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A STUDY ON THE IMPACT OF VALUES ON THE OPEN SOURCE DESIGN DECISION-MAKING PROCESS

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Abstract

The effect of the personal values - such as trust or a desire for privacy - of users and developers of open source software (OSS) on the development and use of the software developed by OSS projects is a topic of growing interest in the Information Systems (IS) field. This topic has been investigated in proprietary IS development, but a limiting factor in many of these studies is a lack of theoretical support for the values measured. Drawing on a large body of existing personal value research in social psychology, built on a foundation of over 30 years of research, this study will attempt to map personal values currently defined in IS research to the decision making behavior in OSS project communities. In particular, this research maps values, beliefs and norms defined by Stewart and Gosain (2006) and other descriptions of the ideologies driving OSS teams onto the value constructs measured by the Theory of Universals in Values (TUV). By using a common theoretical basis for values research, connections across seemingly unrelated values research may be found.

Propositions for the first part of a two-staged exploratory study are proposed to test whether the TUV better defines the values, beliefs and norms found in the OSS community and provides a richer picture of what may, in part, drive decision-making behavior in the OSS community. The methodology for such a study is presented and possible contributions for researchers and practitioners are presented.

Keywords: Open source, values, personal values, free software, TUV

Introduction

Within the Information Systems (IS) literature there are many studies examining values role in system design and use, but many of these studies lack a common theoretical definition of personal values. Particularly in the Open Source Software (OSS) literature the definitions of values varies among authors and is mainly based on colloquial descriptions of the ideologies said to drive OSS development, not rigorously theoretically defined. A necessary step in this stream of research is to examine whether a more rigorous definition of personal values can be utilized to better explain the role of values in the development and decision-making process of OSS projects. The values, beliefs and norms of members of OSS project development teams as defined by Stewart and Gosain (2006) may fit within the value constructs defined by the Theory of Universals in Values (TUV). This study will attempt to better define the personal values seen in OSS literature by mapping the existing values into the more robust and rigorously defined TUV drawn from the social psychology literature. By using a common theoretical basis for values research, connections across seemingly unconnected works may be found. If these values and decision-making behavior of OSS communities map well to the TUV, it can then be tested in other areas of IS research.

A comparison of previous values used in research on OSS and proprietary IS development with the TUV will show whether the TUV better explains the values of OSS developers than the current value constructs based on ideological statements. The research plan proceeds by developing the theoretical grounds for this comparison by mapping currently accepted values in the OSS literature with those defined in the TUV. This research will also examine the impact of values on decision making in OSS project communities. Based on this theoretical justification, propositions are presented that will be
tested in two stages of the proposed study. Propositions are given comparing the TUV with currently defined value constructs as an important preliminary step in explaining the impact of the TUV on decision-making behavior in OSS projects. The method for conducting this exploratory analysis is presented along with the intended design of the study and the planned analyses for comparing the competing value constructs. Finally, limitations, contributions, and concluding thoughts are presented.

**Literature review and theoretical analysis**

Values, beliefs and norms have been defined many ways in the IS literature. Several streams of research exist that discuss the impact of values on design from an ethical perspective (Friedman et al., *forthcoming*, Kumar and Bjorn-Anderson 1990, and Nissenbaum 2001) or values’ influence on web applications (Introna and Nissenbaum 2001). Yet, across these studies there is an inconsistency among how values are defined or measured or what impact beliefs may have on the issues being studied. Kumar and Bjorn-Anderson (1990) draw on social psychology for their definition of a value, but use their own instrument to measure IS designer values. Due to this disparity among previous research it is our goal to try and establish a common value definition and measurement methodology within IS research.

Within the OSS literature, this disparity is further exacerbated by definitions of values that not only differ from other IS research but also between streams of OSS research. Other authors have called for a common cohesive set of community values (Jesiek 2003), however, most values are based on the ideologies presented by OSS community leaders such as Stallman and Raymond. These implicit and intuitive beliefs and ideologies are said to drive OSS developers. Stewart & Gosain further develop these ideologies into very specific meanings for the OSS community in the context of their study (2006). They aggregate the values, beliefs and norms from Stallman (1992), Kuwabara (1999), and Raymond (1999, 2003). The values defined by Stewart and Gosain can be seen in Table 1. Markus et al. (2001) and Baldwin and Clark (2006) include altruism as a motivating value for OSS developers, and Hars and Ou (2002) include altruism as part of their empirical study of motivation in OSS. Altruism, defined as providing something for someone else at your own expense, offers an alternate view of the sharing and helping values of Stewart and Gosain (2006). These and similar statements have been widely promulgated as the underlying beliefs and values which drive individuals to participate in OSS projects, and by extension, influence their decisions regarding design of OSS. These statements have been valuable in shaping research on OSS motivations; however, there is a large body of literature in social psychology defining values, beliefs and norms which can provide an overarching theoretical framework for future research.

It is our thought that the values, beliefs and norms organized by Stewart and Gosain will fit into the Theory of Universals in Values (TUV, Schwartz 1992 and 2004), an accepted theory within the social psychology field with a sizable measurement and validation history. In this study, we define a value as a “shared prescriptive or proscriptive belief that indicates an ideal mode of behavior or desired state of existence that may be situational or pertain to an object” (Rokeach 1980, p. 262). The similar concept of a belief can be viewed as a proposition used by a person to describe, evaluate, or prescribe/proscribe an action enabling some assessment of the world around them (Rokeach 1968). Values differ from other beliefs in that they act as standards that go beyond a single evaluation of a choice or a comparison of an object. It is within the context of the last statement that an argument can be made that values as used in the current IS literature are too specific. Values are important in a person’s evaluation of the world around them as an integral part of an individual’s personality and a factor in how a person responds to differing environments. Norms are standards that act as guidelines for behavior in the community.

The primary effort for the first stage of this study is to map current IS user and developer values into Schwartz’s (1992) TUV ten basic value constructs (listed in Table 2). The TUV has been validated to represent the values of all individuals regardless of culture or country. The values can be presented as a circular structure along two axes. Adjacent values have similar characteristics and importance to an individual. Opposing values are unable to simultaneously exert strong influence on an individual. Two dimensions are evident in this structure of values. The first highlights the difference between values aligned with “openness to change” (self-direction and stimulation) versus those associated with “conservation” of tradition and social stability (security, conformity, and tradition). The second dimension groups the values supporting the individual or the “self-enhancement” axis versus those values that go beyond the individual in the “self-transcendence” axis. Hedonism is denoted with a dashed line because it shares goals with the “openness to change” and “self-enhancement” axes.
Table 1: OSS Values, Beliefs, and Norms (Stewart and Gosain 2006)

<table>
<thead>
<tr>
<th>OSS Values</th>
<th>OSS Beliefs</th>
<th>OSS Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharing – sharing information is important</td>
<td>Code Quality – open source development methods produce better code than closed source</td>
<td>Forking – there is a norm against forking a project, which refers to splitting the project into two or more projects developed separately</td>
</tr>
<tr>
<td>Helping – aiding others is important</td>
<td>Software Freedom – outcomes are better when code is freely available</td>
<td>Distribution – there is a norm against distributing code changes without going through the proper channels</td>
</tr>
<tr>
<td>Technical knowledge – technical knowledge is highly valued</td>
<td>Information Freedom – outcomes are better when information is freely available</td>
<td>Named Credit – there is a norm against removing someone’s name from a project without that person’s consent</td>
</tr>
<tr>
<td>Learning – there is a value on learning for its own sake</td>
<td>Bug fixing – the more people working on the code, the more quickly bugs will be found and fixed</td>
<td></td>
</tr>
<tr>
<td>Cooperation – voluntary cooperation is important</td>
<td>Practicality – practical work is more useful than theoretical discussion</td>
<td></td>
</tr>
<tr>
<td>Reputation – reputation gained by participating in open source projects is valuable</td>
<td>Status Attainment – status is achieved through community recognition</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: The TUV Value Constructs (Schwartz 1992)

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>POWER</td>
<td>Social status and prestige, control or dominance over people and resources. (social power, authority, wealth, preserving my public image)</td>
</tr>
<tr>
<td>ACHIEVEMENT</td>
<td>Personal success through demonstrating competence according to social standards. (successful, capable, ambitious, influential)</td>
</tr>
<tr>
<td>HEDONISM</td>
<td>Pleasure and sensuous gratification for oneself. (pleasure, enjoying life, self-indulgence)</td>
</tr>
<tr>
<td>STIMULATION</td>
<td>Excitement, novelty, and challenge in life. (daring, a varied life, an exciting life)</td>
</tr>
<tr>
<td>SELF-DIRECTION</td>
<td>Independent thought and action-choosing, creating, exploring. (creativity, freedom, independent, curious, choosing own goals)</td>
</tr>
<tr>
<td>UNIVERSALISM</td>
<td>Understanding, appreciation, and protection for the welfare of all people and for nature. (broadminded, wisdom, social justice, equality, a world at peace, a world of beauty, unity with nature, protecting the environment)</td>
</tr>
<tr>
<td>BENEVOLENCE</td>
<td>Preservation and enhancement of the welfare of people with whom one is in frequent personal contact. (helpful, honest, forgiving, loyal, responsible)</td>
</tr>
<tr>
<td>TRADITION</td>
<td>Respect, commitment and acceptance of the customs and ideas that traditional culture or religion provide the self. (humble, accepting my portion in life, devout, respect for tradition, moderate)</td>
</tr>
<tr>
<td>CONFORMITY</td>
<td>Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms. (politeness, obedient, self-discipline, honoring parents and elders)</td>
</tr>
<tr>
<td>SECURITY</td>
<td>Safety, harmony and stability of society, of relationships, and of self. (family security, national security, social order, clean, reciprocation of favors)</td>
</tr>
</tbody>
</table>

While the theory of universals in values proposed by Schwartz has been shown to hold across most cultures, the order of importance of the ten values can differ across cultures. The values have a typical order priority with benevolence, universalism, and self-direction ranking highest. Security, conformity, and achievement typically rank in the middle, while hedonism, stimulation, tradition and power rank lowest. This theory has proven robust to measurement method according to Schwartz et al. (2001), since two different instruments, the Schwartz value survey and Portrait Values Questionnaire (PVQ), have been used to validate the theory.
This study will address the narrow focus of current OSS values research by comparing the beliefs and values measured by Stewart and Gosain (2006) with the values measured by the PVQ. This comparison yields the following propositions, mapping prior OSS values, beliefs and norms into the theoretical framework. The proposed mapping is pictured in Figure 1.

P1: The OSS values of sharing and helping will fit within the benevolence and universalism TUV value constructs.

P2: The OSS values of highly valued technical knowledge, learning, cooperation and reputation will fit respectively within the achievement, self-direction, tradition/conformity, and power TUV value constructs.

P3: The OSS beliefs of code quality, software/information freedom, bug fixing, practicality and status attainment will fit respectively within the achievement, universalism, achievement, self-direction, and power TUV constructs.

P4: The OSS norms of cooperation, forking, and named credit will fit within the conformity/tradition TUV construct.

Figure 1. Proposed Mapping of OSS Values, Beliefs and Norms into TUV
Proposed methodology

Data for this research will be gathered via a survey of open source project community members. The initial dataset will draw from a pool of developers and users who are members in Midwestern OSS organizations. The second dataset will be gathered from members of projects hosted on Sourceforge, a website which hosts the web pages and development tools for 140,000 OSS projects. OSS projects will be utilized for this study, as existing literature claims that participants are motivated by beliefs and values in their actions relating to software development, while very little literature makes this claim for traditional proprietary software developers. Additionally, OSS projects are by their very nature open to easy access, and maintain large quantities of archival data, easing data collection. Each step of the study is outlined below.

The first round of surveys will target Linux user groups. Linux user groups are composed of enthusiasts who utilize the open source computer operating system Linux. Some of these enthusiasts are also participants in OSS projects, thus, these groups make an ideal initial population for testing the instrument and validating the mapping undertaken in comparing the OSS values, beliefs and norms with the values defined in the TUV. The data will be analyzed using the nonparametric smallest space analysis (SSA) method. SSA allows for values that are similar to be grouped by using qualitative rating of a value’s similarity to other values and quantitative correlations (Schwartz 1992). Therefore, the OSS values, beliefs and norms will be tested using the propositioned location of a value, belief or norm with the correlation data with the TUV values. This approach has been successfully used in defining the structure of the TUV and subsequent studies (such as, Schwartz et al. 2001 or Knafo and Sagiv 2004).

For the second phase of this research a stratified sample of projects from Sourceforge will be selected. A stratified sample was chosen to minimize the number of inactive projects that may be selected and to ensure the best possible response rate. A list of validated survey items will be compiled to evaluate the perceived influence on project development from previous research.

A preliminary pilot test will be conducted to ensure the validity of the instruments used in this setting and to test the web-based survey application. The actual survey will be completed once all pilot testing is complete. The survey data will be collected over a two week period and a Partial Least Squares (PLS) model will be used to test the appropriateness of our model by comparison of personal values as measured using the PVQ versus the current instruments from Stewart and Gossain (2006) and their perceived influence on OSS project development. PLS was chosen because it allows for a smaller sample size and fewer survey items to accurately measure a given construct (Chin and Frye, 1996; Chin 1998). By including both alternatives for measuring developer values presented in the literature review, we will be able to compare which instruments or combination of items best support the model of decision-making behavior.

Possible limitations, contributions, and future plans

Limitations may arise from limiting the scope of subjects studied to OSS developers. It is the hope of the researchers that this first step will provide convincing evidence of a theoretical base for additional values research in other areas. An additional concern is that the TUV may not adequately explain OSS values which influence project development decision-making behavior. Therefore, the goal of conducting this research is to address the absence of this validated stream of social psychology research that has largely been ignored by the IS research community and determine whether it is a useful inclusion in future studies. Hence, this particular limitation of the study also forms a potential benefit by preliminarily testing the accepted social psychology method of measurement on a focused group of IS developers and users.

By conducting this research an opportunity is provided to create a uniform starting point for the study of values in IS research. Future research opportunities include longitudinal effects of values on the decision-making process in the design and development of systems, the effect of values on privacy and trust in IS use, and further exploration of the effect of organizational and individual value congruency.

Conclusion

A preliminary theoretical framework is presented to examine the effectiveness of a theory which broadly defines personal values which may impact OSS development. The TUV allows for the study of the transsituational nature of values rather than narrowly defining values specific to a context. In doing so, the opportunity exists to study the impact of values across multiple streams of IS research and examine each using a common definition and measurement instrument. A research plan is presented to first compare currently studied values in OSS research with the values defined by the TUV and secondly test the explanatory model of values impact on the development decision-making process for OSS systems.
References


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