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Idealism vs. Pragmatism: Investigating the Organizational Adoption of Open Source Software

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ABSTRACT

The underlying principles of the free software movement have always been idealistic or even political. The open source movement on the other hand, is more pragmatic in their attempts to promote open source software (OSS). Employees belonging to these movements often advocate the use of OSS in their organization. Hence, decision making in organizations on the adoption of OSS may exhibit certain idealistic characteristics. A recent study has shown that American organizations are quite pragmatic about the adoption decision on OSS. We investigate whether similar results will be obtained in circumstances in which there is more opportunity for idealistic behavior. Therefore, we have conducted ten case studies in Belgian organizations on the organizational adoption of OSS. Our results are largely consistent with previous studies, although some differences were discovered. Idealistic behavior with respect to the adoption of OSS only seems to manifest itself in very small organizations.

Keywords

Open source software, organizational adoption, innovation, Linux.

INTRODUCTION

The free software movement has always taken an idealistic, political view on software. The open source movement on the other hand, was created in order to facilitate the introduction of free software in organizations and takes a more pragmatic stance. Members of the free and open source movements tend to advocate the wider use of OSS¹, including within the organization in which they are employed (Dedrick and West, 2003; West and Dedrick, 2005). These employees will take on the role of *boundary spanners* in their organization, bringing the organization in contact with new innovations (Tushman and Scanlan, 1981). The organizational adoption decision on OSS could exhibit certain idealistic characteristics, since personal views and opinions of these boundary spanners may influence the organization's decision. West and Dedrick (2005) have found in their study on American organizations that although such boundary spanners try to ensure that an open source alternative is considered in the decision making, the final decision is made on pragmatic grounds (e.g. cost, reliability and functionality). The organizations included in their study are rather large², which may have had an impact on their results. Such large organizations tend to have many formalized procedures, limiting the opportunity for idealistic behavior.

We argue that it is useful to perform a similar study in a context in which there is more opportunity for idealistic behavior. We expect that this might be the case in smaller organizations. Some authors have argued that decision making with respect to IT in small businesses is often the responsibility of a single individual (Harrison, Mykytyn and Riemenschneider, 1997; Riemenschneider, Harrison and Mykytyn, 2003). Hence, the possibility cannot be excluded that the adoption decision on OSS in smaller organizations is more idealistic — rather than pragmatic — since personal traits and beliefs of the decision maker are more likely to impact the final decision than in larger organizations. In order to investigate whether decision making in smaller organizations is more idealistic, we have conducted ten case studies in Belgian

¹ We will use the term OSS to refer to both free and open source software, since in practice they mostly refer to the same software.

² These organizations had on average 41,885 employees (25,529 when only counting the unit studied in the organization).

organizations to investigate the organizational adoption of OSS³. Our study aims to identify the reasons why organizations adopt OSS. These factors will provide more insight into whether the decision making is pragmatic or idealistic. A similar approach was used by West and Dedrick (2005).

The paper is structured as follows. We will start by discussing the design of our current research. Next, we will discuss the factors that were found to be most important in the organizational decision on whether to adopt OSS. We will also compare our results to previous studies. Subsequently, we will discuss whether small organizations also tend to be pragmatic in their decision making (similar to the view of the open source movement), or whether they tend to follow a more ideological path (similar to the views of the free software movement). Finally, our conclusions are offered.

RESEARCH DESIGN

Scope

We decided to focus exclusively on the adoption of open source *server* software. We use the term open source server software to refer to both open source operating systems (such as Linux and FreeBSD), as other OSS for server use (for example the Apache web server or the Bind name server). This choice is motivated by the fact that Linux is generally considered a stable, mature product that is already in use by a significant number of organizations. Furthermore, many important open source Internet server applications such as Bind, Apache and Sendmail are also considered to be mature and have a dominant market share. Consequently, we expect that the reasons to adopt Linux are similar to the reasons to adopt other open source server software. This hypothesis is supported by the FLOSS study that showed that organizations perceived the benefits of open source operating systems, databases and website applications as rather equivalent (Wichmann, 2002). A similar research approach has been undertaken by other researchers (see e.g. West and Dedrick, 2005).

Methodology

We used the exploratory case study approach to study the organizational adoption decision on open source server software. The case study approach is well-suited to study a contemporary phenomenon in its natural setting, especially when the boundaries of the phenomenon are not clearly defined at the start of the study (Benbasat, Goldstein and Mead, 1987; Yin, 2003). We conducted a series of in-depth face-to-face interviews with respondents from ten Belgian organizations to identify the factors that influence the decision to use open source server software. Organizations were drawn from the population of all Belgian organizations and were sampled on the basis of two criteria: the size of the organization measured by the number of employees and the sector in which the organization operated. Respondents within each organization were selected using the *key informant method*. Since the use of a single respondent has been shown to give inconsistent results (Phillips, 1981), we tried to speak to both a senior manager (e.g. the IT manager) and a technical person (e.g. the system administrator) whenever possible.

| Name | Sector | Employees | Informants | Extent of adoption |
|---------------|-------------------------------------|-----------|------------|--------------------|
| OrganizationA | Audio, video and telecommunications | 11 | 2 | moderate |
| OrganizationB | Machinery and equipment | 749 | 2 | extensive |
| OrganizationC | Telecommunications | 1346 | 1 | limited |
| OrganizationD | Publishing and printing | 31 | 1 | extensive |
| OrganizationE | Food products and beverages | 204 | 2 | moderate |
| OrganizationF | Research and development | 152 | 2 | extensive |
| OrganizationG | Information technology | 583 | 1 | moderate |
| OrganizationH | Chemicals | 4423 | 1 | moderate |
| OrganizationI | Education | 3303 | 3 | limited |
| OrganizationJ | Publishing and printing | 12 | 1 | extensive |

Table 1: Overview of the organizations in our study

³ The organizations in our case studies have on average 1,081 employees.

The interviews took place between July and November 2005. An overview of the cases in our study is shown in Table 1. The interviews were semi-structured, and the format was revised after each interview to incorporate new findings (Benbasat et al., 1987). In a first part of the interview, respondents were asked to freely discuss their reasons for adopting OSS. In a second part of the interview, we probed for specific factors that were found relevant in previous studies, as well as the respondents' perception of the free and open source movements. Each interview lasted 45–90 minutes, was recorded and was transcribed verbatim. In order to increase the validity of our findings, respondents were sent a summary of the interview and were requested to suggest any improvements if necessary. Follow-up questions were asked by telephone or via e-mail. The transcripts were coded by using techniques from grounded theory (Strauss and Corbin, 1990), and were then further analyzed using procedures to generate theory from qualitative data, as described in the literature (see e.g. Benbasat et al., 1987; Dubé and Paré, 2003; Eisenhardt, 1989). Various data displays were used to visualize and further analyze the qualitative data (Eisenhardt, 1989; Miles and Huberman, 1994).

RESULTS

In this section, we will discuss the factors that were found relevant to the adoption decision on OSS by the organizations in our sample. We will also compare our results to previous studies. Due to space limitations, we will restrict our discussion to the factors that were found to be the most important. Table 2 at the end of this section, provides an overview of these factors, as well as a list of references to other studies in which these factors were encountered.

Lower Cost

All organizations in our sample mentioned that the lower or non-existing license cost of OSS is one of the main drivers for the adoption of Linux and other OSS. Most organizations however, tried to minimize the importance of cost and emphasized the relationship with other advantages of OSS (such as reliability) to support the decision. Hence, the lower cost is often not the only factor in the decision, but interacts with other characteristics of OSS. Nevertheless, in eight organizations, OSS was introduced in order to realize cost savings. Only OrganizationG conducted a formal Total Cost of Ownership (TCO) calculation. These results are consistent with previous studies that have shown that lower cost is the main reason for adopting OSS (see e.g. Dedrick and West, 2003; Fitzgerald and Kenny, 2003; Larsen, Mogens and Pedersen, 2004; West and Dedrick, 2005).

The use of the Linux operating system is also a way for some organizations to lower their hardware costs. All five organizations that previously used Unix, mentioned the fact that using Linux could result in a significant reduction in hardware costs. This can be explained by the fact that Linux can operate on Intel hardware, while Unix hardware from Sun or HP is much more expensive. Moreover, the reliability of Intel hardware is considered to be comparable to that of Unix hardware. The reduction in hardware cost was also found relevant to the adoption of Linux in previous studies (see e.g. Dedrick and West, 2003; West and Dedrick, 2005).

Employee Skills

The migration from a proprietary platform to an open source platform may require retraining of personnel. All organizations except OrganizationD mentioned that the experience of current employees is important when migrating to an open source platform. A possible migration from Unix to Linux is perceived to be much easier than the switch from Windows to Linux. This can be explained by the fact that Linux is essentially a Unix clone and many administration tools are shared between both platforms. Formulated in terms of innovation literature, the transfer from Unix to Linux would be classified as *incremental*, requiring little learning efforts. The transition from Microsoft Windows to Linux is however *discontinuous*, introducing new ideas and technologies for the adopter (Tushman and Nadler, 1986). Hence, the current installed base will have a substantial impact on the ability of an organization to switch to Linux. Previous studies in this field have also demonstrated that the transition from Unix to Linux is much easier than a transition from Microsoft Windows to Linux (see e.g. Dedrick and West, 2003; Ghosh and Glott, 2005; Goode, 2005).

Reliability

We have encountered a considerable range of opinions with respect to the reliability of Linux. Some individuals within organizations still perceive Linux as being inferior to the Unix operating system. Our respondents in OrganizationG and OrganizationH however mentioned that in their experience, this attitude tends to be based on historical perceptions. Several organizations have argued that recent evolutions such as the commitment of large vendors to the development of Linux has increased the trust in Linux considerably. Nine organizations indicated that Linux is a mature product and is very reliable. For seven organizations, the combination of low cost and high reliability was an important reason for the adoption of OSS.

OrganizationC, OrganizationG and OrganizationI also indicated that — in general — there is no difference in the reliability of Linux compared to Windows and Unix. Furthermore, OrganizationB clearly indicated that they consider only those OSS projects that have already proven their reliability. These findings are consistent with previous studies (see e.g. Dedrick and West, 2003, 2004; West and Dedrick, 2005; Wichmann, 2002).

Access to Source Code

Having access to the source code of OSS and therefore being able to modify or customize the software is one of the main advantages claimed by open source advocates. However, given the technical nature of applications such as Linux and Apache, it is doubtful whether many users will actually examine and/or modify the source code. The term *Berkeley Conundrum* has been introduced to question the value of the availability of the source code when users do not download, examine and/or modify the source code (Feller and Fitzgerald, 2002). Five out of ten organizations indicated that they have never used or modified the source code. Moreover, they indicated that the availability of the source code was not a factor during their adoption decision. The other organizations tended to primarily value the availability of the source code because it provides them with more insight into the inner workings of the open source components. Two organizations applied some organization-specific customizations to open source components they used, such as webmail and print services. Mature open source packages such as Linux and Apache were however not modified. This is consistent with the results of previous studies (Fitzgerald and Kenny, 2003; Larsen et al., 2004; West and Dedrick, 2005).

| Factor | References | Confirmed? |
|-------------------------------|---|------------|
| Lower cost | Dedrick and West (2003, 2004); Fitzgerald and Kenny (2003); Larsen et al. (2004); West and Dedrick (2001, 2005); Wichmann (2002) | Yes |
| Employee skills | Dedrick and West (2003, 2004); Fitzgerald and Kenny (2003); Ghosh and Glott (2005); Goode (2005); West and Dedrick (2001) | Yes |
| Reliability | Dedrick and West (2003, 2004); West and Dedrick (2001, 2005); Wichmann (2002) | Yes |
| Trialability | Dedrick and West (2003, 2004) | Partially |
| Access to source code | Dedrick and West (2003); Fitzgerald and Kenny (2003); Larsen et al. (2004); West and Dedrick (2005) | Yes |
| External support availability | Dedrick and West (2003, 2004); Fitzgerald and Kenny (2003); Ghosh and Glott (2005); Goode (2005); Larsen et al. (2004); West and Dedrick (2005) | Yes |
| Avoiding vendor lock-in | Goode (2005); Larsen et al. (2004); West and Dedrick (2001, 2005); Wichmann (2002) | No |
| Open standards attitudes | Kwan and West (2005); Larsen et al. (2004); Simon (2005); West (2003) | No |
| Compatibility | Dedrick and West (2003, 2004); Larsen et al. (2004) | Yes |
| Boundary spanners | Dedrick and West (2003, 2004); West and Dedrick (2005) | Yes |
| Strategic importance | Dedrick and West (2003, 2004); Kwan and West (2005) | Partially |

Table 2: Summary of OSS adoption factors

External Support Availability

The availability of external support for technology has always been an important factor in adoption decisions (Rogers, 2003). Our case studies confirm the importance of the availability of external support for the adoption of OSS. Some organizations opted for an enterprise version of Linux, which includes a number of support services. OrganizationB, OrganizationE and OrganizationI made a conscious choice for using such an enterprise version. In some cases (for OrganizationA, OrganizationF and OrganizationH), the use of a commercial Linux distribution was required by another vendor. SAP for example, only supports their products on Red Hat Enterprise Linux, SuSe Linux Enterprise Server or Red Flag Advanced Server. Hence, an organization planning to install SAP on the Linux platform is forced to buy one of these Linux distributions. Most organizations using such an enterprise version mentioned that they made little use of the support contract,

but considered it more a kind of insurance. Other organizations (OrganizationD and OrganizationJ) relied on the services of an external consultant for the installation and maintenance of their open source systems. The main reason for outsourcing these tasks is that a single person in this organization is responsible for the IT infrastructure. OrganizationE sometimes relies on an external consultant for resolving technical issues, if the required knowledge is not available in-house. The availability of external support was also found to be important in previous studies (see e.g. Dedrick and West, 2003; Ghosh and Glott, 2005; Goode, 2005; Larsen et al., 2004).

Avoiding Vendor Lock-in

Vendor lock-in was perceived to be an important concern by all organizations in our study. OSS can be seen as an extension of the *open systems* movement, whose main aim was to ensure interoperability between Unix systems and hence to reduce vendor lock-in. Hence, it can be expected that using OSS may reduce vendor lock-in for customers. OrganizationA, OrganizationB, OrganizationD and OrganizationJ did indicate that OSS was an important way to reduce vendor lock-in. On the other hand, the other organizations in our sample did consider OSS less important for reducing vendor lock-in. Some organizations argued that they were large enough to negotiate with the vendor or that it depends on the situation whether vendor lock-in should be avoided. For example, OrganizationH did not find the combination of hardware and the operating system to be problematic. OrganizationF also mentioned that the use of proprietary standards resulting in lock-in can sometimes deliver more value to users. Hence, we have found mixed support for the claim that organizations choose OSS to reduce vendor lock-in (see e.g. Larsen et al., 2004; West and Dedrick, 2005; Wichmann, 2002).

DISCUSSION

As can be inferred from our discussion in the previous section, most organizations make a pragmatic choice on the adoption of OSS, based on characteristics of the innovation itself. Furthermore, some organizations explicitly mentioned that they made a pragmatic adoption decision, carefully outweighing the potential benefits of adopting both commercial and OSS alternatives, after which the best solution based upon price and other product features was chosen. Even technical employees with a background in OSS indicated that although they will suggest the use of an open source alternative when appropriate, they did not try to force the use of OSS. Nevertheless, in several organizations, many OSS development tools such as Eclipse, Hibernate and Maven were used. So far, our results are quite consistent with those of West and Dedrick (2005).

On the other hand, we were able to detect rather idealistic behavior in three very small organizations (OrganizationA, OrganizationD and OrganizationJ), consisting of fewer than 50 employees. We consider an organization to be idealistic in their decision making when the decision is significantly influenced by the decision makers' personal beliefs in the underlying principles of the free software movement or open source movement. For example, proponents may argue that software should be free, similar to the views of the FSF. Similarly, proponents may express a strong preference for using OSS, or may even only consider OSS, irrespective of the specific environment in which the adoption will take place. In those cases, no thorough comparison of commercial and OSS alternatives is made. This may result in a less than optimal solution for the organization. The degree of idealism varied however between the three organizations. An overview of idealistic characteristics that were discovered in these three organizations is shown in Table 3.

A respondent in OrganizationA indicated that at the time of the organization's foundation, there were many employees (including the organization's founders) that had a "*firm conviction*" in OSS. These employees pushed the use of OSS in the organization, without properly considering commercial alternatives. During the next few years, several people holding that "*firm conviction*" left the company. As a result, the choice for OSS has now become more pragmatic.

There are certain indications of rather idealistic behavior in OrganizationD as well. The respondent in OrganizationD did possess several years of experience with Linux outside the work environment. He was also the only respondent in our sample who preferred using the term *free software*⁴. In his experience, the term OSS is sometimes misused by some vendors to refer to software of which the source code is available, but whose license is still proprietary. He was also a very strong proponent of open standards, due to problems with commercial software in the past. He also indicated to seek to maximize the degree of freedom when choosing software.

The most prominent form of idealistic behavior was found in OrganizationJ. Our respondent was the IT and business manager of the organization. This respondent also had an extensive experience with Linux and has initiated an OSS project. Recently, the complete IT infrastructure (servers and desktops) of the organization was migrated to Linux. This switch was

⁴ Actually, the Dutch equivalent was used, namely "vrije software", which is similar in meaning as the French term *libre software*.

undertaken in order to realize cost savings. On the other hand, the availability of the source code was valued because it provides more trust in the software. As a result, all software that was used on the Linux operating system had to be OSS. For example, a commercial printer driver was not used on the Linux desktops, because the source code of that driver is proprietary. Similarly, during the consideration of an Enterprise Resource Planning system, Compiere was not retained, because it requires the Oracle database server.

OrganizationA:

- Employees, including the organization's founders, shared the philosophical and cultural views of the OSS movement
- A strong anti-Microsoft sentiment was present
- Vendor lock-in (especially with Microsoft) was feared
- The organisation started their own OSS project (Java virtual machine) to benefit from the community-based OSS development model
- All software that was used, had to be OSS
- Adoption decision was based on their "firm conviction" in OSS, not on an objective evaluation of alternatives

OrganizationD:

- Strives to maximize the freedom in the IT infrastructure by using open standards and OSS
- Extensive personal experience with Linux influenced the organizational adoption decision
- The organisation started their own OSS project (time registration system) to ensure that the software would remain totally free
- Driven to OSS by negative experiences (including vendor lock-in) with commercial software in the past
- Uses the term free software

OrganizationJ:

- IT manager does not want to pay for software, including application software
- The switch to Linux was influenced by personal experience with Linux
- All software that is used must be OSS
- Proprietary printer drivers are not used, even if this means that a work-around must be found
- Commercial software is not trusted because the source code is missing
- Driven to OSS by negative experiences (including vendor lock-in) with commercial software in the past
- The OSS development model is valued, because thousands of developers are reading the source code (hence avoiding the risk of hidden features), correcting bugs and ensuring the continuity of the project
- The complete IT infrastructure was migrated to OSS, except for an ERP system that will however be replaced by an application that is being developed by the IT manager
- The IT manager started his own OSS project (a Perl utility for OpenOffice.org)

Table 3: Idealistic characteristics in the decision making of organizations in our sample

We were able to find a number of idealistic characteristics with respect to the adoption decision in these three case studies. This idealistic behavior was quite strong in OrganizationJ and OrganizationA (at the time of the organization's foundation). In these organizations, the decision makers expressed a strong preference for using OSS, and did not adopt OSS based on the potential benefits of the software, but merely on the fact that the software was open source. Moreover, in some cases alternative solutions were excluded because the software was proprietary. Interesting to note is that all three organizations had started their own OSS project. Evidence from OrganizationA and OrganizationD suggests that these organizations believe in the OSS development model, either to leverage the community-model or to ensure that their software will remain free.

Similarly, all three organizations had a strong desire to avoid vendor lock-in. OrganizationD and OrganizationJ considered OSS to be a way of maximizing the degree of freedom of their IT infrastructure.

Based upon these case studies, we expect that idealistic behavior with respect to the adoption of OSS will only manifest itself in very small organizations. In the small organizations in our sample, a single person — who could be considered an open source advocate — was responsible for the IT infrastructure. In such cases, it is possible that personal beliefs and values of the decision maker have more impact on the final decision making. Hence, the adoption decision with respect to OSS will be more idealistic. In larger organizations, decision making will be more pragmatic, since there are more decision makers and more procedures involved in the open source adoption decision.

CONCLUSION

In this paper, we have investigated the reasons why Belgian organizations adopt OSS. The main contribution of our paper is that we have determined whether smaller organizations are more idealistic with respect to their decision on adopting OSS. Our results indicate that the majority of organizations in our study is pragmatic in their decision making. More idealistic behavior was only observed in very small organizations (with less than 50 employees), where the decision maker had sole authority over the adoption decision, or where a large number of open source advocates were present. In those situations, decision makers might be more likely to let personal views and opinions influence their decision making.

Additionally, our study provides more insight into the factors influencing the adoption of open source server software. By comparing our results to previous studies, we were able to validate a number of their findings. On the other hand, some of the factors that were found to be relevant in previous studies, such as the support of open standards and the avoidance of vendor lock-in, were perceived less important advantages of OSS by the respondents in our study.

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