Association for Information Systems
AIS Electronic Library (AISeL)

PACIS 2013 Proceedings

Pacific Asia Conference on Information Systems (PACIS)

6-18-2013

Open Source Software and Performance: A Fit Perspective

Kaushik Ghosh
Lamar University, kghosh@lamar.edu

Thiagarajan Ramakrishnan
Prairie View A&M University, ram@pvamu.edu

Jiban Khuntia
Oakland University, khuntia@oakland.edu

OPEN SOURCE SOFTWARE AND PERFORMANCE: A FIT PERSPECTIVE

Kaushik Ghosh, College of Business, Lamar University, Beaumont, TX, USA, kghosh@lamar.edu

Thiagarajan Ramakrishnan, College of Business, Prairie View A&M University, Prairie View, TX, USA., ram@pvamu.edu

Jiban Khuntia, School of Business Administration, Oakland University, Rochester, MI, USA, khuntia@oakland.edu

Abstract

Although Open Source Software (OSS) is popular, its continued use in organizations remains an issue, as evidenced by users reporting frequent problems, experiencing hold-ups, and running into implementation and integration issues. Often, it is argued that fit between the person's task, values and work demands pose challenges for the successful use of OSS. In this context, this study draws on the concepts of task-technology fit and person-organization fit to develop a model to explore how different dimensions of fit interact with each other to influence OSS user's productivity and innovation performance. Survey data was collected from OSS users to test the proposed model. Results of the analysis show that when there is fit between an individual's OSS skills and the nature of the task to be performed (demand-ability fit), an OSS user's productivity performance increases, whereas, his innovation performance decreases. Further, when the organization's OSS values matches that of the individual user's (value-based fit), his task productivity decreases. Implications of the results suggest that organizations that intend to use OSS for a long time need to recruit employees keeping in mind the nature of their OSS projects and the demands and priorities of the tasks performed in the organization.

Keywords: open source software, task-technology fit, task-OSS fit, value-based fit, demand-ability fit, performance.

1 INTRODUCTION

Open Source software (OSS) is available to users through open source licenses in which the copyright holder provides the rights to study, modify, change and distribute the software to anyone and for any purpose. Unlike commercial software products, the source code of OSS is 'open', which means it allows freedom to the user to modify and innovate on top of the existing source code (Fitzgerald 2006). Because of the "free" nature, OSS has gained popularity worldwide. An increasing number of organizations are incorporating OSS in their information technology (IT) portfolio. By the year 2016, it is expected that 99% of top 2000 global businesses will deploy OSS programs to run mission-critical operations (Gartner Report 2011). However, the challenges of using OSS over time is evidenced in frequent reports of problems while during integration with existing systems, unforeseen hold-ups during deployment, which may eventually lead to outright rejection of OSS (Fitzgerald 2009). In other words, although organizations are lenient towards OSS use, often the use is not sustained with time in comparison to similar proprietary software.

Prior studies (for example, Chen 2010; Fang & Neufeld 2009; Santos et al. 2012; Shah 2006) have examined how OSS projects can sustain for long periods of time due to continued participation from software programmers. Primary reasons attributed to prolonged participation by software developers in OSS projects are – identifying with OSS ideology (free/libre), enjoying participating in OSS communities, recognition from peers (other OSS developers). Due to the open nature of OSS, access is easy, but to sustain its use, firms must acquire technological expertise and resources necessary for the continuous use of OSS (Gwebu & Wang 2010; Ven & Verselet 2011). Indeed, as some scholars have suggested, a major barrier to OSS implementation is the lack of technical skills among users of OSS (Ayala et al. 2011). Nevertheless, the question that what would influence sustained use of OSS in organizations remains broadly unexplored.

In regards to the continued use of OSS, some studies indicate that a major issue in organizations is the alignment of OSS to the individual tasks and productivity (Nagy et al. 2010). Often, the issue percolates down to the level wherein, by virtue of the free availability of the OSS, users get the software easily. But, customization of the software to the needs of the task or intended work needs time and effort. Moreover, the challenge remains in providing appropriate solution to meet the ends of the work requirements, than engaging in a continuous development of the software. In this regards, prior studies suggest that OSS and productivity linkage is complex, and need to be explored in details specifically in the context of task-individual-organization and productivity alignment or fit of OSS technology (Torres 2012).

In this study, we explore the impact of three dimensions of fit on performance in the context of OSS use by an individual within an organization: (1) task-OSS fit, (2) value-based fit, (3) demand-ability fit. The first dimension is task-OSS fit, defined as the extent to which the functionality of the technology (OSS) is aligned to the features of the task that the individual performs. This definition follows the discussion of task-technology fit in existing literature (Goodhue & Thompson 1995). In addition, anchoring to the concept of person-organization fit (Kristof 1996); we define value-based as match between the organization and the employee (user), due to shared beliefs about the open/free/libre value of OSS; and demand-ability fit is conceptualized as the fit (or match) between the organizational demand to use OSS and the individual's OSS skills. We include two performance measures in the context of OSS use in an organization by an individual; e.g., productivity performance that is defined as the increase in efficiency in executing tasks, and innovation performance that is defined as novel ways of designing software, and/or integrating software with existing systems. While productivity performance highlights the use of OSS by an individual to do routine tasks faster; innovation performance focusses on novel ways of doing work by an individual using OSS in the workplace.

Based on previous research, we argue that task-OSS fit has a direct impact on productivity performance and innovation performance. We also propose that value-based fit and demand-ability fit moderate the relationships between task-OSS fit and productivity performance, and task-OSS fit and

innovation performance. The rationale for proposing the moderating effects is that task-OSS fit is necessary but not sufficient to sustain use of OSS. Facets of fit included in the person-organization concept– such as individual ability-organizational task demands and individual values-organizational values, may often pose challenges for the successful use of OSS.

The conceptual model was tested using a survey of 104 individuals who use OSS in their workplace. Results of the analysis suggest that when OSS expertise of an employee matches the organization's task demands (demand-ability fit), productivity increases, while his innovative or creative task behavior decreases. Further, when individuals share similar OSS values as that of the organization's (value-based fit), it decreases task productivity. These results imply that organizations that intend to use OSS over time need to recruit employees whose OSS expertise match with the organization's task demands, but with some degree of caution. The study contributes to the emerging literature on OSS impact and sustained use in information systems area of research.

2 LITERATURE REVIEW

A stream of information system research has explored the issues associated with adoption, use of OSS, and participation in open source projects (see Aksulu & Wade 2010, for a review of OSS studies). Most of the studies are focused on understanding motivations of individuals developers to participate in OSS projects (Hahn et al. 2008; von Krogh et al. 2011; Roberts et al. 2006; Shah 2006), or users intention to adopt OSS software (Gwebu & Wang 2011; Macredie and Mijinyawa 2011). A few studies have explored the issue of continued voluntary participation in OSS communities; for instance, a study by Fang and Neufeld (2009) suggested that sustained individual contribution in an OSS project depends on the individual developer's process of engaging in learning and his identified presence within the OSS community. However, continued use of OSS in organizations has received limited attention in academic literature and remains an unexplored question.

Prior studies suggest that task-technology fit (TTF) is one of the antecedents of OSS adoption and implementation in organizations (Torres 2012). The rationale for the relationship between task-technology fit (TTF) and OSS adoption stems from the argument that when competencies inbuilt in the technology coincide with the needs of the task, there are performance benefits associated (Goodhue & Thompson 1995). Indeed, when technology (OSS) features match task requirements, users tend to use a broad-range of functionalities of the technology, which subsequently increases their productivity as well as intention for continued use of that technology (Larsen et al. 2009; Lin 2012). Arguably, individuals can modify an OSS's source code in countless ways to suit the needs of their tasks because of the availability of source code. But how far users can leverage on the options to suit their needs remains a widely debated question; specifically because modifying source code requires high degree of technical expertise to 'suit' and 'fine-tune' the source code to task needs (Ayala et al. 2011).

3 CONCEPTUAL FRAMEWORK AND HYPOTHESES

The conceptual framework (see Figure 1) for this study uses the theoretical underpinnings of two streams of literature: (1) task-technology fit (Goodhue & Thompson 1995) and (2) person-organization (P-O) fit (Kristof 1996). Anchoring to these existing theories, we argue that the performance of individual's use of OSS in an organization will be influenced through the interactions of three dimensions of fit: (1) task-OSS fit, (2) value-based fit, (3) demand-ability fit.

The basic tenet of the framework suggests that task-OSS fit has an impact on performance of OSS use in the context of an individual using OSS inside an organization. In addition, we propose that value-based fit and demand-ability fit moderate the relationships between task-OSS fit and productivity performance and innovation performance. The central argument for these moderating relationships is that when the individual perceives a value congruence of his OSS "ideologies" or "beliefs" with that of the organization's, and uses OSS due to this motivation, his innovative performance (e.g., creative

ways to do work) increases. However, when OSS use is enforced from the organization's side, that OSS has to be used to meet a task demand, then the use of OSS may not be voluntarily or "intrinsically" motivated. As a result, the demand-ability fit may increase the productivity performance; but the innovative performance (i.e., newer ways of doing work) would decrease. We substantiate the details of these arguments in the following sub-sections and draw testable hypotheses.

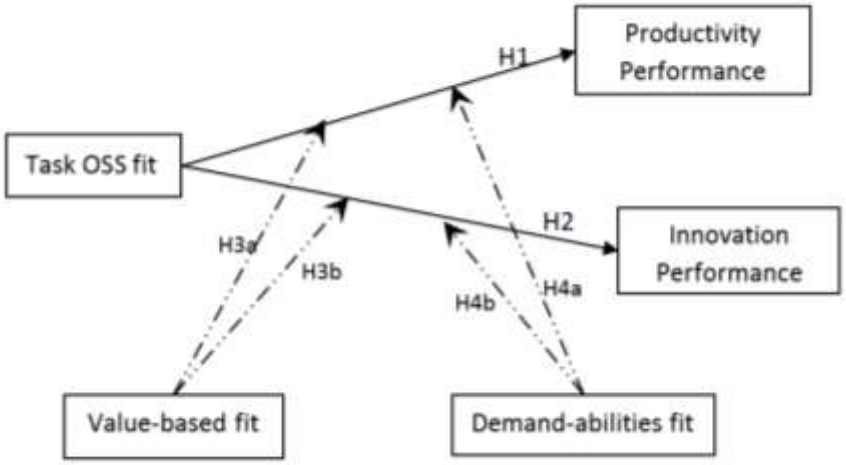

Figure 1.Conceptual Model

3.1 Direct Impact of Task-OSS Fit on Performance

Prior studies argue that when capabilities and features of technology match with the demands of the task, technology improves performance (Goodhue & Thompson 1995). The notion of task-technology fit (TTF) is that users' perception of better fit of certain technology with the task over other alternatives influences their utilization choices (Junglas et al. 2008). The task-technology fit (TTF) perspective has been employed to understand the task performance of mobile information technology users (Gebauer et al. 2010), individual productivity such as number and quality of ideas generated in group meetings (Dennis et al. 2001), effectiveness of individuals collaborating on a task virtually (Maruping & Agarwal 2004).

We argue that when the OSS features match with the task (task-OSS fit or TOF), an individual's ability to perform the task increases (e.g., productivity performance increases). When a user recognizes that OSS has the necessary functionality to carry out his tasks, he has a higher perception of the utility of OSS, enabling the individual to become more efficient while doing the work. We also assert that the 'openness' feature of OSS may induce an individual to find new and creative ways to modify the software to suit the needs of the task. Thus, OSS capabilities (for example, availability of source code) allow modifications in the software to match the nature of an individual's task, which increases innovative behavior of the individual. Based on these arguments, we hypothesize:

H1: Task-OSS fit increases an individual's productivity performance.
H2: Task-OSS fit increases an individual's innovation performance.

3.2 Interaction of Value-based Fit with Task-OSS Fit

Presence of fit between the technology and the task may be required, but may not be sufficient to improve productivity and innovative performance (Dennis et al. 2001; Fuller & Dennis 2009). It is suggested that when there is value congruence, that is, individual values and organizational values

coincide (for example, believing in the core OSS ideology that OSS should be open and free), people are more likely to have positive work attitudes and perform well in their tasks (Cable & Edwards 2004; Kristof-Brown et al. 2005). Indeed, when employees share similar OSS values with that of the organization, it may influence their creative behaviour (Choi 2004) as they perceive the work environment to be conducive to try out new ways of modifying and improving OSS to fit the needs of their task. This subsequently may improve their innovation performance.

On the contrary, Ke and Zhang (2010) suggest that the impact of use of OSS on productivity performance may be low for two reasons. First, individuals may be too enthusiastic to use OSS in multitude of projects without focussing on the success of any one of the projects, thereby reducing their productivity performance as a whole. Second, individuals may be over-identifying with the "free" or culture of OSS, because of which for them, the "task may be losing the mystery or appeal of being challenging" (Ke & Zhang 2010, p. 9). As a result, their productivity performance decreases. Based on these arguments, we hypothesize:

H3a: Value-based fit negatively moderates the influence of task-OSS fit on productivity performance.
H3b: Value-based fit positively moderates the influence of task-OSS fit on innovation performance

3.3 Interaction of Demand-ability Fit with Task-OSS Fit

Prior research suggests that demand-ability fit has a positive influence on work attitudes (Kristof-Brown et al. 2005). Specific to the OSS context, Schilling et al. (2012) found that degree of demand-ability fit was highly correlated with developer retention in OSS projects. Similarly, Livingstone et al. (1997) argued that when there is a mismatch between organizational demands and individual abilities, individual creativity may be affected subject to the demand's overpowering effect on the abilities. Earlier studies suggest that mismatch between the individual's cognitive style and organizational work demand may create a situation for some users to alter the status quo of problem; but in a way that the individual follows a routine approach than innovative approach (Kirton 1987, Chan 1996). In this regard, when an organization places a high demand to use OSS, irrespective of the ability of the individual to modify the source code to suit to the needs of the work, the individual may follow a routine-based approach than an innovative approach. In other words, swayed by the demand of the organization to apply OSS to any context, individuals may deter from their novel ways to achieve or do some work – thereby decreasing innovative performance. Based on these arguments, we hypothesize:

H4a: Demand-ability fit positively moderates the influence of task-OSS fit on productivity performance.
H4b: Demand-ability fit negatively moderates the influence of task-OSS fit on innovation performance.

4 METHODOLOGY

4.1 Sample

The data for the study was collected as part of a larger effort using a survey distributed to IT professionals who used OSS at their workplace. An email list of 800 IT professionals working in the US and using OSS at their work was obtained. An invitation email soliciting participation in the study that included a link to the survey was sent out to these individuals. Participants were briefly explained about the objective of the study and were informed that $15 Amazon.com gift cards would be offered to 5 individuals randomly selected from a lucky draw. Of the 800 emails that were sent out, 217 were invalid, and 61 individuals opted not to participate in the survey. Reminder emails were sent after 2 weeks of sending out the initial invitation email to the remaining 522 individuals. The data collection procedure was conducted for approximately 4 weeks (March to April of 2011). There were 179

individuals that responded to the survey, of which 104 were usable responses. Thus, the overall response rate for the survey was 19.92%.

Out of the 104 respondents, 93 were males and remaining were females, 44 individuals were affiliated with the OSS community, 26 respondents were in the age group of 21 to 30. With respect to years of experience, 84 individuals had 5 or more years of experience working in the IT field, while a slightly higher number (86) of respondents had 4 or more years of experience working with OSS. Approximately, 34 individuals reported that they currently (at the time the survey was conducted) use OSS applications to perform majority (50 percent or higher) of their tasks at work. The sample represented 74 individuals that worked for organizations with annual revenue of over $1 billion dollars. With regards to rank/position in the organization, 46 individuals were programmer/technical specialist. Table 1 shows the demographics of the sample used in the study.

Label	**Question**	**Results (with % of respondents in brackets)**
Gender	Please indicate your gender:	1. Male (89.42%), 2. Female (10.58%)
Age	Please indicate your age in years:	21-30 (25%), 31-40 (36.54%), 41-50 (18.27%), 51-65 (19.23%), > 65 (0.96%)
Education	Please indicate the highest level of education that you have completed?	Some School (0.96%), High School/GED (3.85%), 2-year College Degree (4.81%), Some College (17.31%), 4-year College Degree (47.62%), Master's Degree (24.49%), Professional Degree (e.g. JD, MD) (0%), Doctoral Degree (0.96%), Other (0%)
IT Work Experience	How many years of work experience do you have in the IT field?	1-3 (11.54%), 3-5 (7.69%), 5-8 (9.62%), 8-12 (19.23%), 12-15 (15.38%), > 15 (36.54%)
Experience with OSS	How many years of experience you have working with OSS?	1-3 (17.30%), 4-8 (36.54%), 9-13 (29.81%), 14-18 (8.65%), > 18 (7.7%)
OSS applications currently used	Please indicate OSS applications currently used by you as a percentage of total:	< 10% (22.12%), 11-25% (33.65%), 26-50% (12.04%), 51-75% (11.54%), More than 75% (20.65%)
OSS Affiliation	Please indicate your affiliation with the OSS community:	Member (42.31%), Non-member (57.69%)
Total Employees	Please indicate the total number of employees in your organization:	< 50 (29.81%), 51-100 (17.31%), 101-200 (8.65%), 201-300 (4.81%), 301-400 (1.92%), 401-500 (0.96%), 501-1000 (11.54%), > 1000 (25.00%)
Annual Revenue	Please indicate your organization's approximate annual revenues in Dollars.	< 1 million (1.92%), 1-100 million (5.77%), 100-500 million (7.69%), 500 million-1 billion (13.46%), > 1 billion (71.15%)
Position/Rank	Please indicate your position/rank in the organization.	Programmer/Technical Specialist (44.23%), Manager or Equivalent (20.2%), Sr. Manager or Equivalent (6.73%), Director or Equivalent (18.27%), VP or Equivalent (2.88%), President or Equivalent (2.88%), CEO/CIO/COO/CFO (4.81%)

Table 1.Demographics

Response bias was assessed by comparing the survey responses of early respondents with late respondents. We used T-test to evaluate the difference between these two groups on the basis of relevant constructs. The results of the t-test are shown in Table 4. We found no significant difference between the two groups of respondents. Thus, non-response bias is not a significant issue in this study.

4.2 Measurement Instrument

The survey instrument was designed to elicit information about all of the variables in the research model. Previously validated and established scales were used. Some scales were re-worded based on the inputs from participants in the pre-test. This was done to be certain that the questions in the survey were appropriate for the context of the study. The survey items used to measure all variables are included in Table 2. The independent variable task-OSS fit (TOF) was measured using 8 items on a 7-point Likert scale where 1 represents 'extremely disagree' and 7 represents 'extremely agree'. The two dependent variables, productivity performance (PP) and innovation performance (IP) were each measured using 3 items on a 5-point Likert scale where 1 represents 'not at all' and 5 represents 'a great deal'. The moderating variable, value-based fit (VBF) was measured using 3 items, whereas the second moderating variable, demand-ability fit (DAF) was measured using 4 items. Both these variables were measured using a 5-point Likert scale where 1 represents 'strongly disagree' and 5 represents 'strongly agree'.

	Measurement Items
Task-OSS Fit (TOF)	*Adopted from Moore and Benbasat (1991). Anchors: 'extremely disagree'=1, 'extremely agree'=7* 1. Using OSS is compatible with all aspects of my work. 2. I think that using OSS fits well with the way I like to work. 3. Using OSS fits into my work style. 4. Using OSS enables me to accomplish tasks more quickly. 5. Using OSS improves the quality of work I do. 6. Using OSS makes it harder to do my job. (Reverse coded) 7. Using OSS enhances my effectiveness on the job. 8. Using OSS gives me greater control over my work.
Productivity Performance (PP)	*Adopted from Torkzadeh and Doll (1999). Anchors: 'not at all'=1, 'a great deal'=5* 1. Using OSS saves me time. 2. Using OSS decreases my productivity. (Reverse coded) 3. Using OSS allows me to accomplish more work than would otherwise be possible.
Innovation Performance (IP)	*Adopted from Torkzadeh and Doll (1999). Anchors: 'not at all'=1, 'a great deal'=5* 1. OSS does not allow me to create new ideas. (Reverse coded) 2. OSS helps me come up with new ideas. 3. OSS helps me try out innovative ideas.
Value-based Fit (VBF)	*Adopted from Cable and DeRue (2002). Anchors: 'strongly disagree'=1, 'strongly agree'=5* 1. The things that I value about OSS are very similar to the things that my organization values about OSS. 2. My personal OSS values match my organization's OSS values and culture. 3. My organization's OSS values and culture provide a good fit with the things that I value about OSS.
Demand-ability Fit (DAF)	*Adopted from Cable and DeRue (2002). Anchors: 'strongly disagree'=1, 'strongly agree'=5* 1. The match is very good between the demands of my job and my OSS skills. 2. My OSS abilities are a good fit with the requirements of my job. 3. My OSS training is a good fit with the requirements of my job. 4. My OSS knowledge is a good match with the demands that my job places on me.

Table 2. Survey Questionnaire for Variables and Coding Scheme

4.3 Empirical Analysis

Partial Least Squares (PLS) technique using SmartPLS software version 2.3 (Ringle et al. 2005) was used for data analysis. The measurement model checks for the reliability and the validity of the instrument, whereas the structural model tests the relationship between the constructs (Huck 2004). PLS can handle small sample size better than covariance-based structural equation modelling (Liang et al. 2007; Gefen et al. 2011). Furthermore, PLS can help assess a model with moderating variables. In order to use PLS effectively, the minimum required sample size should be ten times the number of

independent variables influencing a single dependent variable (Chin 1998). Our proposed model consists of three variables (one independent and two moderators) influencing one dependent variable. Thus, our sample size of 104 is more than adequate to conduct the statistical analysis.

The AVEs of all the constructs included in the model were greater than 0.5, thus indicating adequate convergent validity. For constructs to have adequate discriminant validity, the square roots of the AVEs for all the constructs must be greater than correlations among the constructs (Huck 2004). All the constructs exhibit adequate discriminant validity. The diagonal elements in Table 3 in bold represent the square root of the AVEs for the constructs and the non-diagonal elements represent the correlation among these constructs. Composite reliability of all the constructs is greater than 0.7, which indicates adequate reliability (Chin 1998). The Cronbachs alpha which is another indicator of construct reliability should be greater than the threshold value of 0.7. All constructs except demand-ability fit (DAF) had Cronbachs (1951) alpha value greater than 0.7. Table 4 includes values for composite reliability, AVE, and Cronbach's Alpha.

Constructs	**TOF**	**VBF**	**DAF**	**PP**	**IP**
Task-OSS Fit (TOF)	**0.820**				
Value-based Fit (VBF)	0.46	**0.951**			
Demand-Ability Fit (DAF)	0.56	0.26	**0.711**		
Productivity Performance (PP)	0.79	0.67	0.36	**0.899**	
Innovation Performance (IP)	0.58	0.47	0.32	0.64	**0.914**

Table 3. AVE and Correlation among Latent Constructs

In PLS, the relationships between the constructs are represented by the structural model. Bootstrapping with a sample size of 500 as recommended by Chin (1998) was used to test the structural model. The hypotheses were evaluated using one-tailed t-test as they are unidirectional in nature. Table 5 gives the path coefficients, t-values, respective p-values as well as the summary of the hypotheses testing.

Construct	**AVE**	**Composite Reliability**	**Cronbach's Alpha**	**T-value**	**P-value**
Task-OSS Fit (TOF)	0.673	0.942	0.927	0.234	0.816
Productivity Performance (PP)	0.808	0.926	0.88	0.073	0.942
Innovation Performance (IP)	0.835	0.938	0.90	0.857	0.395
Value-based Fit (VBF)	0.904	0.966	0.946	1.884	0.064
Demand-ability Fit (DAF)	0.505	0.787	0.644	0.412	0.682

Table 4. AVE, Composite Reliability, and Cronbach's Alpha, and Response Bias Test

Hypotheses	**Path Coefficients**	**T-values**	**P-values**	**Result**
H1	0.56	2.86	0.00***	Supported
H2	0.74	2.69	0.00***	Supported
H3a	-0.92	2.74	0.00***	Supported
H3b	0.28	0.54	0.29	Not Supported
H4a	0.62	1.62	0.05**	Supported

****p<0.01, **p<0.05, *p<0.10*
TPP R^2=0.78, TIP R^2=0.40

Table 5. Path Coefficients, t-values, p-values, and Result

5 RESULTS

We find that the influence of task-OSS fit (TOF) on productivity performance (PP) ($\beta = 0.56$, $p < 0.10$) and innovation performance (IP) is significant ($\beta = 0.74$, $p < 0.01$), thereby providing support for hypotheses H1 and H2. With regards to the moderating effect of value-based fit (VAF) on the

relationship between task-OSS fit (TOF) and productivity performance (PP), we find a significant and negative influence ($\beta = -0.92$, $p < 0.01$). This result supports hypothesis H3a, that is, value-based fit (VAF) decreases the positive impact of task-OSS fit (TOF) on productivity performance (PP). However, value-based fit (VAF) did not have a significant effect on the relationship between task-OSS fit (TOF) and innovation performance (IP), thus providing no support for H3b. Demand-ability fit (DAF) played a significant moderating role on the relationship between task-OSS fit (TOF) and productivity performance (PP), as well as between task-OSS fit (TOF) and innovation performance (IP); it enhanced the impact of task-OSS fit (TOF) on productivity performance (PP) ($\beta = 0.62$, $p < 0.05$), while the effect of task-OSS fit (TOF) on innovation performance (IP) ($\beta = -0.59$, $p < 0.10$) was reduced. These results supported hypotheses H4a and H4b.

6 DISCUSSION

The findings of our analysis show that task-OSS fit (TOF) has a direct positive effect on productivity performance (PP) as well as innovation performance (IP). These results confirm findings in prior research that the match between features of the OSS and demands of the task enable users to work efficiently. Further, we find that value-based fit (VBF) negatively moderates the influence of task-OSS fit (TOF) on productivity performance (PP). Plausibly, individuals whose OSS values were in congruence with OSS values supported by the organization had a stronger desire to try out new methods of using OSS, rather than trying to perform tasks at a faster rate, or efficiently; thereby reducing productivity performance. There was no significant support for the moderating effect of value-based fit (VBF) on the relationship between task-OSS fit (TOF) and innovation performance (IP). Although, individuals may have been inclined to try novel ways of using OSS, there could be other factors (for example, limited OSS related skills and knowledge) that 'clouded' their preference to be creative.

Moderating influence of demand-ability fit (DAF) was supported as hypothesized. Demand-ability fit (DAF) decreased the influence of task-OSS fit (TOF) on innovation performance (IP) while it increased the effect of task-OSS fit (TOF) on productivity performance (PP). These results support our claim that when OSS skills of an individual match the demands of the task, productivity increases, as users find greater utilization of OSS. Whereas, similar fit diminishes an individual's innovative ability or performance, such as exploring new ways to use OSS.

We draw three managerial implications from our findings. First, organizations need to understand why and how to use OSS, and select the right people to manage tasks that require use of OSS. While OSS as a "free and libre" culture is quite attractive, but leaving everything to the whims of employees may not be good. Second, we infer that as far as productivity is concerned, introducing or adopting OSS may not be good for all employees. Our findings suggest that if a person is very oriented towards the "identity" or "value" of OSS use, OSS may be counter-productive to achieve performance. Third, when the organization hires people for different tasks, it should keep the demand of a task and the abilities of a person's OSS related knowledge and skills in mind. For example, if a specific development or systems design demands high-end skills or abilities, such as redesigning an OSS platform from scratch, a person with 'matching' OSS skills may not be efficient in achieving the innovation performance associated with the platform design. However, the person may be suited to manage routine tasks and improve productivity of such tasks. Thus, overall, OSS use should not be seen in isolation of people involved in using OSS (e.g., highly skilled or moderately skilled), or without keeping in mind the nature of projects or tasks performed in an organization (e.g., innovative or routine), or, without focusing on the demands that need be met in the organization (e.g., deadlines, project deliverables etc.). While a holistic approach towards sustained OSS in organizations is much desirable, managers should consider specific organizational context and priorities, even though it adds a layer of complexity for them to manage the use of OSS.

This study makes two primary theoretical contributions. First, we extend prior literature which suggests that task-technology fit is a necessary but not sufficient condition in improving individual

performance (Denis et al 2001). We conceptualize that value-based fit and demand-ability fit, the two dimensions of person-organization fit, impact individual performance, thus contributing to the existing literature on task-technology fit perspective. Second, we demonstrate that post adoption stage; continued use of OSS may be facilitated by the match between the OSS skills of an individual and the task. Further, the sharing of common OSS values between the organization and the individual may adversely impact continued use of OSS in organizations.

One of limitations of the study was the use of a relatively small sample size. However, PLS was used to analyze the data. Another limitation is the possibility of common method bias in the study. However, de-identified survey data was collected which may have minimized the effect. Further, the cross sectional design with survey data limits the causality inferences that can be drawn from the study, and hence, the results are associational in nature. In addition, the survey data does not include the type of OSS used by respondents. Although, such information may help in understanding the context of use, the primary goal of the study was to understand the factors that drive sustained OSS use in business settings were a wide-range of OSS are used

Extant literature has focussed on examining factors that drive initial adoption of OSS (for example, Gwebu & Wang 2011; Macredie & Mijinyawa 2011) and understanding the reasons for sustained participation of voluntary individuals in OSS projects (for example, Chen 2010; Fang & Neufeld 2009). To our knowledge, this paper is the first to examine the factors that facilitate the continued use of OSS in organizations, beyond the phase of initial adoption. In doing so, this study adds to the stream of literature on OSS that focusses on understanding the successful utilization of OSS in business settings.

References

Aksulu, A. and Wade, M. (2010). A comprehensive review and synthesis of open source research. Journal of the Association for Information Systems. 11, 576-656.

Ayala, C. P., Cruzes, D. S., Hauge, O. and Conradi, R. (2011). Five facts on the adoption of open source software. IEEE Software, 28(2), 95-99.

Cable, D. M., and Edwards, J. R. (2004). Complementary and supplementary fit: A theoretical and empirical integration. Journal of Applied Psychology, 89(5), 822-834.

Chan, D. (1996). Cognitive misfit of problem-solving style at work: A facet of person–organization fit. Organizational Behavior and Human Decision Processes, 68(3), 194-207.

Chen, S. (2010). Determinants of survival of open source software. Academy of Information and Management Sciences Journal, 13(2), 119-128.

Chin, W. W. (1998). Issues and opinions on structural equation modeling. MIS Quarterly, 22 (1), vi – xvi.

Choi, J. (2004). Person–environment fit and creative behavior: Differential impacts of supplies–values and demands–abilities versions of fit. Human Relations, 57(5), 531-552.

Cronbach, L.J. (1951). Coefficient Alpha and the internal structure of tests. Psychometrika, 16 (3), 297-335.

Dennis, A. R., Wixom, B. H., and Vandenberg, R. J. (2001). Understanding fit and appropriation effects in group support systems via meta-Analysis. *MIS Quarterly*, 25 (2), 167-193.

Fang, Y. and Neufeld, D. (2009). Understanding sustained participation in open source software projects. Journal of Management Information Systems, 25(4), 9-50.

Fitzgerald, B. (2006). The transformation of open source software. MIS Quarterly, 30(3), 587-598.

Fitzgerald, B. (2009). Open source software adoption: Anatomy of success and failure. International Journal of Open Source Software and Processes, 1(1), 1-23.

Fuller, R. and Dennis, A. (2009). Does fit matter? The impact of task-technology fit and appropriation on team performance in repeated tasks. Information Systems Research, 20(1), 2-17.

Gartner Report (2011).Hype cycle for open-source software.

Gebauer, Judith, Shaw, M. J., and Gribbins, M. L. (2010). Task-technology fit for mobile information systems. Journal of Information Technology, 25, 259-272.

Gefen, D., Rigdon, E., and Straub, D. (2011). An update and extension of SEM guidelines for administrative and social science research. MIS Quarterly, 35(2), iii-xiv.

Goodhue, D. L., and Thompson, R. L. (1995). Task-technology fit and individual performance. MIS Quarterly, 19 (2), 213–236.

Gwebu, K. L. and Wang, J. (2010). Seeing eye to eye? An exploratory study of free open source software users' perceptions. Journal of Systems Software, 83, 2287–2296.

Gwebu, K. L. and Wang, J. (2011). Adoption of open source software: The role of social identification. Decision Support Systems, 51, 220-229.

Hahn, J., Moon, J. Y. and Zhang, C. (2008). Emergence of new project teams from open source software developer networks: Impact of Prior Collaboration Ties. Information Systems Research, 19(3), 369-391.

Huck, S. W. (2004). Reading Statistics and Research, 4th ed. Pearson.

Junglas, I., Abraham, C., and Watson, R. T. (2008). Task-technology fit for mobile locatable information systems. Decision Support Systems, 45(4), 1046-1057.

Ke, W. and Zhang, P. (2010). Effects of empowerment on performance in open-source software projects. IEEE Transactions of Engineering Management, 58(2), 334-346.

Kirton, M. J. (1987). Kirton adaption-innovation inventory (KAI) Manual (2nd ed). England: Occupational Research Centre, Hatfield.

Kristof, A. L. (1996). Person–organization fit: An integrative review of its conceptualizations measurements, and implications. Personnel Psychology, 49, 1–49.

Kristof-Brown, A. L., Zimmerman, R. D., and Johnson, E. C. (2005). Consequences of individuals' fit at work: A meta-analysis of person-job, person-organization, person-group, and person-supervisor fit. Personnel Psychology, 58(2), 281-342.

Larsen, T. J., Sørebø, A. M. Sørebø, O. (2009). The role of task-technology fit as users' motivation to continue information system use. Computers in Human Behavior, 25, 778-784.
Liang, H., Saraf, N., Hu, Q., and Xue, Y. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. MIS Quarterly, 31(1), 59-87.
Lin, W. (2012). Perceived fit and satisfaction on web learning performance: IS continuance intention and task-technology fit perspectives. International Journal of Human-Computer Studies, 70, 498-507.
Livingstone, L.P., Nelson, D. L., and Barr, S. H. (1997). Person-environment fit and creativity: An examination of supply-value and demand-ability versions of fit. Journal of Management, 23(2), 119-146.
Macredie, M., and Mijinyawa, K. (2011). A theory-grounded framework of open source software adoption in SMEs. European Journal of Information Systems, 20, 237-250.
Maruping, L., and Agarwal, R. (2004). Managing Team Interpersonal Processes through Technology: A Task-Technology Fit Perspective. Journal of Applied Psychology, 89(6), 975-990.
Nagy, D., Yassin, A. M., and Bhattacherjee, A. (2010). Organizational adoption of open source software: Barriers and remedies. Communications of the ACM, 53(3), 148-151.
Ringle, C., Wende, S. and Will, A. (2005). SmartPLS version 2.0 M2. www.smartpls.de.
Ringle, C. M. Sarastedt, M. Straub, D. (2012) A critical look at the use of PLS-SEM in MIS Quarterly, MIS Quarterly, 36(1), iii – xiv.
Roberts, J., Hann, I., and Slaughter, S. (2006). Understanding the motivations, participation, and performance of open source software developers: A longitudinal study of the Apache projects. Management Science, 52(7), 984-999.
Santos, C., Kuk, G., Kon, F., and Pearson, J. (2012 article in press). The attraction of contributors in free and open source software projects. Journal of Strategic Information Systems, article in press.
Schilling, A. Laumer, S., and Weitzel, T. (2012) Who Will Remain? - An evaluation of actual person-job and person-team fit to predict developer retention in FLOSS projects. In Proceedings of the Forty-fifth Hawaii International Conference on System Sciences, p. 3446, Hawaii, USA.
Shah, S. (2006). Motivation, governance, and the viability of hybrid forms in open source software development. Management Science, 52(7), 1000-1014.
Torres, R (2012). Developer-led adoption of open source software libraries: A conceptual model. In Proceedings of the Eighteenth Americas Conference on Information Systems, p. 34, Seattle, WA, USA.
Ven, K. and Verelst, J. (2011). An empirical investigation into the assimilation of open source server software. Communications of the Association for Information Systems, 28(9), 117-140.
von Krogh, G., Haefliger, S., Spaeth, S. and Wallin, M. W. (2011). Carrots and rainbows: Motivation and social practice in open source software development. MIS Quarterly, 36 (2), 649-676.