Navigating Open Source Adoption in the Public Sector

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Navigating Open Source Adoption in the Public Sector

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ABSTRACT
Our focus in this paper is to better understand how and why various governments in Europe are adopting, using and co-creating open source software. Our study involved in-depth interviews of key stakeholders from a number of European government agencies. The main findings lead us to understand and organize our analysis under four broad categories of criteria that motivated open source adoption. They include economic concerns, technical and development features, risk management, and innovation and strategic issues. The more interesting finding was how the idea of lower costs and total cost of ownership was used by the interviewees as a linking platform for their narrative and motivations. This helped us to redefine TCO so that it made sense in relation to open source software in the public sector. We conclude the paper with a number of insights and practical lessons that will help other public sector organizations make better decisions.

Keywords
Public sector procurement, open source software, adoption, soft benefits, total cost of ownership.

INTRODUCTION
Open source software implies openness of the source code thus making it possible to change, and improve the code. In effect open source encompasses certain freedoms that are embedded in the license of the code. Procurement (Phipps, 2011) and acquisition decisions by many governments are currently under question, and greater scrutiny has led to governments in the European Union, UK, Australia (Archer, 2010) and the USA (Kundra, Gordon, & Espinel, 2011) to amend their habits. The European Commission has an explicit directive to promote software alternatives (Ghosh, Glott, Schmitz, & Boujraf, 2010), especially open source software. And very recently, the British Government’s Cabinet Office (Ballard, 2011; Hall, 2011; Saran, 2010) met with the large and influential system integrators to declare a greater need to have open source choice offered to the government. The argument put forward by the Cabinet Office was that the government was unable to choose open source as an alternative if this was not offered as an option by the integrators. Open source software, along with open data and open standards is fast becoming part of the language that governments all over the world are eager to adopt (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).

Open source software is part of the easing of recession and costs of IT in the public sector in the UK. However, as the UK government is aware, open source software is still a rather unknown phenomenon. The true and complete costs involved with switching to another software, be it open source or not, are not easy to evaluate (Russo & Succi, 2009). Open source software further complicates matters with close to zero license costs, but this does not necessarily translate to lower costs in other aspects (Gallopino, 2009).

1 http://www.opensource.org/docs/osd  
2 http://www.opensource.org/licenses/index.html  
Research to date in the area of open source use and adoption in the public sector, though growing, is still quite patchy. A UK based study (Waring & Maddocks, 2005) focused on eight different local councils and agencies. This work outlined a number of concerns and key areas that need improving in the public sector before successful adoption can emerge. Likewise in the US, studies have shown open source use adoption needs top level support and encouragement for success (Oram, 2011). Brazil is a very interesting case where the success of open source adoption has been explained and emphasized as a product of insurgent experts (Shaw, 2011).

Private companies (Agerfalk & Fitzgerald, 2008) tend to adopt open source software for a mix of reasons which clearly include the promise of reduced costs of adoption, but there is often a strategic aspect, as well as a strong desire to innovate (Shaikh & Cornford, 2011b; Sutor, 2009). The public sector would like to enjoy these benefits as well but till very recently the desire to innovate was not foremost for most governmental agencies. Public sector organizations are not profit orientated yet there is much to learn from private companies and their manner of dealing with open source. The larger idea here is the level of experience and comfort that private companies bring to open source adoption which is sorely lacking in the public sector. There are some exemplary cases of open source adoption by the public sector like the Extremadura case in Spain (Zuliani & Succi, 2004, 2004) but there are far more ‘success’ stories of open source adoption by commercial companies (Dahlander, 2007; Dinkelacker, Garg, Miller, & Nelson, 2002; Fitzgerald, 2006; O'Mahony, Diaz, & Mamas, 2005). The factors that encourage private companies to adopt open source software, especially considering most business models of such adoption indicate that the software itself does not lead to value creation or capture directly (Osterwalder, Pigneur, & Tucci, 2005; Vargo & Lusch, 2004; Joel West, 2003; Joel West & Gallagher, 2006), make some of the lessons translatable across both sectors.

Our research was motivated by a desire to make sense of open source adoption by the public sector. More specifically we were driven by a need to understand how open source software adoption was being managed by public sector organizations across Europe and what challenges they were faced with. What, if anything, is it about open source software adoption that makes it more or less problematic in relation to public sector organizations, and why?

Our paper outlines the methodology we used to collect data to answer our research question above, it then explains our findings. The last section redefines our analysis in terms of a clear TCO definition and concludes with some key lessons for other government agencies considering open source adoption.

**METHODOLOGY**

Our study focuses on Europe. This decision was made keeping to ensure that all our case organizations fall under EU directives and policies in relation to use and adoption of open source. We managed to get access to local organizations in seven different European countries. The size of the organizations tended to vary but in general each one employed around 6000 employees. We made sure that each organization had been engaged with open source for a period of at least two years thus giving them some time to learn, adapt, and make decision in relations to keeping open source, returning to proprietary products, and/or becoming more progressive (where more and experienced use open source unfolded over time) with their open source adoption. The companies we spoke too were those that were heavily involved with guiding and consulting for local authorities through the latter’s open source adoption process.

**Data Collection**

We carried out in-depth, semi-structured interviews with core personnel in each organization. These personnel ranged from the open source policy writer, IT and developer team, floor-walking members, users, and strategy level staff. Each of our (31) interviews lasted for an hour or more. The list of interviewee affiliations (organizations where we conducted a number of interviews) is available in Table 1. Our short interview guide covered questions relating to basic information about the length of open source adoption, and the role of the interviewee in the process to more detailed examination of obstacles, opportunities, and challenges involved.

<table>
<thead>
<tr>
<th>Interviewee Affiliation</th>
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### Table 1: Interviewee Affiliations

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<td>Andalucia Govt</td>
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### Data Analysis

The material from the interviews was analyzed (Strauss and Corbin, 1999) systematically using a software tool (Atlas.ti) for the main lessons, decisions, challenges, strengths, advice, best practices, consequences and other interesting elements that emerged from the interviews to help mould the framework we have built that can then guide public sector adoption of open source. We focused on open and axial coding of the data where for the first 12 interviews the open codes were very finely chosen. We stepped through the process of coding by focusing on short phrases. However, we decided 12 interviews later that we could approach our coding paragraph by paragraph instead as we were more in control of our material and able to remain faithful to our data and the ideas emerging from it.

The main ideas the respondents focused on included the lack of maturity level of open source software, license confusions and lack of knowledge about the implications of various open source licenses. Other ideas which arose were somewhat more surprising, such as most organizations do not even attempt a TCO study before making procurement decisions because of the expense such studies involve. At the axial level of coding we began to notice some higher level themes around which our open codes coalesced. Our findings fell largely into four main categories; economic factors, technical issues and development, risk management, and innovation and strategic reasons.

### ANALYSIS OF FINDINGS

This section covers the main reasons why some governments within Europe have been attracted to open source adoption and the obstacles they faced internally, politically and technically. Our findings fell largely into four main categories; economic factors, technical issues and development, risk management, and innovation and strategic reasons.

### Economic Factors

The range of ‘success’ with open source adoption by the public sector varies across Europe and even within the same countries. The Spanish government is publicized as a very successful case, and indeed it is because the use, adoption and spread of open source software has grown and sustained itself. However, Spain is a very specific case due to its political structure and the use of open source.

Real cost savings are possible with open source because the license fees is zero, however, the true costing of any software spans more than just license fees. One needs to consider training, maintenance, vendor and non-vendor supported, service, but there are also areas that move beyond such quantifiable categories. In the latter we need to include expertise level of users, linking promotion with taking initiative, and customization and upgrades.

A distinctive quality that open source brings to the organization is that economic risks can be better managed. Procurement decisions with open source do not have to be made first as is the case with proprietary software. The difference lies in the license because procurement in relation to proprietary software implies buying licenses upfront whereas in open source the license is at little or zero cost so this does not feature in the decision process.

We understand from our interviewees that there is something equally distinctive with migration costs of open source software. Open source software is often based on open standards so any move within and beyond the current open source
application usually brings lower costs of change. It is far easier to interface open source software with other software due to its openness and open standards.

On a more general level many interviewees explained to us that open source can offer real cost savings but often these savings materialize mid to long term use rather than in the short-term. Thus it is important to manage expectations to ensure that an open source project is not considered a failure prematurely.

There are economic factors that are less favourable towards open source. Open source can lead to a larger outlay of money when the implementation is badly planned, and the expectations of short-term returns are misconceived. A real issue with open source adoption is acceptance by the employees and so training becomes more crucial. Training must also not be left to the final stage of implementation, and instead the users should be involved and trained over the entire development time gradually.

Open source adoption by the public sector brings with it the ability to be trained on the job and build up local expertise, however, many examples in the public sector indicate that such employees are quickly swallowed up by the private sector (larger salaries are offered) or they are promoted within the government. This often leaves the open source project without its champion and leader, thus effectively killing the project.

Technical Issues and Development

Many of our interviewees made a clear statement in favour of open source adoption stating that it does help reduce costs, though again, one needs to be careful about how this is managed and what the expectations are of the organization. But some went beyond simply stating that open source saves money, they believe that open source is also more secure. This is a debate that both academics and practitioners aim to qualify but like the idea of TCO it would be close to impossible to 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, organizational culture, etc that need to considered before making any statement, and that too for a specific case only. What we did understand to be a proof of faith is when governments encourage the use of open source software in development of e-ID systems for its citizens.

Some UK local authorities explained how open source was more agile in allowing and developing changes. The response time for any query and bug fix is astounding compared to proprietary software companies. The authorities we spoke too believe there should be more encouragement of open source use and development because they have found the agility of its process very beneficial. There is a quicker turnaround of bug fixes, and it allows for greater reuse.

Some problems that open source has to manage against, especially in the public sector, include the great number of proprietary legacy systems that form a tangled part of the IT infrastructure. It is no mean task to convert and move away from all of them as they have been used for years and interface with many other various software in the organization and across even their partner organizations. This is yet another form of lock-in that can be created when proprietary software is used because again, it is not based on open standards.

Poor documentation is a real and serious concern with open source software. However, our interviewees cited a related issue that was more recalcitrant to fix, that of underestimating the need for documentation by various stakeholders involved. Documentation is a necessary part of the archive of expertise held on the code, and as we will explain below the need for it is urgent because it can create another form of lock in, or as we understand it – a lock-out from open source.

Risk Management

Reducing vendor-lock is a major concern for companies and the public sector. In this respect open source is very useful and looks attractive when compared to proprietary products. Source code is available and open to read, and amend so users and developers feel a sense of empowerment.

Our findings also reveal that a ‘deeper’ form of support is possible with open source as compared to proprietary products. This depth alludes to the idea of empowerment through access to the code base. More can be done with the code. Problems can be resolved but developers are also free to innovate, fork and train with the code.

However, the deep idea of support is not accepted by all. Well, perhaps it is not the depth that some question but more the availability, type and reliability of the support services that open source products can offer. There are a number of open source products where we can see that a small industry has mushroomed to support and build the code, but of course this is not so true of all open source software. It is then very important to think through which product will be adopted and why. It has 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.
A question all companies and government agencies need to answer before signing any software contract is that of who you can sue for infringement by a third party. Can risk in this case somehow be transferred thus making open source more attractive to adopt and use?

**Innovation and Strategic Reasons**

A micro idea apparent is 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 support contract the vendor is in a position to exploit its power. This is far less possible with open source software use.

Drawing out further to a more macro perspective it has become obvious that open source, especially in the case of the Spain has nurtured and built up a great strength in local competence and industry growth. The software industry in both nations has flourished with open source development and this can be keenly seen with the development of a larger base of SMEs.

A facet that is beneficial but rather unexpected is how a culture of innovation and more risk-friendly behaviour has developed in the public sector. Open source adoption has forced local authorities to become more accepting of ‘mistakes’ that can be rectified quickly and indeed, are an innovative element of the open source process. The desire for agility and empowerment has spurred a change in favour of open source.

One natural but worrying (?) issue that our findings lead us to understand is how open source and its vendors are used as a strategic device by both the public sector and private companies to manoeuvre a better contract and deal from their current supplier. There is no intention to change to open source yet the open source suppliers are not aware of this and spend energy and resources to attract such customers.

Another problem with open source adoption is that of sustainability of the code and community. An added problem is that local authorities and even private companies seldom contribute code back to the community. This is not an issue entirely because through the use of open source code the organizations are building up awareness and a critical mass of users, testers, and feedback providers. However, the attitude of taking and not giving back does incense open source developer communities.

And finally, we noted a concern of employees that were being asked to change to open source software use. Change is never easy to bring about and there are many examples that show that a change to open source software has faced a high level of resistance from the users because of a fear of deskilling and gaining non-transferable skills.

**CONCLUSION: REVISED TCO, AND SOME KEY LESSONS FOR THE PUBLIC SECTOR**

Early adopters of open source applications in the public sector quote reduced vendor lock-in as one of the key arguments when making a switch from proprietary to open source software and lower costs. However, some of these local authorities and counties found that the costs of adopting open source software were not directly translatable across to their frameworks of evaluating proprietary software. The costs may well be lower overall for open source but there is difference in where the costs emerge and at what stage of adoption. Greater awareness of such issues was quoted as a real consideration when making other future open source decisions.

**Total Cost of Ownership**

TCO is a fundamental issue when making software procurement decisions (Ellram, 1993, 1994, 1995; Ellram & Siferd, 1993; Hurkens, Valk, & Wynstra, 2006) in organizations yet this is an area that has received limited attention. We are concerned with TCO but more specifically in relation to open source software (OSS) adoption decisions by organizations. This adds yet another layer of complexity because the assessment of open source software procurement is not exactly the same as that for proprietary software (MacCormack, 2003). Indeed, we find that by unpacking the idea of open source TCO we become more aware of the taken for granted in proprietary software procurement decisions (Shaikh & Cornford, 2011a), and make better sense of the softer costs surrounding software procurement especially when the software is open source (a relatively less familiar category for many companies) (Carr & Ittner, 1992). 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, Anderson, & Wynstra, 2005). The proper accounting of cost should include total costs of procurement, management and support, associated hardware costs, and when one is thinking of changing software solutions, migration costs’ (Lerner & Schankerman, 2010).

We sum up with a revised definition of TCO that emerged through our analysis - TCO reflects a measure of all the costs of identifying and acquiring software, installing it and operating it and the exit costs found in migrating away from the software.
TCO reflects not just the direct qualities of a software product (price, functionality, reliability) but also the relationship of the software to the organization’s broader set of technology platforms, installed systems, skills and strategic goals, as well as available market and community based services.

Key Lessons for the Public Sector

Finally, we would like to highlight some of the important lessons learned by different organizations through their experience with open source adoption, use and development.

- If open source is to be spread 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.
- Adoption and development of open source can lead to a sharing of expenses between local authorities, and it can help build local expertise.
- Organizations need to be clear on ‘benefit realization’ – 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.
- 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.
- The open source software that is chosen needs to take into account the size of the community supporting it, the openness of the platform, and if the product is open core then it is necessary to be able to gauge if the core is functional without the company. If it isn’t functional and useful without the company then the product may need to be avoided as there is a high risk of lock-in.
- Desktops are the ‘suicide killers’ of open source projects. Such a migration needs planning that moves the servers over first and then desktops last, and that too in a very gradual manner with sympathetic training for the users.

REFERENCES


