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PROMISES OF OPEN SOURCE SOFTWARE FOR AUSTRALIAN GOVERNMENT AGENCIES – AN EXPLORATORY STUDY

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Abstract

In wake of financial downturn open source software appears attractive to many public sector organisations. Built on a licensing model that avoids binding contracts or financial obligation, it permits like-minded developers to share source code and collaborate in the continuous improvement and enhancement of software. Open source software reduces dependencies on software vendors, is continuously evolving, and does not pose any possibility of running the user into the blind alley or dead-end of development trajectory. This paper presents the findings of a study conducted in three Australian state governments. Purpose of this study was to assess the organisational readiness and potential of open source implementation in government agencies. It identifies the level of open source utilisation in these agencies and also highlights the barriers involved in utilisation of open source at a larger scale. The study concludes that success of open source software in government agencies is contingent upon critical aspects such as, its implementation enabling technical and economic value; its maintainability and adequate support available to sustain its utilisation.

Keywords: Open source software, Government agencies, Software development.

1.   INTRODUCTION

Open source software (OSS) is increasingly being acknowledged as a viable alternative to commercial proprietary software, with significant software reliability and value for money benefits for businesses of all kinds. Proprietary software is closed source, available at a cost, and its copyright is owned by the organisation that develops it. This means that the end user does not have access to source code, cannot make changes to the software to suit individual needs, and the software cannot be redistributed. OSS, on the other hand, allows its user access to source code, thereby allowing them to customize the software according to their needs and integrate it with existing software infrastructure; and, if need be, redistribute it (Latteman & Stieglitz, 2005). OSS is not copyright exempt, there are some specific licensing schemes that still protect contributions of the author but also allow them to redistribute the software for further derivative works (Banda, 2005).

Governments worldwide are acknowledging the potential of OSS and research in viability, usability, maintainability, and supportability of OSS is gaining momentum. European Union has been a forerunner in these areas, where various national governments as well as European union itself has been actively pursuing a research agenda in OSS. The e-Europe initiative is of particular significance in this regard. Governments around the globe recognise the fact that general public around is becoming more technology savvy. General public's demands like faster service, one stop solutions, and independence of temporal and physical constraints are some of the pressures that are forcing government to look for robust technical platforms to address these challenges. Haider and Koronios (2008) report some of the challenges posed to public sector and government agencies in wake of e-transformation as,

a.   Increased public expectations of accessibility to services, magnified by incomplete view of data and constituent services and the difficulty to deliver new services and/or respond to new legislation.

b.   Empowering workforce to deliver higher value and productivity, due to difficulty in finding expert users and developers of systems, and sharing best practices.

c.   Improving operational and organizational effectiveness that is held up due to costly and slow processing, classification, tracking, retaining, and disposing of information.

d.   Collaboration across government for increased efficiency, due to the existing incoherence between cross-agency/department processes facilitated by the lack of information integration and technical interoperability.

e.   Sensing, responding and managing across geopolitical boundaries, since the critical information is scattered among departments/agencies, and is made up of inconsistent data standards and rules of engagement for usage.

These challenges calls for a cost effective, flexible and interoperable technical infrastructure, which makes OSS particularly attractive to government agencies; since flexibility, interoperability, and cost efficiency are its most significant selling points. Nevertheless, success of OSS in government agencies is contingent upon critical aspects such as, its implementation enabling technical and economic value; its maintainability and adequate support available to sustain its utilisation. It is, therefore, essential to establish the potential and value profile of OSS for government agencies. This paper presents a study conducted in three Australian states to assess the organisational readiness and potential of OSS implementation in government agencies. It starts by developing the case for OSS usefulness for government agencies, followed by the modus operandi of the study. This is followed by findings from the study and discussion on the results.

2.   OSS AND GOVERNMENT AGENCIES

Considering the inherent tensions that arise between the philosophical freedom of open source and the institutional constraints of government, adoption of OSS poses interesting observations. Government is obligated to be conservative and risk-averse when considering its software procurements, the need to demonstrate responsible usage of taxpayer funds being paramount. Open source, on the other hand, can be subject to continuous change, and may therefore be perceived as lacking the stability or continuity needed to support ongoing government business processes. It is therefore, important to weigh the potential of OSS in these conditions.

OSS with its features and development culture appears as a viable option for government agencies. From technological perspective, OSS provides global development approach and software quality testing, tailored solutions, better security than proprietary solutions, open standard architecture, and a degree of independence from vendor control. From financial perspective, OSS is available with lesser acquisition costs, avoids vendor lock-in and hidden costs, and less training and software integration costs. Perhaps the most important benefit of OSS is its appeal in terms of software integration and interoperability.
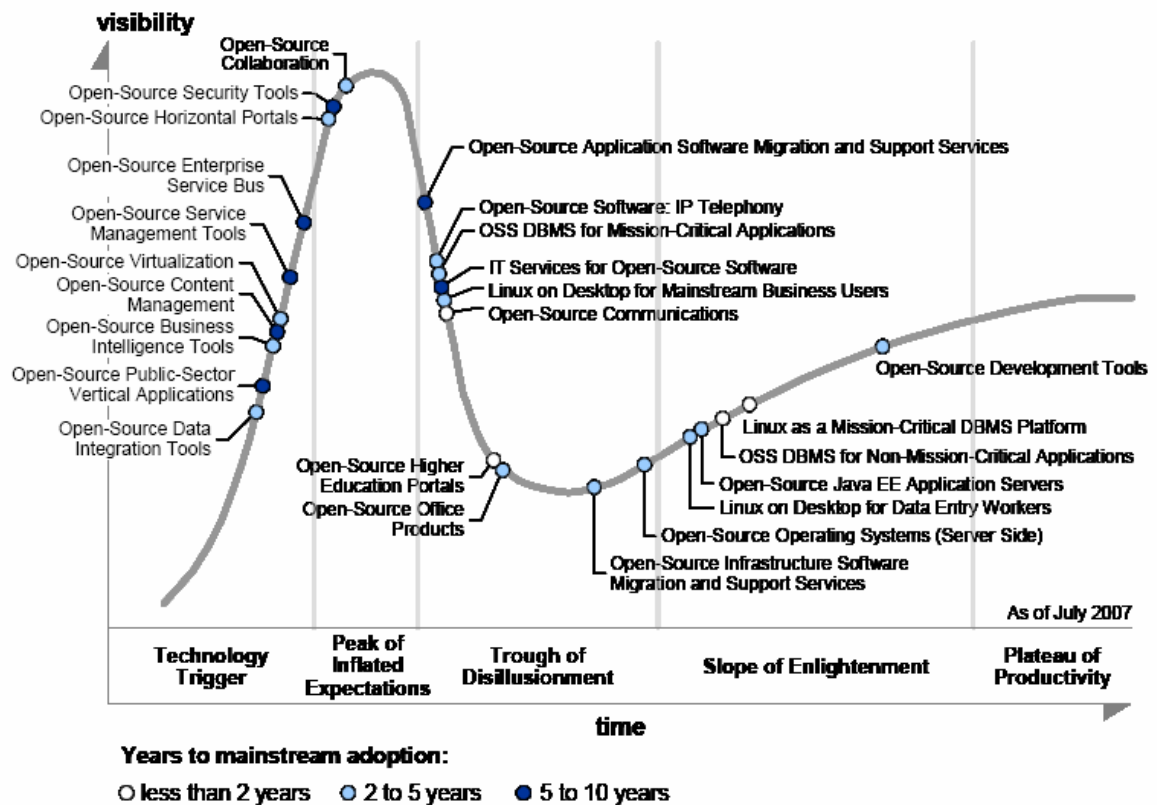

Figure 1 - Hype Cycle for Open-Source Software

(Source Gartner 2007)

The Australian governments (federal as well as state) do not have a significant agenda for implantation of open source in government agencies. On the other hand, Gartner (2007) conducted a study of OSS adoption in government sectors and concluded that mainstream OSS adoption patterns are changing in two ways (figure 1). Open-source solutions are deployed in increasingly mission-critical scenarios where the service level must be equal to or better than closed-source alternatives, and open-source solutions are also being increasingly adopted by organizations (like government

agencies) that regard cost and risk mitigation as their primary concerns. Hypecycle positions reflect these patterns, because technologies emerging from the trough of disillusionment are best-suited to both challenges. Nevertheless, the freedom that OSS allows not only has the potential to mitigate organisational and technical risks, but its financial appeal is even more attractive in the current financial environment.

OSS is not just about free software solution, even though financial reasons account for many of OSS implementations. In fact open source also has comparative edges against proprietary software in various other aspects such as, technical benefits though global development and interoperability due to open standards compliance. According to Simon's study of 24 countries (Simon 2005), OSS is a good fit for the current IT environment in relation to capabilities of data integration, multiplatform of IT architectures, and various standard compatibilities. One of the most important needs of an e-government infrastructure is to enable various services for citizens and businesses in a consolidated manner, often also referred to as single sign-on solution. Open standards capabilities of OSS allow for interoperability with various platforms of proprietary legacy systems and thus enables government agencies to make use of their existing technical infrastructure, while putting up customised interfaces. Potential of OSS to resolve interoperability issues in government agencies is particularly important, since local, state, and federal governments consist of numerous agencies.

The most common misconception of OSS is the reputation of being less secure because of its freely available code (Taylor 2004). The global development concept not only enables a wide ranging developmental community but also allows for global quality test for OSS. OSS development enables software solutions to be fully customised according to the functionality needs of the organization. On the other hand, proprietary software is designed according to vendor's development planning and follows common design and needs, which lacks the depth and breadth allowed by OSS (Woods & Guliani 2005). In proprietary software, software quality testing is limited within a controlled environment and specific scenarios (Lerner & Tirole 2002). However, OSS development involves much more elaborate testing as OSS solutions are tested in various environments, by various skills and experiences of different programmers, and are tested in various geographic locations around the world (Mockus *et al.* 2002). As the main financial benefit of OSS, the acquisition cost of OSS is generally lesser than proprietary software or even free of charge (Kovacs *et al.* 2008). In addition, more flexible license coverage can be gained from OSS that enable redistribution and software modification to comply with specific needs of the organization (Woods & Guliani 2005). Since OSS is developed in public domain and is freely available, there is no dearth of skills and knowledge in any market. These cost differences between proprietary software and OSS can be used for better staff training, customization tasks, or enhancement in existing IT infrastructure (Kovacs *et al.* 2008).

3. RESEARCH BACKGROUND

OSS presents itself a viable alternative to proprietary software. Three years ago, the Australian Government Information Office (AGIMO) issued "A Guide to Open Source Software", dispelling some myths about OSS. AGIMO (2005) recommends to consider all solutions, proprietary or open source, and to make procurement decisions based on 'fitness for purpose' and 'value for money' evaluations. However, the same report points out that due to their differences in nature, comparing proprietary and OSS is not always a straight forward process. On the other hand, some of the success stories emerging from around the globe include, successful utilisation of OSS in government agencies of Brazil, Italy, Malaysia, Germany, Netherlands, United Kingdom, France, USA, Denmark, Sweden, and South Africa (see for example, Ouédraogo 2005; Haider and Koronios 2008). This popularity is partly due to its potential to enable government agencies to become a participatory forum that engages general public in developmental efforts as well as skills development and thus reducing dependencies on software vendors. These dependencies on software vendors are not just restricted to source code,

functionality, and contractual commitments, but also affect the innovations in software development. This research was thus motivated by the apparent contradiction present in the demonstrated potential of OSS in government agencies around the globe and the apprehensive approach of AGIMO. The purpose of this study was to better understand issues related to adoption and usage of OSS as well as the potential of OSS across different jurisdictions.

4.   RESEARCH METHODOLOGY

This research followed a qualitative interpretive approach with interviews conducted in Victoria, New South Wales, and Queensland governments. Participants of this study were identified through a rigorous process of identifying the stakeholders associated with the software procurement process. These participants included Chief Information Officers, Directors/Project Officers ICT sourcing, Enterprise Architects, and Managers of IT Infrastructure Development. It should be noted that responses from the participants of this case study will be referred to by their state rather than their names or job descriptions, to ensure confidentiality as laid out in the agreement signed with the study participants. These interviews were conducted over a one - one and half hour period. The interview questions were open-ended and interviewees had freedom to describe their experiences and problems beyond the scope of the questions. Interviews were recorded and transcribed first which made it easier to categorise responses under different headings at a later stage in order to provide a more systematic overview of our findings. The interviews were followed up by email and telephone for further clarifications, where it was deemed necessary. The conclusions drawn in the following case, thus, represent interpretations of the evidence as understood by the authors.

5.   OSS IN AUSTRALIAN GOVERNMENT AGENCIES

We summarise the findings from our study under three main themes, i.e. software procurement policy and process, current level of OSS utilisation, and benefits and risks of OSS and how are they managed.

5.1   Software Procurement Policy and Process

In Australian environment, there are no standardised guidelines for software procurement. However, there are broad guidelines from Australian states' treasuries that govern the financial side of procurement. It was found that some licensing costs were negotiated and settled at the state level, whereas others had to be paid for by the individual government agency. This implied that proprietary products like Microsoft's Sharepoint or MS SQL did not incur any licensing costs to an agency if there was an enterprise agreement in place. Hence, in these cases the agency would actually prefer the proprietary software because support costs would not strain their budget (Queensland). However, selection of the appropriate software is at the discretion of the purchasing agency. However, almost all interviewees agreed that up-front expenditures are only small part of all costs involved when taking the full life cycle of an application into account. Total cost of ownership, products' compliance with industry standards, and the availability of ongoing vendor support were most frequently listed as additional selection criteria. A common theme in all interviews was that OSS should be treated just like commercial off the shelf software and selection criteria such as 'fitness for purpose' and 'value for money' were more important than the software's sourcing method. An interviewee from Queensland, however, went even a step further and commented that agencies should concentrate on ICT services rather than ICT products. Technology related decisions would then be irrelevant as long as the specified business needs are covered. The choice of technology should not matter to the end user and could be open source, proprietary software or an external or internal service cloud. A third selection criterion of 'innovation' was stressed by interviewees in New South Wales and Victoria. In

absence of suitable proprietary or open source end-to-end solutions, agencies in New South Wales use open source components which are then adapted to their core business. It was pointed out that the enticing factor of OSS is the flexibility that it grants to developers, rather than being locked-in with one standard. In addition, several alternative solutions and applications can be tested quickly in order to decide which application platform fits their business requirements best. Most interviewees agreed that open source systems have to overcome a confidence gap in the mind of decision makers in terms of robustness and the availability of enterprise support. This was often associated with the question of how much risk an agency was willing to accept and accepting support from non-certified vendors was given as an example. For example, an interviewee from Victoria commented that "most closed-source software reseller partnerships involve a degree of certification on behalf of the software vendor, there is rarely such a process for OSS. This then leaves some degree of risk to be accepted by the government agency in engaging an OSS support company." Similarly, due to a lack of experience and the uncertainty decision makers associate with projects involving the use of OSS, more documentation and ongoing communication is needed to get the necessary management approval (Queensland).

To summarise, interviewees shared the perception that there was nothing specific to guide purchasing agency in favour or against OSS. However, it was acknowledged that OSS offers an opportunity for reducing the cost of in-house developments (usually involving contractors). I was also acknowledged that running OSS requires detailed knowledge about licensing mechanisms and an extra effort is needed to organise enterprise support for less common OSS applications. Whereas no official regulation speaks against OSS, the prospect of a greater procurement effort combined with the perceived uncertainties surrounding OSS might deter decision makers.

5.2   Current Level of OSS Utilisation

Questions under this theme were centred on, what business area OSS was used, why was it used, whether agencies are aware of any impact on the local economy, and whether agencies would see themselves using more or less OSS in two years time. Exact usage levels of OSS within different agencies in a State government were mostly unknown. In some cases, there were lists of existing applications, however these lists were quite general and did not specify the business area of an application. A difference was made between infrastructure requirements, such as networking, databases and application servers, and mission critical requirements that drive business. Whereas the former could be outsourced or satisfied through an out-of-the-box product, the latter could benefit from in-house development work which should be under the control of the agency (New South Wales). Although no exact data could be obtained, all agencies stated that they saw the majority of OSS in their hosting and development environment, running Suse Entperprise Linux, Solaris, Apache, MySQL & Sidu, OpenSSH, NCFTP or Java. Some agencies had developed solutions which involved large components of OSS or were entirely based on open source. Most agencies pointed out that the adoption of software would only marginally depend on whether it is OSS or not. This is summarized by an interviewee from Victoria, who stated that "we don't aim to use OSS or not. We evaluate each system on its own merits. From an industry perspective, we think that it [using OSS] will be inevitable however. The Government's Services Group has been considering officially supporting My SQL as a database platform, as well as re-evaluating all options around the desktop and productivity applications. Software as a service is also gaining traction. Whether this results in more OSS use, remains to be seen."

Finally, some interviewees confused OSS with freeware. Although both forms of sourcing are free of licensing costs, there are important differences in the way freeware and open source can be deployed. Inquiring about the current level of OSS usage in the three states turned out to be a complicated task. No ready-to-use lists were available so that a more detailed overview needs to be generated in the

future. This, however, requires the input of the individual agencies coordinated by the respective offices of the relevant State government's CIO.

5.3   Benefits and Risks of OSS

Inquiries under this section focused on financial, operational and organisational concerns as well as for measures to manage these concerns. When discussing the benefits of OSS the following points were raised:

- OSS is generally build for interoperability which allows us to move from one product to another if necessary, i.e. avoids the vendor lock-in (New South Wales)

- OSS has the potential to strengthen the local development capabilities. However, many Australian companies are also supporting Microsoft's products. A reliable estimate of gains and losses for the local economy is not yet available (New South Wales).

- Primarily, the attraction of open source software is the reduced cost of up-front procurement. However, we have to closely scrutinise any support arrangements before making purchasing decisions. For us, the use of open standards is much more attractive than open source. We try to focus on the total cost of ownership, and the lack of standards support can severely affect this (Victoria).

- Safety and reliability were not seen as problematic, if the product was mature and had a stable developer community. With regards to their case management system, New South Wales has been applying OSS components to mission-critical services for more than five years "If the system goes down, Australia's largest trial court cannot operate." (New South Wales)

Government is obligated to be conservative and risk-averse when considering its software procurements, the need to demonstrate responsible usage of taxpayer funds being paramount. Open source, on the other hand, can be subject to continuous change, and may therefore be perceived as lacking the stability or continuity needed to support ongoing government business processes. This contrast between the dynamic supplier community and conservative user community gave rise to some important issues among the interviewees. On the supplier side, these can be grouped into three streams, i.e., developer motivation; governance, organization, and innovation processes; and competitive dynamics. On the user side, they include issues like, total cost of ownership – costs of procurement, management and support, hardware costs; transition costs – system migration and training; ongoing software maintenance support – costs and expertise; configuration and integration with other applications; interoperability - between systems and in enabling system sharing; functionality and reliability - stability in all aspects of the software; awareness of CIOs of OSS solutions; commercial OSS support models; security and trust; knowledge of best of breed OSS solutions; contractual and legal obligations; lack of turnkey solutions; and insufficient public sector oriented applications. Some of the particular risks of using OSS, as mentioned by the interviewees included:

- There is a shortage of skills to administer typical OSS platforms such as Linux or PostgreSQL (New South Wales, Queensland) as well as a general lack of familiarity with non-windows applications for office production (New South Wales).

- OSS based solutions are seldom end-to-end solutions and can require substantial integration effort (New South Wales). Whereas in some cases the integration of several OSS products is done by the agencies themselves, other agencies are more reluctant to take on too much development work and look for outsourcing possibilities. However, outsourcing might result to be difficult if there is expertise available about a given product (Queensland).

- Most OSS products issue new releases frequently. New functionalities or changing interface designs require developers and users to embrace continuous learning in order to realise the benefits of OSS. However, if the people in an organisation are too busy, then there is little time for learning (New South Wales).

- Some uncertainty existed about what level of support could be expected with smaller OSS vendors: "Often, we make use of many 'advanced' features of the software, or in unusual ways. From a support perspective, this means we often need to speak to the person who wrote particular parts of the system. This may be nearly impossible in a reasonable timeframe with open-source software project." (Victoria)

- It was also made clear that vendor support for OSS and proprietary software does not necessarily differ from each other. For example, Victoria uses a vendor supported OSS content management system and they found that time and costs to fix bugs or improve the product are comparable to commercial products.

- In the case of the OSS, for example content management system, a substantial obstacle to innovation was operational cost. Even if there were no up-front purchasing costs, the ongoing development costs had to be paid for by the first agency that asked for it. A suggestion was made that if more agencies could use a specific OSS product, then a cross-jurisdictional, collective funding mechanism could boost innovative product development (Victoria).

- If improvements to a product result in considerable development work, then it is important to be clear about who holds intellectual property rights afterwards – the contractor or the agency. Only if the agency holds all IP rights, can they opt to make the code publically available (Victoria).

In keeping with the spirit of OSS, the interviewees were asked if their agencies would be willing to exchange source code for of the in-house developed applications or OSS applications customised to serve particular business needs. Whereas exchanging source code with other agencies was not seen as problematic, general concerns existed about whether agencies could be held liable for the code they would give back source code to the OSS developer community. Nonetheless, the latter was seen as 'an important part of strengthening the national economy' (New South Wales). Both forms of sharing are supported by AGIMO (2005, p48-49), which suggests that agencies can give back code modifications to the open source community provided an appropriate legal framework regulates warranty and indemnity issues. Furthermore AGIMO highlights the importance of feeding code back into the main codebase since otherwise an agency would develop their own version of an OSS product and could not easily take advantage of future product updates. AGIMO further assets that, iIntra-agency sharing can be realised through direct technology transfer between agencies or any add-on code created when enhancing the software should also be owned by the Australian Government. As a result, other Australian Government Agencies may simply decide to adopt the product through an in-house sourcing process. They are legally able to do so without licensing restrictions, as the Commonwealth of Australia is a single legal entity. Interestingly, Victoria's IT Infrastructure Development group pointed out that even among the different agencies within one state: "... at the moment the option of re-use is not even exposed" (Victoria). It was suggested that prior to any procurement processes, there should be a gating process to ensure that services and solutions that have been developed elsewhere are not re-invented.

6.   CONCLUSION

In conclusion, this study has reflected parts of what was highlighted in Gershon's 'Review of the Australian Government's use of Information and Communication Technology' (Gershon, 2008). One of the report's key findings was that high level of agency autonomy runs counter to the effort of

achieving more efficient IT support of the agencies operations. This is reflected considerably in our study, and in absence of a uniform policy for software procurement in general and OSS in particular has resulted in disparate procurement, implementation, and value realisation profile of OSS. What is needed is a stronger IT governance approach that coordinates and promotes whole-of-government activities on a national level. OSS implementation in government agencies will greatly benefit from such a governance forum, where government agencies from around Australia share their efforts and experiences in terms of OSS selection, customisation, and adoption. This should include efforts towards developing OSS for government agencies as well as support for its implementation and enhancement.

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