Please Help! A Preliminary Study on the Effect of Social Proof and Legitimization of Paltry Contributions in Donations to OSS

Ugo Yukizawa
Kindai University
Osaka, Japan
1510370201m@kindai.ac.jp

Masateru Tsunoda
Kindai University
Osaka, Japan
tsunoda@info.kindai.ac.jp

Amjed Tahir
Massey University
Palmerston North, New Zealand
a.tahir@massey.ac.nz

Abstract—Open source communities have contributed widely to modern software development. The number of open source software (OSS) has increased rapidly in the past two decades. Most open source foundations (such as Eclipse, Mozilla and Apache) operate as non-profit; those foundations usually seek donations from users/developers to financially support their activities. Without such support, some projects might discontinue to develop, or even disappear. However, contributions to those foundations are usually solicited in a very simple and modest way, with no special promotions or attractions for such contributions. The aim of this study is to promote new strategies that can help to increase donations to OSS projects. We analyzed how existing donation pages are structured. We then introduce behavioral economics and psychological theories that have been used in other disciplines to promote donations in OSS. In particular, we used the social proof theory, i.e., where people tend to consider the actions of others in an attempt to reflect correct behavior when they choose their own actions, and legitimization of paltry contributions strategy i.e., using specific phrases such as “even a very small amount will help” to encourage donations. In this study, we conducted an experiment with University students to examine if those theories are effective in encouraging donations to OSS. Our initial results indicate that the two strategies were indeed effective in promoting donations, and showed that users were more open for donation compared to traditional methods. This is only a preliminary analysis - we aim to include more users in the future for a more comprehensive analysis. We anticipate that such techniques might help OSS projects to secure more donations in the future.

Keywords—compliance, social proof, legitimization of paltry contributions, fundraising, OSS

I. INTRODUCTION

OSS projects have been widely developed in past two decades. Key OSS projects such as Linux OS, Mozilla Firefox and Eclipse IDE have been used by million of users around the world. Major OSS projects are very large in size and non-profit foundations mostly manage their development and distribution. For example, Eclipse, a major multi-language integrated development environment (IDE), is developed and managed by the Eclipse Foundation\(^1\). Those organizations often solicit donation to cover their operation cost through their websites. For instance, foundations such as Eclipse, Mozilla, Linux, and Apache provide a donation web page on their websites to encourage users and developers who use their products to donate. However, most of the existing donation pages are very simple and static, might not look very attractive for potential donors. That is, they do not have special characteristics that may help to encourage donation. For example, Eclipse\(^2\) current donation page shows only one sentence (i.e., “Power the Eclipse Community with your donation”) and a box to entre the intended donation amount. When we compare this with the donation pages from other disciplines, we found that such pages are mostly designed with special attributes that can help to promote donations. For example, UNHCR (Office of the United Nations High Commissioner for Refugees)\(^3\) current donation page provides a comprehensive view of how the donation could help, and it breakdown the use of the donated money as it provides some figures on how such donations will help families to bring in food, water and other necessities. In addition, the sentence shown in the donation page includes words such “urgently” to explain why the donations are crucial. Similarly, the U.S. Government organ donation page \(^4\) includes some inspiring stories of individuals who have received organs from donors, and how those individuals have improved their lives due to the donations.

The aim of this study is to improve the way we collect OSS donations. Financial support to OSS is strongly needed to maintain those projects, and therefore donations are extremely important to the future of OSS [6]. We believe that we can transfer knowledge from other well-established fields to help OSS to obtain more donations. For example, in other fields such as marketing, psychology, and communication studies, there are many studies which analyzed how to enhance monetary donation (e.g., fundraising) and organ donation [9][14][16][18]. Several studies have analyzed the effect of various factors such as identifiable victims [14], a victim’s face [15], and self-benefit appeals [18]. For example, White et al. [18] clarified that to promote donation, appealing self-benefits (e.g., “enjoy networking opportunities and meet new people”), is more effective than other benefit when the charitable support is not public.

In this study, we focus on using social proof and legitimization of paltry contributions theories, as they have been shown to be effective in promoting donations in other fields [12]. We also anticipate that those are easy to adapt to

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\(^1\) https://www.eclipse.org/org/foundation
\(^2\) https://www.eclipse.org/donate
\(^3\) https://donate.unhcr.org/int/general/~my-donation
\(^4\) https://www.organdonor.gov
OSS projects. The two theories are shown to be effective to solicit monetary donation [12]. Legitimization of paltry contribution (also known as the single penny tactic) is an influence technique used to increase donors’ compliance by using soft phrases like “even a single dollar helps”. On the other hand, social proof means people tend to consider the actions of others in an attempt to reflect correct behavior when they choose their own. A phrase such as “75% of your colleagues donated to this charity” is shown to be effective to enhance donations in general [12].

While there are similarities, donations to OSS projects are not quite the same as other charitable organizations for the following reasons:

- donors of OSS usually receive benefits before providing any donations, as most of them are considered to be actual users of OSS (in contrast, non-donor users can be regarded as free-riders). In other fields, donors might not receive any benefits before the actual donation (i.e., the benefit of the donation affects the behavior of donors [18]).
- most donors are considered to be users of OSS (i.e., “donee”), and therefore, donors have knowledge of the donees. In other fields, donors do not know the donees (also known as victims) well on ordinary donations (i.e., the knowledge of the “donee” affects the behavior of donors [19]).

This study provides an initial assessment of how social proof and legitimization of paltry contributions can help in promoting and improving donation to OSS. We provide a high-level methodology that can help to improve donations to OSS projects using those two social and psychological theories.

II. RELATED WORK & BACKGROUND

There are only very few studies that have investigated donations to OSS projects. For example, the study of Nakasai et al. [10][11] analyzed the relationship between bug reports and donations (badges). However, and to the best of our knowledge, we are not aware of any studies that specifically looked into promoting donations in OSS. Many studies analyzed how to promote monetary (fundraising) and organ donations in other fields. We discuss some of these studies and the methods that they used below.

Benefit: White et al. [18] explained that to promote donations, appealing self-benefits (e.g., “enjoy networking opportunities and meet new people”), is shown to be a more effective technique than appealing other benefits (e.g., “help make the community a better place for everyone”). In contrast, when the support is known by other people, appealing other-benefits can be also effective. In case of OSS, some OSS donation are recognized by others. For example, donors to Eclipse are recognized on Bugzilla with a “friend of” badge, and the name of the donor is published in a list (Hall of Friends).

Identifiable victim: using identifiable victim to enhance donation (e.g., a picture and explanation of a child who facing starvation) is more effective than providing statistical figures about victims (e.g., “thousands of children who will almost surely die in automobile accidents this coming year”). This is because donors discount sympathy towards identifiable victims but fail to generate sympathy toward statistical victims [14].

Knowledge of victims: When the knowledge of victims is increased, willingness to donate to victims also increases. Zagefka et al. [19] analyzed donation to disaster victims, and clarified that the more donors know about an area where a disaster has occurred, the more they are willing to donate. Major OSS donors are considered to be users of the OSS. Therefore, donors already have knowledge of the donee (victims).

Determined victim: Small et al. [13] suggested that determined victims (i.e., a specific victim to support has been selected. Note that the information about the victim is not provided, to avoid the effect of identifiable victim) is more concrete, and therefore it stimulate sympathy more than indeterminate victims (i.e., a victim to support will be selected), leading to more donations.

Temporal distance: Some studies focused on construal level theory [17] to promote donation. Intuitively, on the theory, when psychological distance such as temporal distance is far from subjects, people tend to think about it abstractly. In contrast, when the distance is near, they do it more concretely. Based on the theory, Fujita et al. [7] analyzed donation to wildlife conservation. As a result, when the subject is high-level condition (i.e., orcas in general), distant future condition (i.e., few months from now) was shown to be effective in collecting donations. In contrast, when the subject is low-level condition (i.e., a specific killer whale, named Simoon), near future condition (i.e., a few days from now) was shown to be more effective.

Target amount: Sometimes, target and current amounts of donation are shown on the donation page. Smith et al. [16] analyzed online charitable fundraising webpages, and showed that presenting a target amount positively affected donation (i.e., increase donation). Anik et al. [1] proposed contingent match incentives to increase commitment to recurring donation. For example, “If 75% of people seeing this offer agree to upgrade to a monthly recurring donation today, we will match 100% of your donation” is a message based on contingent match incentives. The percentage presented in the message is regarded as a target of donation. Therefore, such specific targets are expected to promote donation.

Social proof: Social proof [3] means that people decides their behavior based on others’ behavior, especially when the proper behavior is unclear. That is, the correctness of the behavior is proved by others, assuming others have more knowledge about that specific behavior. Social proof typically use phrases like “X% of people have engaged in the behavior” [1]. A good example of social proof is to encourage reuse of towels and sheets at hotels. For example, Goldstein et al. [8] found that a message considering social proof (e.g., “90% of guests reuse their towels”) was more effective than traditional messages such as “please reuse your towels.” Additionally, when the message fits to the situation of the people (e.g., “90% of guests in this room reused their towels in the first night”),
the effect was found to be even higher. Social proof has also been utilized to enhance donations [12].

Legitimization of paltry contributions: Legitimization of paltry contributions [4] simplifies contributions, and encourages users to donate even small amounts by using phrases such as “Even a penny helps.” Legitimization of paltry contributions has been applied to various subjects (e.g., blood donation [9]), and it was effective in increasing donation rates [12]. However, legitimization of paltry contributions can affect the total amount of donation negatively, because the average amount of donation may be lower than normal donations. Bolkan et al. [2] conducted meta-analysis of past donation studies, and found that the total amount of donations made when using legitimization of paltry contributions tactic is almost the same as ordinary donation messages (i.e., the method does not really improve donations). However, Shearman et al. [12] combined social proof and legitimation of paltry contributions, and evaluated the effect of them on donation to charitable organization. Donation rates was the highest when social proof and legitimation of paltry contributions were combined, and the total amount was the second highest on the field study (using real money).

In this preliminary study, we first analyzed if OSS donation pages uses any of the strategies discussed in Section II. We combine both social proof and legitimation of paltry contributions theories and examine whether the two techniques can help in increasing donations to OSS projects.

III. ANALYSIS OF EXISTING DONATION FOR MAJOR OSS WEBSITES

In order to understand to what extent that donation promotion methods (explained in section II) are used in OSS, we conducted a preliminary of donation pages for major OSS projects. In our study we selected nine major OSS projects: Linux, Mozilla, Eclipse (plus Eclipse Helios), Apache, GNU, Libre Office, BSD, Python, and Perl. We examined if the donation pages of the selected OSS use any of the following methods: self-benefit, identifiable victim, facial emotion expression, determined subject, temporal distance, target amount, social proof, and legitimation of paltry contributions. In this analysis, we read each web page manually, and then judged whether the page uses any of those promotional methods. This process was done by two of he authors.

<table>
<thead>
<tr>
<th>Foundation</th>
<th>Self-benefit</th>
<th>Identifiable victim</th>
<th>Determined subject</th>
<th>Temporal distance</th>
<th>Target amount</th>
<th>Social proof</th>
<th>Legitimation of paltry contributions</th>
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<td>X</td>
<td><a href="http://www.eclipse.org/donate/">www.eclipse.org/donate/</a></td>
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</table>

The results of this analysis are presented in Table I. In the table, we marked those that used the method with a Yes, “PA” means “partially, yes” and “X” means the page does not use the method. “N/A” means the page includes only one subject, and therefore the subject is already determined. The following provide a summary of the results:

- **Self-benefit**: Donation web page of Eclipse Helios grants user an “early access to the Helios release”, which is considered as a self-benefit tactic. In addition, donor’s name is recognized in a special list of donors that is also shown in the main web page of the project. The same strategy has been followed in other projects. For example, the FreeBSD Foundation mentions that donors will receive a tax deduction, Python software foundation provides both tax deductions and also including donor’s name in the donors’ list. Meanwhile, if we look at Eclipse, the main donation web page does not provide a list of donors, and therefore it is considered as a lack of self-benefit.

- **Determined subject**: Donation webpage of Apache Software Foundation has “targeted sponsor program”. With the program, donor can choose determined subjects.

- **Target amount**: Eclipse Helios donation webpage shows a specific target amount. However, it is not clear if the donation is only used for Helios development or other projects, and therefore we did not consider this in our analysis.

- **Social proof**: Mozilla Foundation uses social proof to encourage donations. The website shows the following message: “Thousands of people like you”, which is a typical example of a social proof tactic. However, it does not include statistics on the number of donors (e.g., “75% of users donated to Mozilla”) which is typically used in such strategies [1]. Therefore, we consider this as a partial yes.

Overall, with a very few exceptions, the majority of OSS projects that we studied use only one method (or even none, for example Eclipse donation webpages did not use any methods at all) to encourage donations. We believe that social and psychological methods that have been used in other fields could help increase donations to OSS. Of those methods, social
proof and legitimization of paltry contributions methods are shown to be effective in the past, and therefore could enhance they way OSS projects collect donations. To the best of our knowledge, those two methods have not been used in OSS in the past (combined), with the exception of Mozilla, which used social proof methods (but only partially).

IV. Preliminary Analysis

To understand the users’ aspect of this, we conducted an experiment with actual users to understand if they are willing to donate to a specific OSS project. Our target system was Eclipse, a well-known and widely used OSS project that is also widely used by our subject users. In this preliminary analysis, we showed users a specially designed Eclipse donation webpage (Fig. 1), and asked them whether they will be willing to donate to this project or not. This approach has been used in the past (e.g., [5][12][19]), where subjects are asked about their willingness to donation, rather than using actual money.

On Fig. 1, the phrase “many university students in Japan donate to the project” is a social proof method. The phrase “It is OK to donate only 10 Japanese Yen” is a legitimization of paltry contributions method. We also used the phrase “You can donate to the project using loyalty program cards such as credit card” to promote the paltry contributions.

Our subjects were 13 undergraduate students majoring in Computer Science. All students were familiar with Eclipse, and often uses (at least) the Eclipse IDE during their classes/labs. So, we regarded that they represent typical OSS users to some extent. We randomly divided them into two groups. The first group (Group 1, 7 students) was shown the original Eclipse’s donation page. The second group (Group 2, 6 students) were given the specifically designed donation page which incorporates social proof and legitimization of paltry contributions methods. For each group, and after viewing the donation webpages, we asked the following questions:

Q1: Will you donate to Eclipse? (yes / no)
Q2: If the answer of 1 is “Yes,” how much will you donate?
Q3: Have you donated to ordinal (i.e., monetary donation except for OSS donation) charity activities? (1: no, 2: seldom, 3: sometimes, 4: often)
Q4: If the answer of 3 is “Yes,” how much have you donated on average?

We acknowledge that the number of subjects was small, and therefore, to enhance the reliability of the analysis, we analyzed the data using three methods (descriptive statistics, bivariate analysis, and multivariate analysis).

Descriptive statistics: when focusing on ordinal donation, average of the answer for Q3 (experience of ordinal donation) was 2.0 on group 1, and 1.7 on group 2 (i.e., more people donated to charity activates in the past in group 1 compared to group 2). The average donation (i.e., the answer of Q4) was 217.5 JPY (Japanese Yen) on group 1, and 60.0 JPY on group 2. In contrast, no one had willingness to donate to Eclipse on group 1. As shown in Fig. 2, On group 2, 33% (two out of six) subjects showed willingness to donate. The average of donation (i.e., the answer of Q2) was 30.0 JPY. All of subjects have not donated to OSS before. This may be because subjects thought that donation to OSS is different from ordinal one (The former may not stimulate emotion of subjects such as compassion).

Bivariate analysis: we also examine the correlation between Q1 and all other questions (by applying Pearson correlation coefficient test). Results of the correlation analysis are shown in Table II. The results show that webpage (grouping of subjects) had the largest correlation, and average of ordinal donation (Q2) was the smallest. Next, to analyze the influence of shown webpages (i.e. whether a subject viewed Fig. 1 or not) to Q1 and Q3, we applied Chi-squared test. Before the application, the answer of Q3 was transformed into binary values (the threshold was two). As shown in Table III, only shown web page was significant on 10% significance level. These results support our initial assessment that social proof and legitimization of paltry contributions may have positive effect on donations to OSS projects.

Multivariate analysis: we found that subjects who answered “donate money to Eclipse” had contributed to other ordinal causes in the past. Therefore, when subjects have willingness to donate with ordinal donation, and shown page includes social proof and legitimization of paltry contributions, the behavior may change positively. That is, there may be interaction (i.e., effect of an independent variable is changed by other independent variable). To consider the interaction, we made a new variable which was made by multiplication of the two variables. Before the multiplication, centration was applied to avoid multicollinearity. Centration means that average of each variable subtracted from values of each variable. The procedure is generally applied when the interaction is considered on multiple regression analysis. We built a model using multiple regression analysis, and the adjusted $R^2$ of the model was 0.61. The adjusted $R^2$ was larger than 0.5. Table IV shows standardized partial regression coefficients. As shown in
This is only a preliminary analysis, we plan to increase the number of subjects and projects to enhance the reliability of our results. We aim to engage major OSS foundations in our research. We also aim to use real money and subjects who have different cultural backgrounds to check consistency of our results.

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