When Cultures Clash: Participation in Open Source Communities and Its Implications For Organizational Commitment

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ABSTRACT

Software applications developed within the OSS community have enjoyed tremendous success and for-profit organizations are keen to tap into this significant pool of software development talent. These companies seek to benefit from the talent of a global and sometimes voluntary workforce by paying some employees to contribute to OSS projects. This merging of open and traditional software development may cause developer stress based on conflicting OSS community and traditional software development norms. Specifically, developers must balance company intellectual property concerns with the reciprocal and community-based norms that drive OSS development. When these values are not in sync, contributors that aim to abide by conflicting values may exhibit dysfunctional attitudes. Employee stress with respect to their role can be destructive to organizational outcomes. This study develops an OSS context specific model that describes the relationship between clashing software development cultures and employee organizational commitment. We leverage the rich OSS literature and the research that focuses on organizational-professional conflict (OPC) to develop hypotheses linking clashing cultures and organizational commitment. These hypotheses are tested using a combination of archival data and a survey of 127 GNOME developers. The findings presented in this paper contribute to OSS literature and offer findings that will enable organizations to more successfully engage OSS communities.

Introduction

Open source software (OSS) development has received considerable attention in the literature (Fitzgerald 2006). Projects developed within the OSS community have enjoyed tremendous success and for-profit organizations are keen to tap into this significant pool of software development talent (Chesbrough 2003; Feller et al. 2008). Examples include Netscape, IBM, MySQL, JBoss and Google (MacCormack, Rusnak et al. 2006; Hauge, Ayala et al. 2010). The ability to draw upon the expertise of developers in the OSS community offers many clear advantages to organizations. However, they must balance the benefits of openness and the ability to make a profit (Shah 2006; West 2003). Specifically, companies must balance intellectual property concerns with the reciprocal and community-based norms that drive OSS development (Stewart and Gosain 2006). For instance, organizations may be concerned about developers leaking source code-based intellectual property into the public domain (Henkel 2008). In addition to intellectual property concerns, allowing people to contribute source code does not ensure that developers will contribute their efforts to the development of the application (MacCormack, Rusnak et al. 2006). The Eclipse project gets most of its platform maintenance from IBM employees (Wagstrom 2009). An additional challenge is that organizational commercial interests are seemingly inimical to the ideology that proponents of the OSS community embrace, causing members of the community to be less enthusiastic about for-profit sponsored projects (Stewart, Ammeter and Maruping 2006).

Differences between the culture of for-profit organizations and the ideology of members of the OSS community can create barriers when for-profit organizations attempt to tap into this important resource. Simply put, in many cases the two have different values about the development of software. Values, according to Dose (1997), are evaluative standards relating to work or the work environment by which individuals discern what is "right" or assess the importance of preferences (Dose 1997). OSS developers value openness and participating in a reciprocal relationship with the rest of the OSS community (Shah 2006; Stewart and Gosain 2006). If a company tries to develop a community in which the benefits are not shared by the community, but by the corporate entity, some contributors' motivation may be dampened. Indeed, Stewart et al. (2006) find that projects sponsored by for-profit organizations tend to attract less OSS developer interest compared to projects sponsored by non-profit organizations. A company that requires contributors to act in a way that limits their ability to develop an OSS community may inhibit participation. So a company could give away its intellectual property rights yet not receive development contributions from the OSS community.

As organizations seek to engage with the OSS community—for example, by encouraging or requiring their employees to participate in OSS projects, or by hiring OSS developers—it is important to consider the potential for clashes in values—i.e., situations where a developer has to choose between doing things the organization's way versus the open source community way. Clashes in values might reduce developer enthusiasm for contributing to the organization's objectives. Clearly, understanding the implications of organizational values and OSS values is important if organizations are to be successful in engaging members of the OSS community. Yet, we know surprisingly little about the extent to which clashes in values occur and how they affect developers who are simultaneously employees of a commercial firm and participants in an open source community.

Our objective in this research is to address the theoretical gaps identified above. To achieve this objective, we draw on work focused on the impact of conflicting values in organizations (Wallace 1995; Shafer 2002; Gunz and Gunz 2007). Specifically, we examine how conflicts between organization and OSS community affect the organizational commitment of developers embedded in such situations. We argue that in order to understand the implications of such conflicts, it is important to know how the values of developers relate to those of the organization that employs them. Further, we expect that the extent to which developers identify with their organization, instead of with the OSS community, can affect the way they react to such conflicts. OSS developers who are employed by organizations span two worlds. Whether or not conflicts between these worlds reduce their commitment to the firm is contingent on the degree to which a developer identifies with the OSS community or the employing organization.

In this research we report on the results of a field study of 127 OSS GNOME developers who are also employed full time by for-profit organizations. Our empirical study finds marginal support for our thesis that the conflict between organizational and OSS standards reduces developers' organizational

commitment. This relationship is contingent on two key context-specific moderators. Organizational-OSS conflict appears to lower organizational commitment only among developers who do not identify with the organization, and has no effect on developers with higher levels of identification with the organization. The effect is also moderated by value congruence between the developer and the organization. The tendency to reduce organizational commitment appears to occur only among developers whose values are less congruent with the organization.

Our research has implications for theory and practice. We contribute to research on organization-professional conflict by adapting the construct of organization-professional conflict to the emerging context of OSS ecologies. By doing so, we introduce the OSS community as an alternate and important type of professional peer group. We also contribute to OSS research. Most of the OSS research has sought to understand the factors that facilitate commitment and continued participation of developers in OSS projects (Fang and Neufeld 2009). Our study changes the focus to understanding how OSS projects impact a developer's commitment to his employing organization. Our findings inform managers about the ways that OSS engagement may stress programmers and diminish organizational commitment.

Theory and Hypotheses

Organizational Commitment

Organizational commitment is the extent to which an individual is involved with, and is psychologically connected to an organization and is willing to expend effort on its behalf (Mowday, Porter et al. 1982). Organizational commitment is a critical outcome variable because it is associated with several employee actions that organizations desire, including turnover intentions (Ahuja, Chudoba et al. 2006), staying with the organization (Cotton and Tuttle 1986), and punctual attendance at work (Dishon-Berkovits and Koslowski 2002). Given its importance, we focus on the organizational commitment of OSS developers who work for for-profit organizations. Next, we briefly discuss our core theory—organizational-professional conflict theory (Wallace 1995)—and then develop our hypotheses.

Organizational-Professional Conflict

We draw on the rich literature that seeks to understand the impact of organizational-professional conflict (OPC) (Wallace 1995; Shafer 2002; Gunz and Gunz 2007; Kippist and Fitzgerald 2009). OPC is related to the fact that a professional's behavior is subject to professional norms, often spelled out in a code of ethics developed and maintained by a set of peers practicing the same profession. Yet the professional is also subject to direction from an employing bureaucratic organization. The organization is thought to emphasize values such as hierarchical control and authority, conformity to organization norms, and regulations and organizational loyalty, where the professional orientation emphasizes a code of ethics and standards of professional performance. To the degree that the values are incompatible, conflict emerges. This kind of conflict emerges across a variety of professionals, including lawyers, accountants, veterinarians, and doctors. It has been shown to facilitate negative outcomes, including employee turnover and low organizational commitment (Johnson, Morgeson et al. 2006)Aranya and Ferris 1984; Kippist and Fitzgerald 2009). A recent example from the accounting field shows that when accounting business unit controllers feel stress related to their conflicting local and corporate responsibilities, they misreport data as a dysfunctional way of dealing with the stress (Maas and Matejka 2009). Kippist and Fitzgerald (2009) find that doctors who treat patients and also manage staff have conflicts related to their two roles and sometimes have dysfunctional outcomes (Kippist and Fitzgerald 2009). OPC can impact organizational and professional commitment, job satisfaction, and turnover intentions (Aranya and Ferris 1984; Shafer 2002).

Organizational-OSS Conflict

Like the professional peer community, the OSS community may dictate that the developer behave in ways that are distinct from behaviors prescribed by the employing bureaucratic organization. The OSS community has its own culture, values, and ideology (Stewart and Gosain 2006). The ideology places

value on sharing knowledge, peer review, collaboration, and user input. These values may conflict with the more bureaucratic, rigid, and process-oriented structure in a traditional software development firm, which focuses on intellectual property rights, hierarchy, competition, and individualism.

While OSS community values and those of a traditional software development firm may conflict, the OSS community and traditional software development firms are merging in many ways. Sometimes paid software developers contribute to OSS projects in their free time. In other cases, software development companies pay employees to contribute to OSS projects (Dahlander and Wallin 2006; Henkel 2008). Up to 50% of developers earn income from their engagement in FOSS (Ghosh 2002). Lakhani and Wolf (2005) find that 40% of developers are paid to contribute. Whether developers are paid to contribute to OSS or not, when one developer writes code in both environments, there is a potential for a conflict between the OSS culture and that of the traditional software development culture.

Another example of the merging of cultures is when a for-profit software development company releases its software as an OSS application. Examples include JBoss and MySQL (Hauge, Ayala et al. 2010). A final example of the merging of these cultures is when software development firms adopt open source type practices such as code sharing, peer reviewing, and user contributions (Hauge, Ayala et al. 2010). Blending cultures with different values may create stress for the developers seeking to adhere to the values prominent in each.

There are multiple documented cases of the conflict that developers feel as they seek to behave in accordance with both cultures. Fink (2003) documents the tension that Bruce Perens, an OSS leader, experienced as he transitioned to working for Hewlett-Packard (Fink 2003). Henkel (2008) eloquently describes how the OSS developer employed by a commercial firm may act as a double agent (Henkel 2008). The employed OSS developer may be in a situation in which his employer sometimes wants to release code as public and keep other code secret. These intentions may or may not be consistent with the developer's own ideas about what code should be private (Henkel 2008). Over thirty percent of paid contributors (30.6%) agreed that the statement "I believe source code should be open" was one of their three most important motives, but this attitude could conflict with a firm's attitude about what code should be revealed publically. Lakhani and Wolf (2005) find that, while some of the motives and actions of paid OSS developers are aligned with their employers' interests, others are not. Thus, there is likely to be a perceived conflict between the organizational and OSS cultures.

As suggested by the preceding arguments, organizations vary in the extent to which their standards conflict with the standards of an open source community (Wagstrom, Herbsleb et al. 2010). Some for-profit firms, such as Red Hat, IBM, and Google have had long involvement with open source communities, and have fostered a corporate culture that values openness, sharing, and transparency. Other firms, which have more traditional cultures that emphasize self-interest and competitiveness, view disclosure as potentially damaging. To the extent that developers experience conflicts as they are paid by a firm to work in an OSS community, the discomfort is likely to lead to less organizational commitment. This gives us our first hypothesis:

H1: Organizational-OSS conflict is negatively associated with organizational commitment

Organization and Developer Value Incongruence

Organization-OSS conflict is reflected by a difference in standards, procedures or expectations between the employing organization and the OSS community. In addition to this conflict, there can also be similarities or differences between the values of the OSS developer and those of the employing organization. This is reflected in the degree of developer-organization value incongruence. Greater congruence between individual and organizational values results in higher levels of organizational commitment (O'Reilly, Chatman et al. 1991; Finegan 2000; Cable and Edwards 2004). Value congruence is now widely accepted as a determinant of both commitment and job satisfaction (Cable and Edwards 2004).

OSS developers have their own personal values related to software development that may be congruent to a greater or lesser extent with their organization's values (Finegan 2000). As an example, highly competitive environments may be fully congruent with the values of some developers but in conflict with those of others. On the other hand, organizations that value sharing and openness may generate discomfort for developers who place a high value on individual achievement and reward. Research shows that employees find it more pleasurable to work in environments that are congruent with their own values (Schneider 1987). Experiencing the emotional discomfort of value incongruence is likely to reduce a developer's level of commitment to the organization:

H2: Organization-developer value incongruence is negatively associated with organizational commitment.

We expect an interactive effect between organization-OSS conflict and developer-organization value incongruence in influencing OSS developers' organizational commitment. As argued in H1, developers who experience organizational-OSS conflict may respond by reducing their commitment to the organization. To the extent that they also experience incongruence between their own individual values and the values of the organization, their response to the experienced conflict between OSS and organizational values is more likely to reduce commitment to the organization. The combined effects of conflict and value incongruence create an uncomfortable work environment for such developers. In contrast, the effects of organizational-OSS conflict on organizational commitment are likely to be muted among developers whose values are congruent with those of the organization. Such developers are less likely to feel discomfort from such conflict. Hence, our third hypothesis:

H3: The negative relationship between organizational-OSS conflict and organizational commitment is moderated by developer-organization value incongruence, such that the relationship will be stronger with increasing developer-organization value incongruence

Social Identification

Identity represents the psychological manifestation of categories (Randel and Jaussi 2003). Social identity, in particular, represents an individual's psychological connection to a social unit (e.g., a group, an organization, a department, a profession) and forms an important basis for how individuals understand their place in the world (Tajfel and Turner 1986). When individuals socially identify with a group, they create psychological in-groups and out-groups. Positive attributions are made about the actions of in-group members and negative attributions are made about out-group members. Moreover, the negative actions of in-group members are psychologically minimized or dismissed (Tajfel and Turner 1986). Consequently, an individual's identification with a broader social unit impacts his/her attitudes and behaviors (Randel and Jaussi 2003). Recent work suggests that developers' identification with their organization and the OSS community may impact their development-specific attitudes and behaviors (Henkel 2008). The salience of professional versus organizational identity and time spent on professional activities have been shown to impact OPC (Gunz and Gunz 2007). Thus, we include identification with the employing organization and the OSS community as important moderators to the relationships proposed.
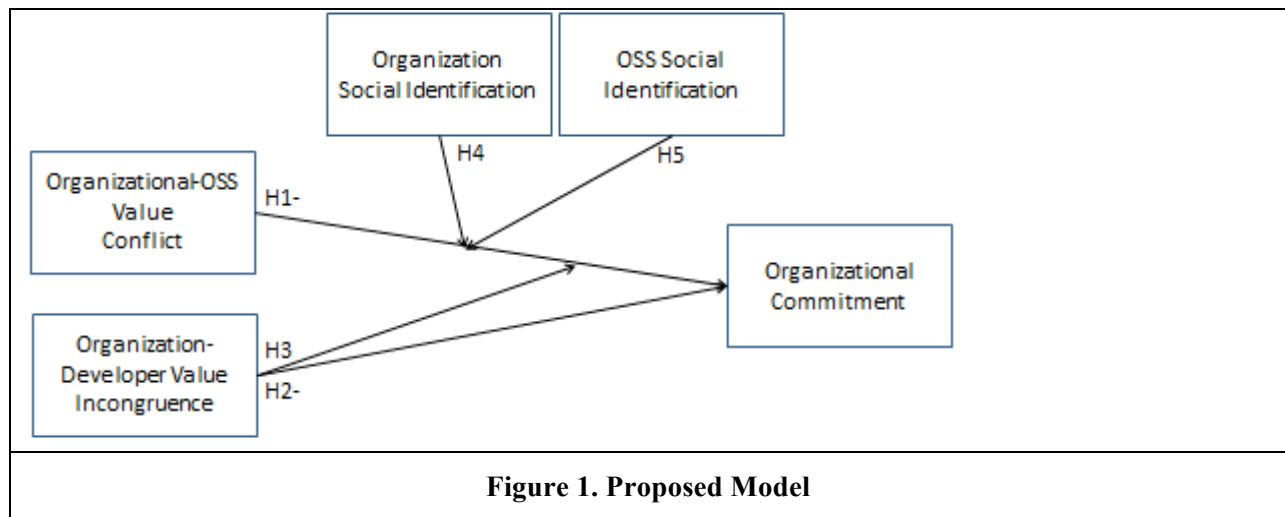
When OSS developers identify with their organization, they view the organization itself as part of the in-group. As such, they are likely to make positive attributions about the actions of the organization and minimize the significance of negative actions. Thus, when Organization-OSS conflicts arise, such conflicts are unlikely to affect the level of developer organizational commitment among those who identify with the organization. In contrast, those who do not identify with the organization are likely to react negatively to such conflicts, as it creates tension with the values they encounter within the OSS community. Conversely, when OSS developers identify with the OSS community, conflicts are likely to invoke negative reactions toward the organization. For OSS developers who identify with the OSS community, organizations may be viewed as being part of the out-group. They will make negative attributions about the actions of the organization, especially when those actions conflict with the values of the in-group (the OSS community).

Based on these arguments we suggest social identification will moderate the negative relationship between organizational-OSS conflict and organizational commitment.

H4: The negative relationship between organizational-OSS conflict and organizational commitment is moderated by organization social identification, such that the relationship will attenuate with increasing organization social identification.

H5: The negative relationship between organizational-OSS conflict and organizational commitment is moderated by OSS social identification, such that the relationship will be stronger with increasing OSS social identification.

Our research model is shown in Figure 1.

Figure 1. Proposed Model

Method

Sample Selection

We examined the proposed hypotheses using data collected from the GNOME open source community. The GNOME community has developed a graphical user interface platform for operating systems such as Linux. It was initiated in 1997 and over the following decade, volunteers around the world have contributed to this development effort in order to create a freely available desktop platform and a host of applications. GNOME is in fact a compilation of various software development projects (German 2003). Projects in the GNOME community utilize two traditional tools to enable the work of the project members. Mailing lists represent the main mechanism for communication among project members (e.g., developers) as well as between project members and community members (e.g., users and developers in other projects). The source code repositories enable developers to make changes to the system and also allow them access to the history of the development activities in a project.

In this study, we used a combination of archival and survey data. The source code repositories from the various projects in the GNOME community were used to identify the collection of contributors across the various projects in the community as well as to extract control factors used in our analyses. From its inception in 1997 until 2010, numerous projects were created. As of August of 2010, the GNOME community has 734 projects. Since there are only few, relatively easy to meet requirements to create a new project in the GNOME source code repository system, projects tend to differ significantly in their development activity, size, and participation rate. Building on criteria used in past research (Crowston, Annabi et al. 2003), we only considered active projects that satisfied the following criteria: (a) continuity

of development activity (at least one year), (b) amount of development activity (at least 100 commits), (c) attractiveness of project for developers (at least 10 committers), and (d) user interest to participate (at least one community hosted mailing list). Using these criteria, we identified 91 projects that satisfied them. Those 91 projects included 27 projects that have been active in the community from as early as 1998. We identified 2,341 different developers who made contributions to those 91 projects between 1998 and August of 2010. However, 553 developers did not make any contributions beyond 2005. Therefore, we did not consider them in our analyses. The remaining 1,788 developers contributed 91.6% of the commits (595,327 out of 649,526) to those 91 projects throughout the period cover by our data.

We invited the 1,788 identified contributors to complete our survey instrument. The initial email was sent on January 7, 2011, one follow up was sent January 14, 2011 and a final follow up was sent on January 30, 2011. As an incentive, each participant who completed the survey was entered into a drawing for a monetary prize. Two of the participants were randomly selected through the drawing and awarded $200.00 each. Five hundred and sixty two individuals responded to the survey and 413 fully completed it. Those 413 respondents were from 55 countries distributed across North America (69), Europe (248), South America (20), Asia (45), Africa (4), and Oceania (13). 14 participants did not indicate their location. The sample of respondents included 93.7% males, 3.1% females and the remaining respondents did not provide gender information. Mean age for the respondents 29.7 years, with a standard deviation of 8.3 years. Three hundred and thirty respondents were employed. One respondent explained that he was blind and we surveyed him over the phone. Our analyses considered only 127 employed respondents because these individuals responded to all the questions in the survey associated with our constructs. Wilcoxon rank-sum tests revealed no statistically significant differences between the sample included in our analyses (N = 127) and the rest of the survey respondents (N = 286) in terms of Age ($z = 0.678$, $p = 0.497$), Gender ($z = -1.785$, $p = 0.074$), Education ($z = -0.817$, $p = 0.414$), and Network Centrality in GNOME ($z = 0.174$, $p = 0.862$). We did find a difference between the two groups of respondents in terms of the Number of Commits ($z = -7.524$, $p < 0.001$). The developers included in our analyses tended to have more contributions (mean = 40.576, S.D. = 121.431) than the group of individuals not included in our analyses (mean = 16.795, S.D. = 78.011).

Operationalization of Constructs

Organizational commitment. We used a five-item scale by Ahuja et al. (2006) to measure participant organizational commitment. The scale is measured on a seven point scale with "strongly disagree" and "strongly agree" as anchors. Sample items include "I show by my actions that I really care about the fate of this organization" and "I am extremely glad to have chosen my primary employer to work for over other organizations." The Cronbach's alpha reliability score of the scale was .81.

Organization-OSS conflict. We adapted Gunz and Gunz (2007) measure of organizational-professional conflict to measure organization-OSS conflict. Items were reworded to refer to conflicts between the organization and the OSS community. For instance, one item stated "I often have to choose between following FLOSS community standards and doing what my primary employer asks me to do." Another item stated "I often have to choose between following FLOSS community standards and doing what is best for my primary employer." The Cronbach's alpha reliability of this scale was .81.

Developer-organization value incongruence. We used Stewart and Gosain's (2006) measure of developer values to measure organizational values and developer values. Questions used to measure organizational values used the lead-in: "Those employed by my employer…" for each value. Questions used to measure developer values used the lead-in: "As a software developer, I…" for each value. Other than the lead-in, the specific values referenced in the items were identical. The Cronbach's alpha reliability score for organizational values was .83 and the Cronbach's alpha reliability score for developer values was .76. We computed developer-organization value incongruence as the absolute value of the difference in scores on these two measures.

Social identification. Organization social identification and OSS social identification were measured using three-item scales adapted from Randel and Jaussi (2003). A sample item for organization social identification is "My role as a developer at my primary employer is an important reflection of who I am." A sample item for OSS social identification is "In general, my role as a FLOSS developer is an important part of my self-image." Organization social identification had a Cronbach's alpha reliability score of .64

and OSS social identification had a Cronbach's alpha reliability score of .72.

Additional Control Factors

We controlled for gender, age, education and organizational tenure. In addition, we assessed the effort the participants spent on GNOME-related activities as the Number of Commits, which indicates the number of times individuals changed the source code of a project during the defined period of time. In order to assess the degree of embeddedness of the individuals in the GNOME community, we constructed a people-to-people adjacency matrix where an edge between a pair of individuals indicated that those two individuals worked together in a project within the GNOME community. Using the adjacency matrix, we computed embeddedness using the closeness centrality measure (Wasserman and Faust 1994).

Results

Table 1 presents descriptive statistics and correlations. As the table shows, organizational commitment is negatively correlated with organization-OSS conflict ($r = -.35$, $p < .001$) and developer-organization value incongruence ($r = -.59$, $p < .001$).

We used moderated regression analysis to test our hypotheses. Following the guidelines of Aiken and West (1991), we centered the variables prior to computing the interaction terms. This improves the interpretability of the interactions and also reduces multicollinearity. The variance inflation factors were all below the recommended threshold of 10 (Hair et al. 1998). Table 2 includes 3 models that are used to examine hypotheses 1-5. Model 1 includes control variables and explains 12% of the variance in organizational commitment. Model 2 includes control variables, developer–organization value incongruence, and organization-OSS conflict and explains 41% of the variance in organizational commitment ($R^2 = .29$, $p < .001$). As the results show, although the sign is in the expected direction, organization-OSS conflict is not statistically significantly related to organizational commitment ($= -.10$, $p > .10$). Thus, H1 is not supported. Developer-organization value incongruence is negatively related to organizational commitment ($= -.52$, $p < .001$), providing support for H2. Model 3 includes control variables, main effects and the hypothesized interactions. Model 3 is significant ($p < .01$) and explains 44% of the variance in organizational commitment ($R^2 = .03$, $p < .05$). The interaction between organization-OSS conflict and developer-organization value incongruence is significant ($= -.18$, $p < .05$) and provides support for H3. The coefficient associated with the interaction between organization-OSS conflict and social identification with the organization is also significant ($= .19$, $p<.05$) and provides support for H4. The final interaction between organization-OSS conflict and social identification with the organization is not significant ($= .00$, $p > .10$) and so we do not have support for H5.

Table 1: Means, Standard Deviations and Correlations

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
Organizational commitment	5.10	1.29										
Developer-organization value incongruence	.77	.85	-.59***									
Organization-OSS conflict	2.71	1.50	-.35***	.41***								
Social identification with OSS	2.84	1.25	-.15†	.10	.09							
Social identification with organization	3.67	.75	-.12	.14	.06	-.08						
Network centrality	.50	.04	.05	-.06	-.02	-.27**	.13					
Gender	1.06	.23	.15†	-.16†	-.09	-.07	.06	.06				
Age	29.43	5.31	.02	-.08	-.06	.08	-.06	-.02	-.13			
Education	2.33	.75	.07	-.05	.08	.03	.01	-.06	.08	.22*		
Organizational tenure	3.51	3.83	.10	.02	-.09	.27**	.00	-.11	-.04	.38***	.12	
Number of commits	42.29	122.44	.19*	-.12	-.17†	-.16†	-.04	.24**	-.07	.00	-.04	-.05

Notes: n = 127; developer-organization value incongruence is the absolute difference between developer values and organizational values.

† p < .10, * p < .05, ** p < .01, *** p < .001.

Table 2. Models Used to Examine Hypotheses			
	1	2	3
R²	.12*	.41***	.44***
R²	.12*	.29***	.03*
Adj. R²	.06	.36	.38
Controls:			
Gender	.16*	.06	.05
Age	-.03	-.09	-.11
Education	.05	.05	.05
Organizational tenure	.16*	.17*	.21*
Number of commits	.18*	.11	.11
Social identification with OSS	-.17*	-.10	-.13
Social identification with organization	-.05	-.06	-.05
Network Centrality in GNOME	.01	-.02	-.04
Main Effects:			
Developer-organization value incongruence		-.52***	-.53***
Organization-OSS conflict		-.10	-.14†
Interaction Effects:			
Organization-OSS conflict x Developer-organization value incongruence			-.18*
Organization-OSS conflict x Social identification with organization			.19*
Organization-OSS conflict x Social identification with OSS			.00

To further investigate our significant interactions, we develop the plots in Figures 2 and 3. Figure 2 suggests that, among OSS developers whose values are congruent with those of their employer (low developer-organization value incongruence), organization-OSS conflict is not related to organizational commitment. In contrast, among OSS developers whose values are incongruent with those of their employer (high developer-organization value incongruence), organization-OSS conflict has a significant negative influence on organizational commitment.
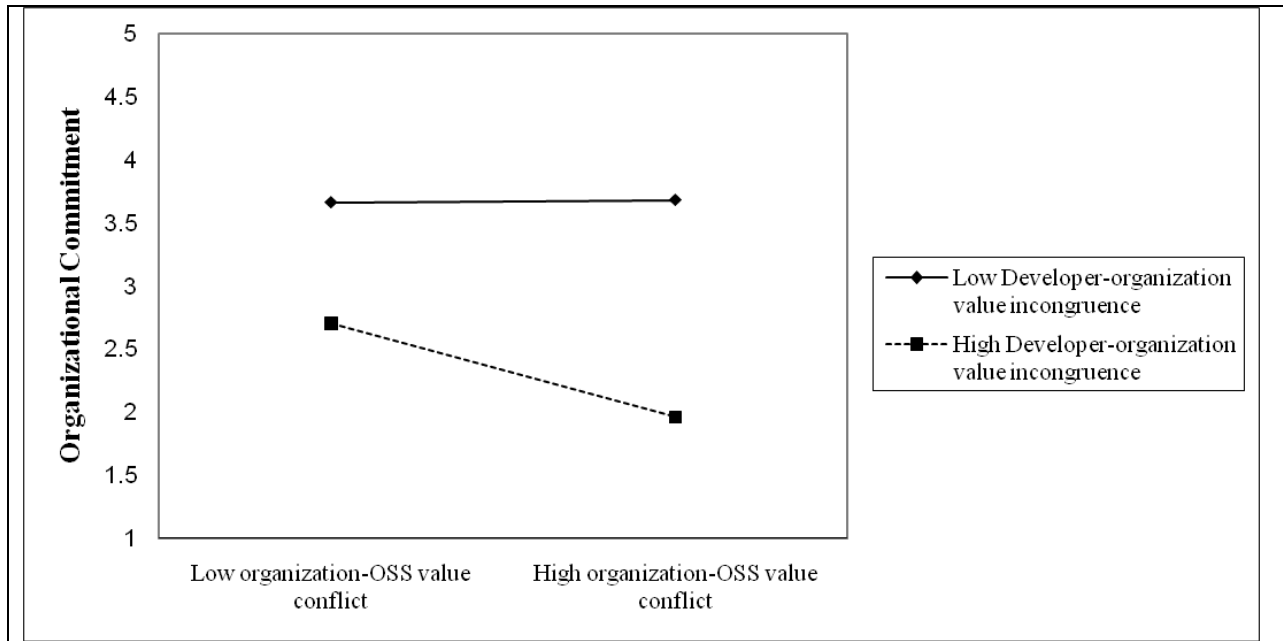
Figure 2. Organization-OSS conflict -Developer-Organization Value Incongruence

As the interaction plot in Figure 3 illustrates, organization-OSS conflict has no influence on developer organizational commitment for those who highly identity with their employers (high organization social identification). In contrast, organization-OSS conflict has a significant negative influence on organizational commitment among developers who do not identify with their employers (low organization social identification). These interaction plots further corroborate our moderation hypotheses.
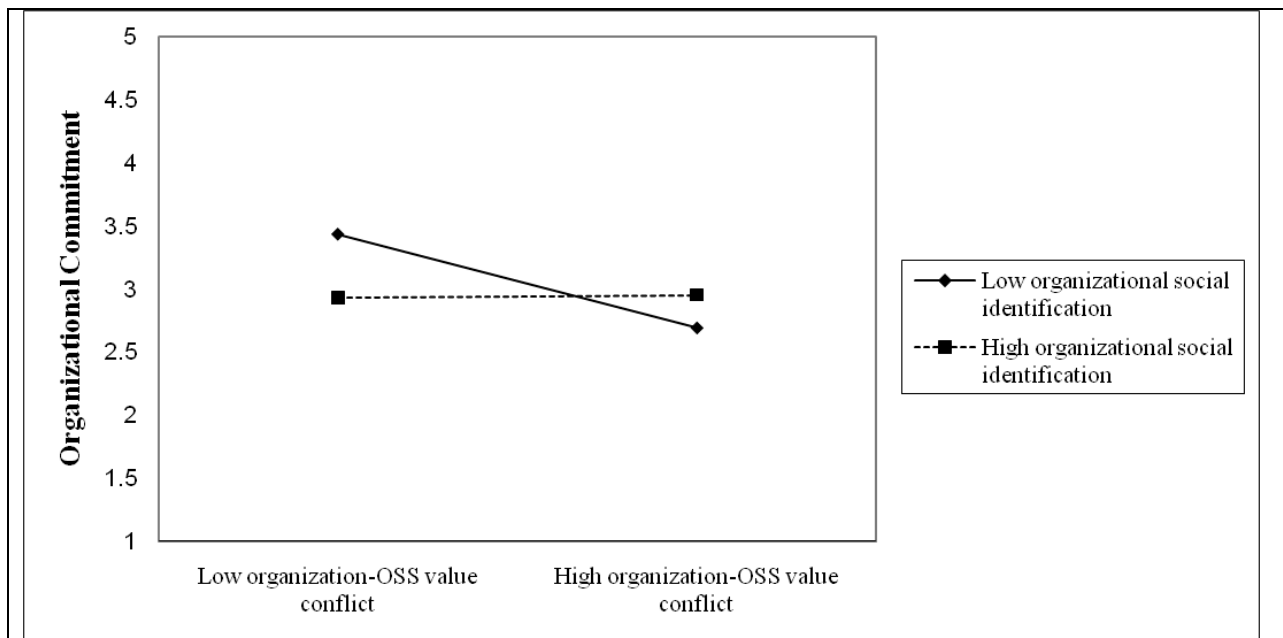

Figure 3: Organization-OSS conflict - Organizational Social Identification Interaction

Discussion

We find support for H2, our thesis that developer-organization value incongruence negatively impacts the developer commitment to the employing organization. However, we do not find support for H1: Organizational-OSS conflict does not have a significant positive main effect on organizational commitment. One possible explanation for the lack of support for H1 could be that the organizational-OSS conflict may not have an impact on organizational commitment unless the appropriate attributions are made, i.e., the developer makes a negative attribution about the traits of the organization. Social identification with the organization may inhibit negative attributions, while developer-organization value incongruence may make such attributions more likely. We also do not find support for H5, the impact of the interaction between OSS social identification and organizational-OSS conflict on organizational commitment. This could be explained by the fact that most people in the sample work as software developers and, because they are paid as software developers, they may not identify strongly with the OSS community. If they do not identify strongly as OSS developers, then there is no impact. A sample composed of students or non-software developers may identify more strongly as open source software developers. This suggests an opportunity for future research.

Implications for Research

This paper extends the current research on OSS development by focusing on how OSS development communities impact for-profit software development organizations. Most prior OSS research has focused on OSS communities and projects in isolation, but increasingly traditional software companies and OSS organizations are merging and research should address the issues associated with such merging. While other studies have focused on intellectual property concerns, such as software developers leaking employer code to the OSS community (Henkel 2006), we suggest considering other potential negative outcomes.

Another stream of research has focused on open source applications as an external complementary asset that companies can leverage for their profit (Dahlander and Wallin 2006). By paying developers to contribute and perhaps take on a central role in OSS development the for-profit company seeks to direct the development path of the application and benefit from the efforts of the broader OSS community. However, our results suggest that having an employee who embraces the OSS culture and contributes to OSS development may not be beneficial to the employing organization in the long run. The employee, especially if he does not identify with the organization, is not likely to be committed to the organization and thus may be expected to move to a competing for profit organization. When the employee leaves he may take the reputation that his employing firm has paid for him to develop in the OSS community and move it to a competitor. Thus, future research may usefully consider the degree to which OSS applications can be considered a complementary asset and how to leverage it. Specifically, the manner and degree to which firms can leverage open source communities is unclear and deserves future study.

This paper also extends the work that focuses on OPC. We contribute to this literature by introducing the OSS community as an alternate professional community that has previously been overlooked. Prior literature has adapted this construct into a variety of industries, including the accounting and medical professions (Shafer 2002; Johnson, Morgeson et al. 2006; Kippist and Fitzgerald 2009; Maas and Mat jka 2009). We are the first to adapt the OPC construct and develop measures for it that are relevant to software developers. Our results suggest that the OSS community can have influences that are comparable to those of other professional groups.

Implications for Practice

Open source software development communities have the potential to provide firms with a valuable platform for innovation and product development (Chesbrough 2003). In order to realize such potential benefits, a firm must participate in an OSS community. If such involvement is articulated through direct contributions by the firm's developers, the firm has to choose which software developers to dedicate to this effort. This paper helps managers understand the implications of participating in a particular OSS community and guides them in choosing which software developers should contribute to OSS.

Our analyses found that the gap between the perceived organizational values and the developer's own values creates a tension that is likely to reduce the commitment of a developer to an organization (H2). In particular, the higher the difference in values, the higher the likelihood of individuals leaving the company in the short- or medium-term. However, the more interesting pragmatic implications are associated with the interplay between two factors: the conflict between Organization-OSS values and the difference in Organization-Developer values.

Our results showed that when the organization and developer's values are congruent, the individual's organization commitment remains relatively high regardless of the OSS-Organizational conflict. On the other hand, developers are less devoted to their employer if the organization and developer's values are incongruent and OSS-Organizational conflict is high. These results suggest that an organization that might have a high degree of conflict with the values and processes used in OSS project would benefit if it selects those developers that have low organization-developer value incongruence to participate in an OSS community. Furthermore, one could envision an organization utilizing a survey instrument similar to the one used in this research for formalizing the evaluation process in a company. Alternatively, organizations could employ a strategy of minimizing the conflicts between organizational values and OSS values by creating project sub-cultures that are similar to those of the OSS community. This would minimize the potential for fall-out among developers whose own values are not congruent with those of the organization and among those who do not identify with the organization.

A second relationship among factors that has interesting pragmatic implications is the interplay between the Organization-OSS conflict and Organizational Social Identity. Our results showed that individuals who have high organizational social identity are more likely to remain committed to the organization, regardless of the degree of Organization-OSS conflict. These results suggest that mechanisms and practices that promote the development of social identity with the organization could be a valuable tool to ensure that members of an organization that participate in an OSS community remain committed to the organization, even in the case of high levels of Organization-OSS conflict.

In sum, our methodological instruments and results provide a framework for managers and executives to assess how the organization's values relate to an OSS community and to assess the extent to which the values of organization's developers are congruent with the organization's values. Utilizing such information, managers and executives could make more informed decisions as they decide first, **if** they should participate in a particular OSS community, and, second, **who** should be part of such an effort.

Conclusions

Traditional and open software development methods are mixing. As these cultures merge the developers who cross cultures may be exposed to situations where the values conflict. We find that a software developer's commitment to his/her employer is impacted by conflicting values and the degree to which the developer identifies with the OSS community and the employing organization. Organizational commitment is important for companies and understanding how to engage the OSS community while maintaining commitment is valuable. Our work suggests that, like other professional peer groups, the OSS values impact the way developers feel about their employer. Organizations should be strategic in selecting the developers to contribute to OSS development on their behalf.

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