an initial theory for understanding when compensation helps an OSS project and when it hinders.

Keywords: Grounded Theory, Open Source Software, Compensation

Introduction

Under the paradigm of open innovation, open source software (OSS) has changed the landscape and economics of software industry. Open source software refers to programs which provide free and open access to the source code in contrast to proprietary software where only executable program is available. Open source software is developed (Von Hippel 2005) and supported (Von Krogh et al. 2003) by a volunteer community of OSS developers. A large number of globally distributed OSS developers contribute their time and effort to produce high quality OSS for free. These independent programmers participate in testing and fixing bugs resulting in the production of high quality software in a very short time (Crowston and Howison 2003; Sharma et al. 2002). Given the diversity of perspectives, background, and capabilities of thousands of independent programmers, the process of software development tends to be faster while preserving quality and innovation in development (Von Hippel 2005; Von Krogh et al. 2003).

Unprecedented success of OSS has attracted attentions of proprietary software firms (Von Hippel and von Krogh 2003) which were skeptical at the beginning. Large software firms which considered OSS as a threat to their survival, have now realized the value of OSS and are changing their business models to incorporate OSS for long term success. As a result of greater organizational involvement in OSS, there is an increased prevalence of payment/reward options (Krishnamurthy and Tripathi 2006) for OSS developers (volunteers). The current model of OSS development depends on a high level of volunteerism from ideologically motivated individuals (Stewart and Gosain 2006), and hence, introducing monetary rewards to these volunteer communities may threaten their sustainability (Fitzgerald 2004; Frey and Goette 1999). Since volunteers’ motivation to associate with, and contribute via these communities is vital (Roberts et al. 2006) to the sustainability of these communities (Von Hippel and Von Krogh 2003; Von Hippel 2005; Von Krogh et al., 2003), it is critical to explore the nature and types of financial incentives/rewards that
would be acceptable in OSS communities and impact of these rewards on the OSS development ecosystem.

Unfortunately, literature on compensation and rewards for OSS developers is very thin. Prior literature in OSS largely focused on examining developers’ motivations for participation in OSS projects and evolution and impact of OSS communities on OSS projects. Researchers have found that developers are motivated to participate by volunteerism (Raymond 1998, Ghosh 1998, Von Hippel and Von Krogh 2003), enjoyment of coding (Roberts et al. 2006), ideology (Stewart and Gosain 2006), and financial incentives (Fitzgerald 2006). Similarly, Self-determination theory (SDT) theorizes the existence of intrinsic and extrinsic motivations of individuals to work effectively towards a desired goal (Deci and Ryan 2000; Ryan and Deci 2000). Despite a large number of studies in this area relevant to information systems discipline, few have explored whether or how developers want to be compensated or rewarded for their contributions on OSS projects. We do not know how rewards or compensation affect the dynamics of OSS developer communities. Note that the potential perturbation of these dynamics could threaten the viability of entire project communities. Some preliminary work in this area has found that not all OSS developers/communities accept monetary rewards (Krishnamurthy and Tripathi, 2009; Krishnamurthy et al. 2014). We contend that before we explore the effect of availability and desire to accept rewards, on motivations and effort of individual and communities, it is critical to understand nature and type of compensation and rewards that are acceptable in OSS community. This understanding will later guide the development of compensation and reward mechanisms for OSS developers.

This study aims to explore developers’ perception of monetary rewards in OSS ecosystem and types of rewards/compensations that are acceptable or preferred by OSS developers. As growing number of companies and individuals are increasingly leveraging the OSS community to develop their products, it is critical to understand the role of compensation/rewards in OSS development community. The exact research question theorized in this research paper is: what impact does compensation have on the development of open source software? This study selected the grounded theory procedures to extract relevant codes from raw data and conceptualize them. In the following sections, we provide a description of grounded theory methodology, conduct the data analysis and report our findings. We conclude by discussing the potential contribution of the findings and the future plan of improving and extending the current study.

Research Design

Survey methods based on statistical notions of sampling, are used to collect the data on the preference of compensation methods of open source developers. Data was collected from OSS developers who work on projects hosted on Sourceforge.net development platform. Sourceforge is one of the largest repository of OSS projects. Developers were asked following open ended questions-

1. Does compensating OSS developers, helps or hinders the progress of open source project?
2. How should OSS developers be compensated?

We had usable response from 321 OSS developers who explicitly stated their idea of rewards for OSS development. These semi-structured questions were then coded using grounded theory procedures outlined by Strauss and Corbin (Strauss and Corbin 1994).

Grounded theory methodology (GTM) is chosen to examine the open-ended questions. The basic reason for choosing GTM in this research was to theorize the developers’ perception of role of rewards in OSS communities. In this section, the steps taken during analysis are elaborated as qualitative research emphasize on the reflexivity of the process of analysis and research. There are four basic elements of grounded theory method, i.e., open coding, constant comparison, memoing and theoretical coding (Allan 2007; Strauss and Cobin 1990). For conducting the grounded theory analysis, we follow two sets of guidelines. At a macro level, we follow the guidelines proposed by Urquhart et al. (2010), i.e., open coding. At a micro level, for the identification of the concepts, we follow the constant comparison method guidelines proposed by Bojije (2002) and Allan (2007). Following Urquhart et al. (2010) and Allan (2007), we open coded the data with an open mind searching for the underlying conceptual issues. Codes are linguistic labels selected by the researcher to name each underlying concept embedded in each sentence of the response (Allan 2007). After the open coding period, we conducted the constant
comparison for each code. Specifically, each code emerged from open coding was compared with all previous codes to search for similarities, connections and patterns (Strauss and Cobin 1990). We grouped the codes that share commonalities and named each group or category, referred to as concepts. In order to identify the codes for the respondents’ analytic answer, we first code the string responses inductively based on their real world meaning. Table 1 presents an example excerpt from the data where the process of open coding is depicted.

Excerpt:

helps, they would work on it anyway, but compensating them enables them to put more time into it (ideally, one would be compensated enough so he could work full-time on the open/free software)

<table>
<thead>
<tr>
<th>Open Codes: Helps, Enable developers to put more time, developer can work full time</th>
</tr>
</thead>
</table>

Table 1: Example of Open Coding Process

Next, we aggregated the codes into groups that indicated a broader category of why developers think that compensation helps or hinders the project. In focused coding we categorized the relevant codes in the form of categories. Categories are concepts at a more abstract level. Third step in GTM is to determine the relationships among categories. The theoretical coding helps to analyze and develop relationships between categories. Following the above mentioned process, the next section reflects on the preliminary findings of this research.

Findings

The data is analyzed using grounded theory procedures as mentioned above to theorize the effect of compensating open source software developer on open source software ecosystem. The core and sub-categories with some of the excerpts are shown in Table 2. This section will discuss whether reward/compensation helps or hinders an OSS project. Later, we elaborate on the types of compensation preferable to OSS developers. In the discussion section, an initial theorizing of the concepts is presented to elaborate the impact of compensation on OSS development.

Compensation- Core Category

“Compensation” results as a core category of this research during the analysis of open-ended questions. A core category has a binding effect that holds together the sub-categories that are grouped together during data analysis. Compensation can be referred to various value exchange scenarios according to the respondents. The two main value exchange scenarios are monetary versus non-monetary exchanges. Indeed, some of the respondents believe that every OSS developer is compensated, if not economically, then by learning something new and relevant, each day through work. Based on the analysis, compensation in the context of OSS development is defined as, “value exchange to develop quality open source software”.

Compensation facilitates (helps) OSS Project Success- Sub category

Our analysis suggests that compensation facilitates both OSS projects and OSS developers. “Helps” or “facilitates” in this analysis refer towards something which is beneficial for both OSS project and developer. OSS project success sub-category in the context of compensation can be defined as the extent to which a project can progress and achieve completeness. Prior literature has also argued that OSS project success means overall completion of the project. It is believed that compensation helps in pushing the developers to work on the project modules which need more attention from the community. Thus, completion of project is one of the criteria of a successful OSS project. Compensation may result in achieving overall success of an OSS project, because compensation motivates some developers to work on certain programming tasks which otherwise no one would be interested in doing. Therefore, completion of OSS project in the context of compensation can be defined as the extent of overall OSS project completion in a required timeframe through incentives.
Compensation helps OSS developers to put more time into the work they really enjoy and therefore, facilitates a better collegial interactive environment in OSS projects/communities. Based on the analysis, we define OSS developers’ roles as the extent of devotion of time and effort they put in, in their role. Compensation helps the developers and the project; however there are various conditions and factors which need to be considered. Compensation schemes should respect the OSS development ideology and philosophy and the commercial or the sponsoring organization need to take special precaution as the data in table 2 identifies. OSS ideology is built on knowledge sharing and voluntary contributions of OSS developers (Stewart and Gosain 2006), compensation wasn’t considered to be a part of OSS ecosystem. Early champions of OSS (Stallman 1992) saw a limited role of money in software development. Based on our analysis, we define the compensation factors as the conditions which are necessary in certain circumstances to pay the OSS developers.

**Compensation Hinders OSS Project Success- Sub Category**

Some developers also argued compensation/reward to be the hindrance for overall project success. Thus, “hinders” is defined in the analysis as something which hampers the progress of OSS project. Though most developers think that compensation facilitates both OSS project and OSS developer; however, there are developers who do not think the same way. As the theory looks at two major motivations’ groups, therefore it is important to identify the reasons where the developers find that commercial rewards hinder the progress of the project. Based on our investigation therefore, we define OSS developer’s perception around compensation as compensation hinders OSS projects as the extent to which a project fails and developers are demotivated to spend more time on the OSS development. It suggests that OSS development should not be for return on investments, as most of the time it kills OSS. Similarly, people have this perception that it often will not help and therefore should not be legal.

The reasons which OSS developers believe hinders the progress of the project are: compensation changes the focus of the project and sponsors may have too much influence. This is consistent with the literature which argues that, if rewards are controlling, they would crowd-out intrinsic motivation (Frey and Jegen 2001). Developers believe that compensation is likely to make the OSS development less open and can prevent new people to join the OSS communities. As the OSS developers are believed to work under their own rules, compensation can affect their personality traits because compensation may convert OSS participation to a forced/paid job. There is a potential to go back into the same employer-employee relationship which is against OSS ideology. Thus, from this analysis we define the compensation as an adverse effect “the reason which can lead to failure of an OSS project”.

<table>
<thead>
<tr>
<th>Focused Code</th>
<th>Relationship</th>
<th>Category</th>
<th>Open Codes</th>
<th>Relationship</th>
<th>Category</th>
<th>Open Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation</td>
<td>Helps</td>
<td>OSS Project Success</td>
<td>Through a formal roadmap Software and hardware cost Bigger projects stabilize Features’ additions become easy Progress of the project Rewards always help Developers can focus on their hobby Motivates them (developers) Help them to work full-time on OSS Enable developers to put more time</td>
<td>Depends on OSS Project</td>
<td>OSS Developers</td>
<td>If development process remains open If OSS is the primary activity the most ambitious project If feature is useful to community If I require a particular feature If a permanent body controls the project If there are no conditions If done in respecting the philosophy of the software If constraint have same focus as developer Project developer’s attitude matters One has be careful with it If it makes sense to hire someone</td>
</tr>
<tr>
<td>Hinders</td>
<td>OSS Project Success</td>
<td>OSS Developers</td>
<td>Compensation are self-defeating Could trigger unnecessary developments Would be out of place here Can change the focus of the project Can hinder the innovation of a project Can make open source less open Slow development process Can change the personality traits of developers May treat OSS as a forced job Can divide community in two Compensation is a necessary evil Would not remain a hobby OSS culture would change Prevents to work on community problems Negative impact on community involvement pace</td>
<td>Depends on OSS Project</td>
<td>OSS Developers</td>
<td>External control Money will determine needs Employer-employee relationship Needs of the community will not be considered Hinder if they make lot of money When time is not spent efficiently Developer is forced to make decisions</td>
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**Table 2: Does Compensation help or hinder an OSS Project?**
The hindrance due to compensation comes in a form of social impact where the OSS developers are divided because of compensation and OSS project/community is destroyed because of developers' demotivation. However, some believe that compensation is a necessary evil because you sometimes need compensation for sustaining the project. Data also suggested that compensation hinders the development towards community problems and increases focus to satisfy the sponsors. This leads to less innovative input from the OSS developers. As the focus shifts towards compensation, it also slows down the project progress. Thus, harmful implications of compensation in our investigation are defined as the extent of demotivation and social conflicts of OSS developers with respect to the progress of the project.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Types of Compensation</th>
</tr>
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<tbody>
<tr>
<td>Direct Monetary Compensation</td>
<td>government subsidy&lt;br&gt;proper payments&lt;br&gt;grants&lt;br&gt;financial compensations without obligations&lt;br&gt;anything that is feasible&lt;br&gt;sponsorships&lt;br&gt;funding (public and private)&lt;br&gt;jobs and salaries&lt;br&gt;small donations&lt;br&gt;financial payments &amp; compensations</td>
</tr>
<tr>
<td>Non-Monetary Compensation</td>
<td>• Support&lt;br&gt;support contracts&lt;br&gt;• Learning&lt;br&gt;compensation by knowledge enhancement&lt;br&gt;• Awards&lt;br&gt;community awards&lt;br&gt;recognition&lt;br&gt;respected&lt;br&gt;media appreciation&lt;br&gt;gifts&lt;br&gt;appreciation&lt;br&gt;• Hardware and Software&lt;br&gt;provide hardware&lt;br&gt;software sales&lt;br&gt;provide software&lt;br&gt;• Other&lt;br&gt;non-financial means</td>
</tr>
</tbody>
</table>

Table 3: Types of Compensation

Compensation Types

Data suggested different compensation types discussed by the OSS developers. In essence there are two types of compensations; monetary compensations, and value-based or non-monetary compensations. However, as depicted in Table 3, most of the OSS developers responded with an intention of formalization of monetary compensation for open source community. Monetary compensations involve money exchange at some level; however, value-based compensations mean value-gain from OSS development. In this research we are not going down the value co-creation concepts as in that scenario value always get co-created. Here we only look at the compensation types that are explicitly identified in the dataset.
The monetary compensations include money or any other incentive. Our analysis indicates that developers need to earn a living (Fitzgerald 2006), and it is difficult to work on a project without compensation. Similarly, incentives include any free service in exchange to their work.

However, in value-based compensations, data indicates that people want anonymity, they want appreciation and recognition of their work and developers believe that they are compensated anyways because they gain experience and market value by contributing to OSS projects. Prior research has shown that OSS developers are intrinsically motivated, they love to contribute to OSS and they would continue contributing irrespective of compensation/reward.

**Discussion**

The findings from this qualitative research highlight an important aspect of open source projects compensation. They suggest that though the open source community still has people who believe that monetary compensation hinders the ideology behind open source development, there are even a large number of people who think otherwise. Ideological motivations are defined as belief structures that stem from values and norms underpinning the OSS development methodology (Stewart and Gosain 2006). However, a general suggestion comes as an intention of formalization of monetary compensation for open source community. In this context, therefore an initial theorizing of compensation’s impact on progress of the project is formalized. It is evident from this visualization that non-monetary and monetary compensation types both help in the progress of open source software by supporting the developer, while according to the data monetary compensation reduces the intrinsic motivations of the developer and negatively affects the OSS ideology.

Thus, initial theorizing, of the data as depicted in figure 1 suggests the following:

- Non-monetary and monetary compensation types help the progress of open source software.
- Non-monetary and monetary compensation types help stabilizing the open source software.
- Non-monetary and monetary compensation types help to support open source developer.
- Monetary compensation hinders the intrinsic motivations of open source developer.
- Monetary compensation hinders the ideology of open source software.

This theorizing suggest that non-monetary compensation is equally responsible for the support of OSS developers. The compensation types extracted from the data range from simple recognition to hardware and software support. These are dealt in the analysis as non-monetary compensation types as the direct monetary compensation only refers to the money given to developers and not to the project. Thus, supporting OSS developers eventually helps the progress of the project. The data also suggest that intrinsic and community motivations which form the basis of the OSS ideology decrease only because of the monetary compensation.

As indicated in the findings, the compensation is a value exchange to develop quality open source software. The findings from our analysis confirm the current model of OSS development which depends on a high level of volunteerism from ideologically motivated individuals (Stewart and Gosain 2006). Moreover, the community response for hindrance to intrinsic motivations is also relevant to the previous research which suggests that introducing monetary rewards to these volunteer communities may threaten their sustainability (Fitzgerald 2004; Frey and Goette 1999). Since volunteers' motivation to associate with, and contribute via these communities is vital (Roberts et al. 2006) to the sustainability of these communities (Von Hippel and Von Krogh 2003; Von Hippel 2005; Von Krogh et al. 2003), the preliminary theory presented in this work clearly establishes that for progress and completion of OSS projects, financial incentives are critical if not very essential (Alexy and Leitner 2011). Thus, the value of this initial theory lies in the fact that the conventional understanding about OSS developers has also evolved as the sponsoring organizations have brought in different direct and indirect methods of compensation. According to OSS community, the monetary incentives keep a project stable and provide an essential support for the developers.
In future, we will compare the compensation preferences between those who are sponsored by companies to participate in OSS projects and those who are not. This comparison will further shed a light on the differences of compensation preferences between sponsored and volunteer developers. This will help OSS community better manage their contributors and improve the sustainability of the community. Third, future study can explore the antecedents of different compensation preferences so that companies and OSS communities can better understand how to manage OSS projects. This initial theory would then be enhanced accordingly.

**Conclusions and Implications**

This paper contributes to the literature of open source software development by (1) providing in depth examination of the developers’ intention to work on the OSS project if compensated (2) providing an initial theory for understanding when compensation helps an OSS project and when it hinders. It is believed that OSS philosophy works in a loosely organized communities where developers work for private gain in order to achieve a collective good. The open source literature also has provided different perspective with respect to the rewards and compensations for the developers who spend their time and effort into these projects.

In summary, from the analysis presented in this paper, we found that monetary rewards and career in industry are two most preferred compensation methods for both paid and unpaid developers. Differences exist in the importance of social recognition and prestige, and non-monetary benefits. Practically, this study intends to provide guidelines to management on what incentives have been expected by different groups of OSS developers. The emergence of new expectations would provide researchers and practitioners different perspectives to study developers’ participation in OSS community. Further, understanding the differences in compensation expectations will afford companies, OSS community managers, and policy makers an opportunity to differentiate their incentive management for different groups of developers.
References


