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STRATEGIC DRIVERS OF OPEN SOURCE SOFTWARE ADOPTION IN THE PUBLIC SECTOR: CHALLENGES AND OPPORTUNITIES

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Abstract

This paper draws upon the results of a qualitative study on the procurement and adoption of open source software by public sector organizations spanning Europe, Brazil and the USA. The premise of this work was to understand the role 'cost' or total cost of ownership of software plays in government procurement decisions. We found, however, that this was more a rhetoric to gain acceptance for open source and to achieve a level playing field. Interviews with key stakeholders from government agencies and system integrators led us to understand and organize our findings on open source adoption under four broad categories; economic concerns, technical and development features, risk management, and innovation and strategic issues. We conclude with a number of insights to help other public sector organizations make better procurement decisions for information technology.

Keywords: public sector, procurement, open source, total cost of ownership, innovation, and risk management

1 Introduction

Procurement and acquisition decisions by many governments for software and systems are currently under question (Phipps, 2011), and this has led governments in Europe, Australia (Archer, 2010) and the USA (Kundra et al., 2011) to reconsider the role for open software in their procurement practices. Indeed, along with open data and open standards, open source software is fast becoming part of the information systems language that governments speak all over the world (Burkhardt, 2008). It is, for example, one of the basic building blocks of the US government in relation to its encouragement of its open government initiative (Noveck, 2011). The European Commission also now has an explicit directive to promote software alternatives (Ghosh et al., 2010) including open source software. Meanwhile, in 2010 the UK Government Cabinet Office met with large and influential system integrators (SIs) to impress upon them the need to have more procurement options, of which open source needed to be one (Ballard, 2011, Saran, 2010, Hall, 2011)¹. The specific argument put forward on that occasion was that government was unable to potentially choose open source software as an alternative if it was not offered as an option by SIs.

In this paper we explore how the incentive of reduction in costs, and other perceived and expected benefits is used by governments to overhaul public sector procurement and acquisition and to ‘level the playing field’. We interviewed key personnel and stakeholders in the public sector and suppliers in eight different countries. The aim of the study was to make sense of moves for the adoption of open source software in the public sector. We spoke to IT strategy stakeholders in the UK, France, Spain, Germany, Belgium, Brazil, USA, and Italy. Each of the interviewees was involved in creating, sustaining and promoting one or more open source projects in the public sector.

The data and analytical themes that emerged went beyond any narrow idea of total-cost-of-ownership and focused on the larger benefits and challenges involved with open source adoption by the public sector. This reflects a view that as open source software is incorporated into government IT strategy there is still little experience or direction as how to implement such projects ‘successfully’. We found that the discourse about open source revolved around four core areas: economic concerns (costs); technical issues of development; management of risk; and the promise of public sector innovation.

The paper is structured as follows: first a review of literature in this area of public sector adoption of open source, and the problematic issue of evaluating total cost of ownership. This is followed by a brief discussion of methodology, and then the analysis of data. We conclude by laying out a possible agenda for future research.

2 Literature Review

Open source software implies openness of the source code making it possible to adapt and improve the code to meet new needs. In effect open source encompasses certain freedoms (Perens, 1999) that are embedded in the license of the code (Stallman, 1999). Open source software, in the sense of being ‘free’, has become a part of many government responses to economic recession and the costs of IT. However, as for example the UK government is aware, open source software is still a rather unknown phenomenon. The true and complete costs involved in switching to any other software type, be it open source or not, are never easy to evaluate (Russo and Succi, 2009). The close to zero license costs of open source software are enticing, but this does not necessarily translate to lower costs in other aspects of the lifecycle or lower costs overall (Gallopino, 2009).

¹ <http://www.cabinetoffice.gov.uk/resource-library/procurement-policy-note-ppn-use-open-standards-when-specifying-ict-requirements>

There are some exemplary cases of open source adoption by the public sector like the Extremadura case in Spain (Zuliani and Succi, 2004,) but there are far more ‘success’ stories of open source adoption by commercial companies (Dinkelacker et al., 2002, Dahlander, 2007, Fitzgerald, 2006, O’Mahony et al., 2005). The factors that encourage private companies to adopt open source software indicate that the software itself does not lead to value creation or capture directly (West and Gallagher, 2006, West, 2003, Osterwalder et al., 2005, Vargo and Lusch, 2004). Private companies (Agerfalk and Fitzgerald, 2008), certainly seem to adopt open source software for a mix of reasons which include the promise of reduced costs of adoption, but there is often a strategic aspect, as well as a desire to innovate (Sutor, 2009, Shaikh and Cornford, 2011b). The public sector would like to enjoy such benefits, though until very recently the desire to innovate was not foremost for most governmental agencies. Still, early adopters of open source applications in the public sector quote reduced vendor lock-in as one of the key arguments when justifying a switch from proprietary to open source software and hence lower lifetime costs. However, some of these have found that the emerging cost structures of adopting open source software were not directly translatable to their frameworks of evaluating proprietary software.

Thus while costs may or may not be lower overall for open source there is more certainly difference in where the costs emerge and at what stage of adoption. Greater awareness of such issues is reflected in the literature of public sector adoption of open source. Fitzgerald et al. (2011) present one such piece of work that combines an academic and practitioner grasp of this area and discusses a number of public sector adoption cases across mostly Europe with one example from the USA. This book applies a cross case comparison using Gallivan’s (2001) secondary adoption framework and highlights ideas of innovation, deskilling, and organizational change. Other key papers in this area focus on Germany (Cassell, 2010; Cassell, 2008). The findings from these German cases relate to the significance of independence and control rather than cost savings. A similar study in the UK (Waring and Maddocks, 2005) reflects rather different results. Instead of independence and reduced lock-in concerns the focus was on cost cutting. As the analysis of our data (below) shows cost reduction is still a concern and part of the message used by government to change perspectives and create a new discourse for public procurement. However, the UK government’s understanding of open source software’s larger benefits is becoming more nuanced and reflects a mix of strategic concerns and ambitions.

There are a handful of studies of public sector adoption in Latin America (Shaw, 2011; Maldonado, 2010) where the authors give a very detailed account of the political conditions that led to open source adoption, and the key actors involved. Here the focus is often on ideas of (national) freedom, independence and social inclusion where software is linked to a wider metaphor of the state. A similar open agenda is also present in Europe but to a far lesser degree. Cases of open source adoption in the USA have been better documented (Seiferth, 1999; Evans and Reddy, 2002; Oram 2011) but these works tend to be more normative, stressing what they feel is needed rather than describing the situation as it is. These authors too are keen to promote and link ideas of open government, and transparency through the use and adoption of open source software.

2.1 Total Cost of Ownership and Beyond

Despite the various approaches and concerns reflected in the studies summarised above, all share to some degree a common idea – that of cost reduction through the greater use of open source software. Our study commenced with this issue clearly as its focus, however we soon discovered that the issue of total cost of ownership is quite problematic.

We adopt Lerner and Schankerman’s (2010) definition of the total cost of ownership (TCO) as our starting point which encompasses both the costs of acquisition and operational costs. TCO is “a measure of the total cost of owning and operating a piece of software, including both the initial monetary cost of purchasing it and any associated costs of implementing it”. However, this is still not a very complete picture of how useful or effective some software or IT is because though it allows a comparison between various software products and services through like-termed costs it doesn’t

accommodate any sense of the benefits of the compared items. Thus return on investment is often used in conjunction with TCO to provide a benefit versus costs perspective. Thus benefits of open source adoption were a large part of the qualitative phase of our study (see methodology below).

TCO is usually presented as a fundamental issue when making software procurement decisions (Ellram, 1994, Ellram, 1995, Ellram and Siferd, 1993, Hurkens et al., 2006) in organizations. We are concerned more specifically with open source software (OSS) adoption decisions by organizations². This adds yet another layer of complexity because the assessment of open source software for procurement may not be exactly the same as that for proprietary software (MacCormack, 2003). Indeed, by unpacking the idea of open source TCO we become more aware of what is taken for granted in proprietary software procurement decision processes. Thus refined accounts of TCO see it as an understanding of ‘the “true cost” of doing business with a particular supplier for a good or service’ (Ellram, 1993). The idea of a ‘true cost’ and the ability to be able to assess it accurately, however is something most academics and practitioners would agree is not straightforward (Wouters et al., 2005).

3 Methodology

The aim of this study is to make sense of the processes of acquisition and adoption of open source software by public sector organizations. Our study of literature on open source adoption by the public and private sector described above helped guide our understanding and frame our interview guide.

3.1 Data Collection

We conducted 32 in-depth interviews. Key personnel involved in making procurement decisions and creating strategy for open source use in the organization were interviewed (for an hour, or more). We concentrated our interviews in a number of public sector organizations in European countries. The aim was to have a balanced study across the cases and which could allow some cultural and other differences across the study sites. This helped to strengthen our final framework of best practices and guidance for open source adoption for the public sector. The cases were chosen on the basis that open source adoption has been in practice for two years or more. The government bodies and local authorities represented a mix of progressive cases of open source adoption, and some less successful (see Table 1).

Our interview guide consisted of twelve questions beginning with asking for basic information about the length of the open source adoption, and the role of the interviewee in the process, and then progressing to more detailed examination of obstacles, opportunities, and challenges involved. We were also keen to make sense of the role of various people in adoption and what sort of changes open source could be considered to have made in the organization (if any).

Interviewee(s) Affiliation	Country	Mode
Andalucía Government	Spain	Skype/phone
Ars Aperta	France	Skype/phone
Brazilian Government	Brazil	Skype/phone
Bristol City Council	UK	In person
Camden Council	UK	In person
Cenatic	Spain	Skype/phone
Connectathon	UK	Skype/phone
Fedict	Belgium	Skype/phone

² Some of this research was funded by the UK Cabinet Office and the OpenForum Europe.

Freelance	Italy	Skype/phone
Mil-OSS	USA	Skype/phone
Munich	Germany	Skype/phone
Newport News	USA	Skype/phone
OpenEyes (Moorfields hospital)	UK	In person
Opentia	Spain	Skype/phone
Red Hat UK (public procurement)	UK	In person
Red Hat USA (public procurement)	USA	In person
Schoten	Belgium	Skype/phone
Socitm	UK	Skype/phone
Sollihull	UK	Skype/phone
Tfl/Oyster	UK	In person
Value Decision	UK	Skype/phone

Table 1: List of Interviewee Affiliations

3.2 Data Analysis

The interviews were transcribed and then analyzed systematically (using Atlas.ti software) for the main lessons, decisions, challenges, strengths, advice, best practices, consequences and other interesting elements that emerged. We conducted a process of open coding, and axial coding (Strauss and Corbin, 1999). We also made use of the conceptual memo tool in Atlas.ti to connect our ideas, themes and data and this helped our analysis emerge across four key areas.

The open coding stage revealed the main ideas respondents focused on. These included, for example, the lack of maturity level of open source software, license confusion and lack of knowledge about the implications of various open source licenses. Other ideas which arose were more surprising, such as most organizations did not even attempt a TCO study before making procurement decisions because of the expense such studies involve. The models used to assess TCO or similar are also seen as more suited for proprietary software and organisations are not comfortable or skilled to tweak them for open source. And lastly, there is no policy in most organisations for open source adoption and such decisions are made more ad-hoc and based on pragmatic decisions of use and need, rather than cost.

At the axial level of coding we saw some higher level themes around which our open codes coalesced around. We noted that the key challenges, opportunities, coping strategies, confusions, policy issues, and so on made better sense when seen through the main categories of thought of the managers involved. Our findings thus fell largely into four main categories; economic factors, technical issues and development, risk management, and innovation and strategic reasons (see below).

4 Analysis and Discussion

This section presents the developed model of why some governments have been attracted to open source, their adoption processes and practices, and the obstacles they faced internally, politically and technically.

4.1 Economic Factors

The range of ‘success’ with open source adoption by the public sector varies across Europe and within the same countries. The Spanish government is often publicized as a very successful case, and indeed the use, adoption and spread of open source software has been sustained. However, Spain, like Brazil can be seen as a very specific case due to its political structure and their connection to the use of open source. Indeed in Brazil, openness is emphasized by many, if not all political parties, as a value of the state.

Economic discussions start with the proposition that real cost savings are possible with open source because the license fee is zero. However, the true cost of any software spans more than just license fees and includes categories such as changeover, training, maintenance (vendor and non-vendor supported), but there are also aspects that move beyond such quantifiable categories within a life-cycle model. Thus respondents speak of issues of the expertise level of users, linking individual promotion and careers with taking initiative, managing customization and responding to upgrades. A distinctive quality that open source brings to the organization, as reported by our respondents, is that economic risks may be better managed. For example, procurement decisions with open source can be informed by experiments with free downloaded software.

We understand from our interviewees that there is something equally distinctive about migration costs of open source software. To the extent that open source software is based on open standards (usually the case) so any move within and beyond a current open source application will bring lower costs of change. More generally, it is understood as far easier to interface open source software with other software or systems due to its openness of code as well as use of open standards. More generally, many interviewees emphasised that open source can offer real cost savings but often these savings materialize mid to long term and during the period of use rather than in the short-term and as part of the 'set-up'. Thus, they argue, it is important to manage expectations to ensure that an open source project is not considered an economic failure prematurely if it fails to slash development costs.

Our interviewees acknowledge that there are economic factors that are less favourable towards open source. Open source can lead to a larger outlay when implementation is badly planned, and expectations of short-term returns are misconceived. Open source may also demand stronger in-house technical facility, implying higher internal costs for IS staff. A real issue can be acceptance by employees, both technical staff and users, making good training essential and emphasising the need for wider participation and buy-in.

4.2 Technical and Development Issues

Many of our interviewees made clear statements in favour of open source adoption based on a belief in reduce costs. But some went beyond speaking about the technical benefits of open code, for example, that open source is more secure. This is a debate that both academics and practitioners have pursued over the years and it is probably impossible to back a claim that all open source software is more or less secure than proprietary. There are so many other factors like context of use, application type or infrastructure software, and organizational culture that need consideration before making any statement, and that too for a specific case only. Our study, nevertheless indicated the power of the proof of faith implied when government bodies encourage the use of open source software in development of various types of e-ID systems for citizens. This type of commitment is seen to have a wider impact in changing minds.

One of the key attractions of open source reported is its basis in open standards, combined with open code and (at least potentially) multi-channel support services. Taken together this is understood to reduce lock-in, allowing for greater innovation (e.g. reducing risk), making for a more agile development process, and providing a safeguard for the sustainability of systems. Open source also is seen as a way allowing some pooling of technical resources, expertise and talent, and specifically code for reuse and customization. The Brazilian open platform and repository shows how open source software can support innovation, reduce costs, and bring the citizens closer to the government. Everybody in theory is allowed to contribute to the archive, and many citizens have found ways other than software code to contribute and become a part of the platform co-creation. UK public bodies also believe there should be more encouragement of open source use and development because they have found the agility of its process very beneficial with a quicker turnaround of bug fixes, and support for pooling of interests and greater reuse.

Another technical concern for open source is the context of legacy systems (often proprietary) that form a tangled core to many bodies IT infrastructure. It is no mean task to convert and move away from this since they will have been developed over years and will interface with other software in the organization and across their partner organizations. Inserting into such a complex legacy architecture open source code may have substantial initial costs, even if longer term benefits.

From this technical perspective it was poor documentation of open source code that was indicated as a real and serious concern. They were concerned that the need for various types of documentation, from the most technical to the most user-centric was often underestimated. Such documentation is indeed an overlooked but necessary part of the archive of expertise held on code, and as we explain below, can create a *lock-out* from open source (Shaikh and Cornford, 2011a).

4.3 Risk Management

Software acquisition is understood in large part as a risk (or risk aversion) driven process as reflected in the enduring aphorism, “Nobody gets sacked for buying IBM”. Thus risk indemnification is one of the first concerns of any commercial or public sector organization in acquiring any asset. A question all companies and government agencies want to answer before signing any software contract is who you can sue if things go wrong (and who can sue you). Open source software, with its distinct licenses and a persistent history of potential intellectual property (IP) disputes, can raise concerns. Even multinational system integrators report clients who are wary of open source supplied via them for these reasons.

On the other hand, software acquisition is usually also about solving current and future problems and will often look to innovation and change. Vendor-lock-in (e.g. buying IBM) may address some risk issues, but organisations do not want to be captured by their suppliers. They want to be able to tap into a wider market which can offer innovative ideas and can scale projects appropriately to achieve a portfolio with an appropriate risk profile. In this respect movement towards open source can seem very desirable when compared to proprietary products delivered through a limited set of channels and as large projects. Our respondents also reveal that a ‘deeper’ form of risk management is possible through the empowerment of in-house staff by access to the code base. More can be done with the code, problems can be identified and resolved and developers are free to innovate, fork and train with the code.

However, the idea of deep support has its limits and in many respects respondents do question the availability, type and reliability of the support services for open source products. For a small number of open source products we see a small industry emerge to provide support and build the code. But this is not true for all open source software that organisations want to use. It has thus been argued that if you are using a niche open source product where there is only one vendor that can support you then you are almost as locked in as you would be with a proprietary product.

4.4 Innovation and Strategy

Under this category we look at the greater benefits that accrue to the organisation by open source adoption. For example, a number of our respondents spoke about how open source can offer strategic independence so that the organization is less vulnerable to forced upgrades that are not useful but very costly. When an organization is tied into a conventional support contract the vendor is in a position to exploit its power. This is less possible with open source software use. From a more macro perspective open source, as in the case of the Spain and Brazil, can nurture and build up strength in local competence and industry growth. Thus the software industry in both nations has flourished in alignment with open source development and use, and showing the development of a larger base of SMEs. Public sector procurement policies can reinforce such processes. Open source adoption by the public sector thus can have local economic significance.

Within adopting organisations, and those that take a strategic decision to positively support open source, the culture of innovation and more risk-friendly behaviour can develop. As reported, open source adoption can encourage local authorities to become more accepting of ‘mistakes’ that can be rectified quickly. Put the other way round, the desire for agility, innovation and empowerment has spurred a change in favour of open source.

Some use of open source is more tactical than strategic. Thus open source alternatives and its vendors are used at times as a strategic device by both the public sector and private companies to manoeuvre a better deal from their current supplier. There may be no intention to change to open source but the open source suppliers spend energy and resources to attract such customers.

Another problem identified in our data is the sustainability of the code and community behind it. Thus local authorities (and private companies) seldom contribute code back to the community. This is not a problem entirely, and is indeed fundamental to the open source model, and traditionally we are reassured that the most un-giving user is still building up awareness and the critical mass of testers, and feedback providers. However, the attitude of taking and not giving back does incense some open source developer communities.

5 Discursive Pointers for the Public Sector

In this section we highlight some of the important controversies and discussions surrounding open source adoption as told to us by our interviewees.

- Pragmatism needs to guide open source adoption and not ideology (on its own).
- If open source is to be spread in the public sector then it needs government level policy to make a real change. Change in government agencies is seldom bottom-up driven as local authorities and personnel are not keen to take any risks that could hurt their career.
- It is better to migrate to open source when you have a real and already present need to migrate rather than simply make a migration decision based on finding open source attractive. To reduce the cost of migration organizations need to plan the change and only take such a step when it would have been necessary to have a change.
- Any organization interested in adopting open source software needs a proper plan and IT strategy which doesn't foster false hope, and premature feelings of ‘failure’ but instead makes the benefits of OSS realizable over time.
- Organizations need to be clear on ‘benefit realization’ – *how will* they realize the benefits (considering the organization, etc) and *when* will the organization realize the benefits? These questions need a clear and honest answer so as not to nurture false hope and expectations.
- Short-term costs of open source may seem disproportionately high, or may just end up being higher than the expectations of the people involved (see point about stage of benefit realization). It might be best at this point to manage the accounts ‘creatively’ (creative accounting) when you know that the long term costs will be lower and that the benefit of using open source will convert into cost reduction.
- A strong champion is needed to facilitate change in the public sector as innovation can be risky. Job security and accountability in the public sector needs to be more open to risk taking if an atmosphere of innovation is desirable and open source is to spread.

6 Conclusion

In this paper we explore how the issues of open source adoption by the public sector have evolved over time and moved from a solution in search of a problem (Evans and Reddy, 2002) to a constructive argument to reduce costs, increase participation, build transparency, reach out to citizens and build an environment for greater innovation. Yet, this fine rhetoric around open source adoption has not so far materialized into clear solutions, services and acceptance – well, not yet anyway.

Nonetheless, this research indicates that many governments and public bodies around the world are seriously rethinking their software strategies and procurement practices. A level playing field and more sourcing options (as opposed to fewer) are now understood to be desirable and an important way to ensure more competitive supply of technology solutions and productive and innovative outcomes.

We see this as a beneficial movement, but one for which more research is needed. Our agenda for future work includes on the relationships between open source software and open government data and open standards. We also see a need for studies of the supply industries, including traditional forms of contracting and the role of SME companies and open source communities. This then extends to a wider set of issues associated with the development and management of public information infrastructures, the expression of public values in procurement, transparency in government and relationships between the citizen and the state.

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