Structure, Cohesion, and Open Source Software Success

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Abstract – This paper proposes a dissertation designed to understand how the open source software (OSS) development group and its associated interest community jointly and independently impact OSS success for a single OSS project.

I. BACKGROUND

Open source software (OSS) is software for which the source code is available when the software is distributed. OSS is often developed by volunteers and the software is frequently made available without a licensing fee. The factors that lead to success for OSS development are of interest to both academics and practitioners. Corporate and government agencies are intrigued by the potential to gain software at lower costs. Several companies, including Oracle and IBM have begun to invest in OSS. Several governments, including Brazil and China, are endorsing open source operating systems. In addition to practitioner interest, one of the many reasons OSS is interesting academically is because OSS developers are able to overcome many challenges. Two of the most frequently acknowledged challenges are the lack of monetary incentives for OSS developers and the geographical dispersion of developers. Research has sought to understand how these challenges are overcome. Specifically, research has sought to understand what leads to contributions in OSS development and to the effective coordination of those contributions.

Research into the factors that lead to success for OSS development has been conducted at multiple levels of analysis. These include the individual developer, the development group and the open source community. At the level of the individual developer, research has considered the individual developer motivations to contribute to the development of OSS. These motivations include indirect economic, social and technological motivations. At the open source community level, it has been proposed that a community ideology enables the development of OSS. Research at the group level has considered the impact of trust, communication quality, adherence to the open source ideology and control structures on open source success.

This paper focuses on the project level, which is differentiated by the software that is produced by each OSS development group. Although other levels of analysis are important, from the user perspective, focusing on the software may be of greatest interest because this is the level that has the most direct impact on them. Characteristics of the software that impact the users are the quality of the software and the potential for network externalities. Potential network externalities include the compatibility of the software with other software, the level of adoption that the software experiences and the availability of support for the software.

II. MOTIVATION

It is difficult to address the issues of software quality and network externalities of a particular piece of OSS when using the open source community level of analysis. Examining the OSS development phenomenon at the level of the open source community is too broad because users or sponsors are interested in what makes a single OSS project a correct match for their needs. Similarly, the group and individual levels are too narrow because it doesn’t capture all of the variables that make a project useful to users. One important factor outside the project development group and the individual developers is the set of interested users surrounding the software. We refer to this set of interested users as the community of interest. The interest community can have a significant impact on the adoption of the software and the quality of the software.

My dissertation will argue that it is useful to conceptualize the organizational structure that supports a single OSS project as consisting of a development group and an interest community. This organizational structure leverages the unique features of the open source context. By taking advantage of an active community of interested users who have access to the source code, successful open source development groups are able to substitute for the functions provided by an authority structure in a proprietary software development environment. Authority structures provide among other things, deadlines and requirements. We suggest that it is the effective use of this organizational structure that differentiates the successful from the unsuccessful open source projects.

The contribution of this research to the growing body of research on OSS projects is in its explicit attention to organizational structure as a key driver of project success. Understanding the organizational structure is essential to provide insight into the internal interactions of the open source project that contribute to success.

We take a multidimensional view of OSS success and examine popularity, software quality and development group effort. This work further contributes by drawing on the social psychological and software development literatures to identify characteristics of the development group and interest community that are expected to lead to these dimensions of OSS success.
III. RESEARCH METHOD

Sample We will attain a sample of OSS projects from the sourceforge.net website. We will randomly sample projects that use OSS approved licenses and are active during the time of the study.

Dependant Variables We will examine developer group effort, software quality and popularity as three dimensions of success for OSS projects. Developer group effort will be operationalized using responses to modification requests. Responses to modification requests have been used for the study of the open source projects Apache and Mozilla and in a study of a more broad sample of open source projects by Stewart and Gosain [9]. Software quality is often measured by the complexity of the software. Some studies have begun to look at software complexity in the open source context [11]. Low complexity is expected to make the source code easier to understand and therefore easier to maintain [12]. This study will measure software complexity using coupling and cohesion. The final measure of success that is proposed to be examined in this study is popularity. Popularity will be approximated using the number of times the software has been downloaded.

Independent Variables There are several characteristics of the development groups and interest communities that may be important in determining the success of the OSS project. One factor that has been shown to be important in previous research on the determinants of group performance is group cohesion. Group cohesiveness will be measured using Evan and Jarvis’ Group Attitude Scale [13]. This scale has been used in prior research on computer mediated groups [14, 15]. This scale measures the affective aspect of group cohesiveness [16].

We will use a secure, web based survey to get feedback from participants in our sample of projects to understand the level of cohesion in the development group and interest community. We plan to follow prior research and use an aggregation of responses [17, 18] to get measures of cohesion at the group and community level. As is appropriate for this method, we will conduct analysis to ensure that respondents to the survey do not differ substantially from non respondents.

The size of the development group and the size of the interest community will be used as controls in this model. Size is an important control variable in this model because size has been linked to lower levels of cohesiveness [19].

These methods are intended to lend evidence to the existence of an organizational structure that consists of an open source development group working with an interest community. They will provide insight into the ways through which these groups impact varying dimensions of success for OSS development. This will therefore progress the knowledge on OSS development and give practitioners a better understanding of how to develop successful open source projects.

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V. REFERENCES


