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Adoption of Open Source Software: The role of social identification

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ABSTRACT

While the benefits of incorporating Open Source Software (OSS) into personal and organizational systems have been widely touted, OSS must be adopted and used by end users before these benefits can be realized. Drawing on research in information systems and sociology, this study develops and evaluates an integrated model for the acceptance of OSS. In addition to the traditional technology adoption variables the findings stress the importance of social identification as a key driver of OSS adoption. The proposed model provides a useful decision support tool for assessing and proactively designing interventions targeted at successful OSS adoption and diffusion.

1. Introduction

According to a recent study by the International Data Corporation (IDC), the market for Open Source Software (OSS) will grow at an annual rate of 22.4% to reach $8.1 billion by 2013 [37]. This finding supports Gartner's projections that by 2012, at least 80% of all commercial software solutions will include substantive open source components [25]. Despite the promising picture painted by these forecasts and the potential technological superiority of OSS applications i.e., high quality, security, reliability, flexibility, low acquisition cost, and no vendor lock-ins [21,24], low acceptance rates continue to hinder their dominance in the marketplace [27,28]. Although the benefits of successful OSS incorporation can be enticing, they cannot be realized unless it is accepted and used by the intended mainstream software users. Further, OSS also has disadvantages including limited documentation and training support, overwhelmingly frequent releases of patches and software version upgrades, and constraints imposed by the various OSS license terms [26,28,49,50]. Thus, understanding and creating the conditions under which OSS applications will be used remains a real challenge and a high-priority for researchers and practitioners alike [27,28]. To this end, the current research aims to identify factors that facilitate the voluntary acceptance of OSS applications by mainstream users.

OSS applications certainly share many characteristics with other types of software, thus, factors identified as important in technology adoption and diffusion may play an equally important role in the adoption and use of OSS. Nevertheless, OSS applications also have certain key unique features. For instance, they are more than just computer programs; they are community-based innovations [23,59]. Hence, an important question is whether individuals would think and act differently in their decisions to adopt OSS. Since its inception the OSS culture has been shaped by a strong sense of community [43]. However, research investigating the link between the OSS community and individuals' adoption behavior is scarce. Under the theory of social identity [52,53], OSS can confer its users with a distinct collective identity which in turn creates a sense of identification with the OSS community. Empirical work from sociology and marketing demonstrates that social identification positively impacts member behavior, including product evaluation, adoption, purchasing, word-of-mouth marketing, and member participation and engagement [4,20]. Thus, we can develop a parallel argument that strong identification with the OSS community may contribute favorably to individuals' decision to adopt OSS applications.

Given this, OSS adoption should be viewed as an instance of software acceptance within a setting that combines technology adoption with a social identity element. It therefore requires distinct theorizing that integrates literature from the fields of information systems (IS) and sociology. Consequently, this study draws from established bases of research in IS and sociology to develop an integrated model for the acceptance of OSS in a voluntary adoption setting. While IS research offers models of technology adoption, we expect the factors affecting OSS adoption decisions to be somewhat different due, in part, to the unique social identity OSS confers to its users. Issues of social identification and behavior are addressed in the sociology literature. Specifically, we examine how individuals' identification with the OSS community could influence their beliefs related to OSS applications (usefulness and ease of use), and how identification and beliefs could together contribute to OSS adoption in a voluntary adoption setting.

This study has direct implications for research. Recently, firms have become increasingly interested in making significant investments

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in building and facilitating communities for innovation and new product development [23]. This continuing phenomenon of community based innovation underscores the importance of adapting the technology acceptance theories to this trend and understanding how to use individuals' relationships with the community as a lever for increasing adoption and usage. This research explores how individuals' social identification with the OSS community contributes to their adoption intention, representing one of the few efforts toward understanding technology acceptance and usage behavior in the context of community-based innovations. From a practical perspective, factors similar to those important in the adoption of OSS applications may be influential in the adoption and usage of other types of community-based innovations. Thus, understanding the adoption patterns of OSS could provide profound implications for organizations' community-based innovation initiatives.

This research should also be of practical importance to firms trying to push for cost saving through OSS adoption. The proposed model provides a useful decision support tool for firms needing to assess the likelihood of success for new OSS implementations. It also helps them to understand the drivers of voluntary OSS acceptance in order to proactively design interventions targeted at user groups that may be less inclined to adopt and use OSS. The OSS community and firms that seek to establish lucrative services using OSS could also benefit from the findings of this research and increase the market share of OSS applications in the software industry.

The paper begins with a brief review of the communal nature of OSS and the work on OSS acceptance. Next, we draw on the technology acceptance literature and the theory of social identity to develop an integrative model of OSS adoption. We then empirically evaluate the model using survey data. We conclude with a discussion of the results and their research and practical implications.

2. Literature review

2.1. Why is OSS a community driven innovation?

OSS refers to any computer software whose source code is made publically available under OSS licensing formats. The idea of open source software development can be traced back to 1960s when scientists and researchers (also known as hackers) relied on free and openly shared software code for their work due to the unavailability of commercial software solutions [29,61]. In the 1980s when software vendors began to control source code, some hackers became offended by the loss of access to the source code, particularly to the code that they had been involved in developing. They were also distressed by a general trend towards the development of proprietary software released under licenses that prevented free access to the source code. To fight against closed source/proprietary software, a practice they deemed *immoral*, the Free Software Foundation (FSF) was created and various *copyleft* licensing was developed to preserve free access for all to the software developed by hackers [61]. The goal of these initiatives was to promote ideologies such as 1) information should be free and 2) making the source code of computer programs freely available is more valuable to users and the society because it enables them to adapt, learn from, or base new work on the source code. Despite its appeal, the free software idea remained non-mainstream and the software industry was especially weary of it. To enhance its acceptance, prominent hackers such as Bruce Perens and Eric Raymond founded the OSS movement in the 1990s, which incorporates similar licensing practices as those pioneered by the FSF, but de-emphasizes ideological concepts with regard to morality [61]. Today, the OSS phenomenon has evolved into a significant force in the software landscape.

In addition to the free access to source code, another unique feature of OSS is its communal nature. Since its inception, the hacker culture, which later evolved into the OSS movement, has differed substantially from the proprietary software culture. Specifically, in extremely distributed environments enabled by the internet, individuals from geographically dispersed locations form various OSS user groups. Through these groups individuals collaborate and interact online (occasionally face-to-face), and a wide variety of OSS products and user support are developed and offered [29]. Further, OSS development is marked by shared ideologies and values. In addition to the ones mentioned above, other well-developed and repeatedly cited OSS ideologies and values include: 1) sharing, cooperating, and helping should be valued and 2) OSS development model should produce higher quality software than the closed source software development model [7,29]. Third, a strong sense of duty and obligation permeates many OSS development and user groups. This is exemplified by the reciprocal behavior widely observed in OSS groups and the member-funded promotion for various OSS projects [7]. These characteristics–the establishment of social relationship through interaction and cooperation, innovation by and for the users, shared ideologies and values, and the strong sense of duty and obligation–epitomize the fundamental aspects of a community and distinctively mark OSS as a community-based innovation [11].

2.2. Previous work on OSS adoption

While opinion leaders, professionals, and agencies alike opine that OSS is ready for mainstream adoption [21,25,37], the dilemma of its low acceptance rate and underutilization persists [27,28]. In general, the issue associated with OSS adoption has received little attention in the academic literature [19]. The few exceptions focus on OSS adoption at the organizational level and minimal work exists at the individual level [19,28]. However, OSS applications that are intended to be incorporated into organizational work processes are of little value and can eventually be discontinued unless the intended users accept and use them. Hence, it is imperative to go beyond examining the acceptance of OSS at the organizational level and understand OSS adoption from the individuals' perspective.

To our best knowledge, there exists only one other study which seeks to understand OSS adoption at the individual level. Using Davis' technology acceptance model (TAM) as a theoretical backdrop, Gallegoa et al., [24] propose and empirically examine a model of user acceptance towards OSS applications. Based on a survey of 347 Linux operation systems users, their findings suggest that perceived usefulness and perceived ease of use exert a strong positive impact on intention to use Linux, which subsequently predicts usage behavior. Perceived ease of use is also found to positively impact perceived usefulness. User perceptions of the technological characteristics (flexibility, quality, capability) are found to positively impact perceived usefulness and perceived ease of use while no significant relationship is found between social influence and users' beliefs on ease of use and usefulness.

While the study by Gallegoa et al. [24] has made important and unique contributions, the understanding of user acceptance of OSS can be deepened through the identification of other significant determinants that are unique to OSS adoption and use. Although the strength of TAM lies in its parsimony, it may lack adequate specificity to explain and enunciate OSS adoption given that OSS has some notable differences compared to traditional proprietary software. For instance, OSS adoption is often a voluntary decision and is hence less likely to be influenced by subjective norm pressure [7]. This may explain why Gallegoa et al. [24] did not find any relationship between social influence, measured as subjective norm pressure, and users' beliefs on ease of use and usefulness. On the other hand, the strong community-oriented OSS culture highlighted in the previous section implies that the effect of social influence on OSS adoption is more likely to manifest in the form of social identification with the OSS community. In the marketing and sociology literature, social identification with a brand community or a social movement has been