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Open Source Software Utilization in Australian State Governments

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Abstract

The financial meltdown has affected businesses around the globe. Businesses are facing extreme pressures to reduce overheads, rationalize costs, and consolidate operations. It is, therefore, decisive to scrutinize all of the options available to the business before making an investment into information technology infrastructure and select the best option within the available means towards growth and seizing long term opportunities. These considerations are even more important in government departments or agencies, where broader public good and the need to demonstrate responsible usage of taxpayer funds are always paramount. Open source technology presents itself as a viable alternative to proprietary software and offers best little opportunity cost and trade offs. Open source software technologies offer genuinely collaborative innovation, at a fraction of cost, and provide robust and secure solutions. This paper presents a study of the open source software penetration in Australian state governments departments, and puts into perspective the value that open source software can add to these departments. It examines why the adoption of OSS for e-government is successfully utilized elsewhere but not in Australia.

Keywords

Open source software, proprietary software, software adoption, government.

INTRODUCTION

During the last ten years, Open Source Software (OSS) has emerged as an attractive option for delivering e-government technical infrastructure. 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 system and application software. Research into OSS has gained momentum in recent years. Much of this has focussed on software development, as well as the coordination and collaboration processes associated with the OSS development process. Comparatively little research has been done into the social processes, work practices, and organizational contexts that are necessary for the successful implementation of open source software into different operational settings. Consider, for example, the inherent tensions that arise between the philosophical freedom of open source and the institutional constraints of government departments. 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. The contrast between the dynamic supplier community and conservative user community gives rise to some important research issues. 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 such as, availability and cost of support; software reliability; and maturity and longevity. Due to these existing research gaps into utilisation of OSS in government departments, value profile of OSS is still being established in government. As a result, although there are many national governments around the globe that have successfully implemented and utilised OSS to provide service to general public (for example Brazil), yet there are many countries where OSS is yet to make substantial penetration into government departments. However, there is growing evidence that non-governmental profit organisations across India, China, Eastern Europe, South and Central America, companies are dominantly using open source to create enormous wealth (San 2008).

OSS with its features and development culture appears as a viable option for government departments and 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. 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 is becoming more technology savvy. General public's demands like faster service, one stop solution, and independence of temporal and physical constraints are some of the pressures that are forcing governments to look towards OSS as a cost effective and robust solution to address these challenges. It is, therefore, essential to establish the value profile of OSS in government departments. This paper presents a study of the open source software penetration in Australian state governments departments, and puts into perspective the value that open source software can add to these departments. It examines why the adoption of OSS for e-government is successfully utilized elsewhere but not in Australia. It starts with the literature review of OSS, which is followed by an assessment of OSS utilisation in government. The paper then presents an account of OSS utilisation in Australian government agencies and discusses the level of OSS utilisation in these departments, their software acquisition and implementation policies, their value perception of OSS, and the issues and problems posed to OSS diffusion in Australian government departments and agencies.

THEORETICAL FOUNDATIONS OF OSS

The unique quality of OSS is a development culture that harnesses open development from wide community and decentralized peer review; thus the development process is effective in lowering software production cost and improving the software quality (Raymond 2001). According to his book, "The cathedral and the bazaar", Raymond (2001) draws an analogy between "The Cathedral" (Proprietary Software) and "The Bazaar" (OSS), where "the Cathedral" development is carefully crafted by individual "wizards" in an isolated work place and there are no beta releases on this development style since everything has been fixed to a single plan, single point of focus, or even single mind (Zeitlyn 2003). On the other hand, "The Bazaar" style is similar to the common meeting place, when everybody adds different things to the interaction, like minded community congregate and talk, and disseminate important information within the development community (Raymond 2001; Zeitlyn 2003). 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 (Latterman and 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).

In proprietary software project development, programmers are commonly motivated by money as an incentive for their working efforts. However, in the OSS development concept, the reason is not money as an incentive for the contributors' motivation (Figure 1). In OSS a programmer or a group of programmers develop the core of an application and make its source code available to wider developer community. This open access helps in identification and fixing of bugs, as well as enhancement of the software in terms of features, capabilities, and security. At the same time, the open access also attracts critique on the software from its users, reviewers, and evaluators, which helps in a comprehensive feedback to original developers and developer community at large. This paves the way for enhanced and more capable versions of the software. Nevertheless, according to Woods and Guliani (2005), the three most significant strengths of this software development model are:

- a. Faster development due to large number of developers available and at lower production cost.
- b. Flexible and close to user requirements, since it is developed by wide community, the resultant software will serve several common needs.
- c. Improved developer's skills through interactions between developers of varied experiences

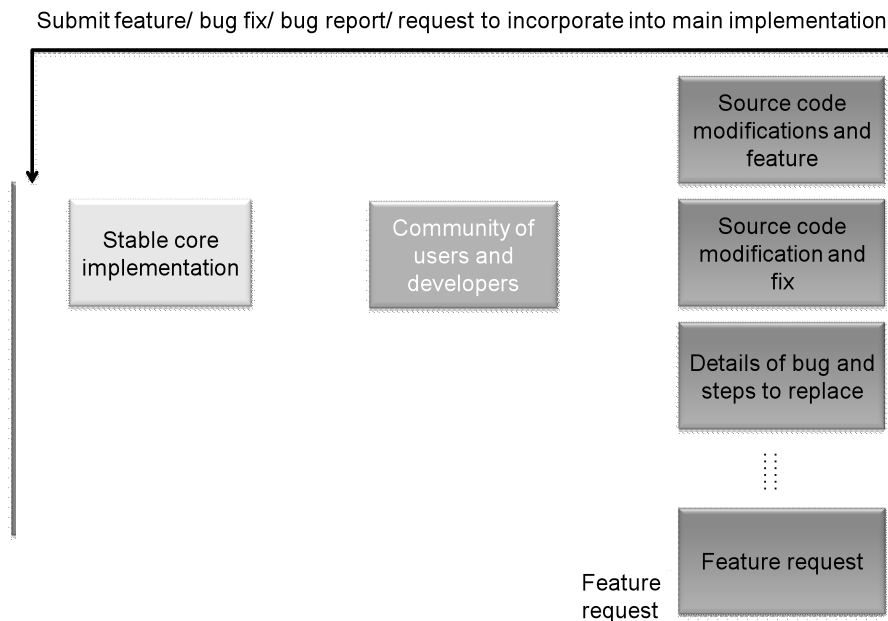


Figure 1: OSS Development Cycle (Alexy and Henkel 2006)

Though like every other thing in this world, there are issues with the development culture of OSS. Godfrey & Tu (2000) summarise the two major issues as,

- a. Scheduling, there is little commercial pressure on the market that enables open source development projects difficult to be scheduled since it is related to the satisfaction level of the project owner and the contribution level of communities.
- b. Code quality standard, wide global contribution can be a beneficial in terms of time and performance quality. However, it is difficult to ensure the particular code standard within open source software development since everyone has different coding style.

OSS projects are developed through communities of interests that evolve a governance structure around the project lifecycle. OSS governance model requires leadership and trust to ensure sustainability of project (Hamel 2007). This governance structure in open source community simply starts from individual motivations that interact into one social control mechanism (Latterman and Stieglitz 2005; Sandred 2001; Vujovic and Ulhoi 2008). This social control creates conformity for certain moral and cultural rules within the development community (Latterman and Stieglitz 2005). Thus, there are two types of social control activities within Open Source projects: direct governance and indirect governance. Direct governance is a social control that ensures the quality of project by doing direct inspection or monitoring tasks. On the other hand, indirect governance is based on output result from development. The governance mechanism within each stage of OSS lifecycle cannot be the same. Due to scale of project development, every stage has a specific governance focus, structure, and coordination to ensure the sustainability of open source project (Table 1).

	Introduction	Growth	Maturity	Decline or Revival
Focus	Idea Generation	Expansion	Stability	Adaption
Structure	Completely informal	More formal, centralized	Somewhat formal, decentralized	Slightly formal but less adherence
Division of Labor	Generalists	Some specification	Highly decentralized	Less specialized
Coordination	Informal one on one	Technology Introduction	Formal technology intensive	Formal but less adherence
Examples	Dam, HTM Larena plus accessibility	Eclipse, Typo3	Linux, Apache, Mozilla	Gnutella

Table 1: Governance details within each lifecycle stages (Latterman and Stieglitz 2005)

In open source development, the author of the original code mostly bequest his/her intellectual property to society without thinking of return from the code. Open source development culture is also identical with parents relationships with their kids (Zeitlyn 2003). In analogy, parents always give everything to their kids without

expecting any return. Researchers (Alexy and Henkel 2006; Kovacs *et al.* 2008; Taylor 2004) attribute various other benefits with OSS, such as

- a. Acquisition cost of OSS is generally lesser than proprietary software and may even be completely free of cost and thus may eliminate the financial burden of proprietary licensing schemes.
- a. Reduced vendor lock-in contracts, since OSS is freely available for download. Support is generally free, and where it is commercially provided it is available at a lesser cost. Proprietary software is generally bundled together with additional update and maintenance costs. Thus, the vendor may charge more for updates available within specific software support. At the same time, closure of vendor may lead to the unavailability of support for the software. In open source, even though original developers may cease to participate in development effort, the knowledge is still kept within society.
- b. Open source enables global development effort that maximizes the potential of software by integrating various programming skills of all contributors and thus enhances reliability of the software.
- c. The availability of source code enables end users to improve functionality or modify the software to specifically fit-in with their own needs. Personal customizations also enable sense of belonging and full performance measurement among end users.
- d. Wide development culture enables OSS to grow and enable programmers to work together to produce a secure software. Some contributors act as bug finders and communicate them through forums to let other programmers fix up the problem.
- e. Most OSS are open standards compliant, which means open interoperability with other systems. Open standards feature enables simple interoperability with other systems without the need of additional integration software or systems modification.

However, these benefits demand certain requisites, which according to Woods & Guliani (2005) are,

- a. Develop and maintain skills required to install and configure open source. Since open source may be different from common proprietary software design, it is important to learn some skills to develop and maintain specific OSS.
- b. Increase software development skills; since not all vendors provide support for OSS. It is important to have in-house development skills.
- c. Become expert in evaluating the maturity of open source software. Proprietary software ensures that software is launched fully tested and ready to use. However, OSS development produces software in a relatively shorter period of development. It is important to always monitor and measure the maturity of the version before implementation.
- d. Improve understanding of technology requirement of the business; since OSS is more flexible and not designed for specific business requirement. It is important to understand the technology requirement of the business first before the appropriate OSS is chosen.
- e. Understand and manage open source licensing issues. Various licensing schemes are available within open source software, therefore, it is important to understand the licensing mechanism and choose the license that is most suited to the needs of user or business.

OSS is not just about free software solution, even though financial reasons account for many of OSS implementations. OSS has comparative edges against proprietary software in various other aspects such as, technical benefits, and ease of utilisation. According to a 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 and Guliani 2005). In proprietary software, software quality testing is limited within a controlled environment and specific scenarios (Lerner and 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. 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. 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).

OSS AND GOVERNMENT AGENCIES

The Australian governments (federal as well as state) do not have a significant agenda for implantation of open source in government agencies. 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. OSS, however, 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. OSS needs to be seen within the context of a government agency's priorities, i.e. the provision of high quality government services to citizens, businesses or other agencies. Aiming for a more efficient and effective execution of these services is then often associated with digitising a process (e-government), i.e. increasing the speed of accessing and forwarding information as well as having a better oversight of what information is actually available (Reimer, Hack, and Streit 2008). Towards this goal, the openness of source code is only one means in order to improve government services. Equally important are open standards, open archives, open access and open innovation (Unsworth 2004). Openness in general has shown to promote competition, create markets and foster innovation, all in all desirable effects for the wider industry (Chesbrough 2003; Maxwell 2006).

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. San (2008) explains that, on a macro level, Brazilian President Luiz Inacio Lula da Silva spearheaded a country-wide movement toward open standards, alongside free and open source software to bridge the technology gap between Brazil and wealthier economies. The result is more than 70 per cent of Brazilian enterprises using open source software today, a robust domestic software economy, and tens of millions of Brazilians participating on the network - opening new markets, new online bank accounts, creating new Internet businesses, and engaging in the political and electoral process, many for the first time. 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 Australian state government jurisdictions.

RESEARCH METHODOLOGY

This exploratory research employs an interpretive epistemology with a qualitative perspective. It is obvious that the issues relating to OSS in government agencies are multifaceted and require a broad and flexible perspective for comprehensive examination. It includes investigation of implementation as well as an assortment of others dimensions such as technical, organisational, social, and cultural. The aim of this research is to explore the issues and impediments to maximising OSS value for government departments in Australian environment. The research question framed for this research is: What value OSS brings to Australian state governments and what factors impede maximising value from OSS adoption in Australian government agencies? In order to address this question, 14 senior managers/directors were interviewed in three Australian state government departments, i.e. New South Wales, Queensland, and Victoria, during November 2008 – March 2009. These interviews were conducted over a one - one and half hours. The interviewees are actually involved in IT strategy making, decision making regarding software procurement, or software development, and represented job descriptions such as Chief Information Officers, Directors/Project Officers ICT sourcing, Enterprise Architects, and Managers of IT Infrastructure Development. These interviewees, thus, are well placed to provide insights into policy setting and decision making of the senior management and the issues and challenges posed to these policies and decisions at the operational level. The interview questions were open-ended and interviewees had freedom to describe their experiences and problems beyond the scope of the questions. The interviews were transcribed and data from all sources were analysed using typical case study techniques of themes, descriptions and assertions as detailed in Creswell (1998). 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 author. It should also be noted that due to the confidentiality provisions of the ethics approval of the University of South Australia for this research, responses from interviewees are not attributed to job descriptions or individuals, and are credited to their corresponding state.

OSS IN AUSTRALIAN STATE GOVERNMENTS

Among the three states that were the subject of this study, exact usage levels of OSS within different agencies in state governments was mostly unknown. However, no significant implementation of OSS was noted. Whatever OSS is being used is mostly at the backend and there is little OSS presence at the front end. The majority of OSS implementation is in the hosting and development environment, running Suse Enterprise Linux, Solaris, Apache, MySQL & Sidu, OpenSSH, NCFPT or Java. Some agencies have developed solutions which involve large components of OSS or are entirely based on open source. For example, The New South Wales's Judicial Commission hosts its entire backend systems with open source. The application framework includes Linux/Apache/PostgreSQL/OpenLDAP with an in-house developed search engine. This system is also being used by two other states. Queensland State Government has developed a Smart eDA initiative, which is supported by the Local Government Association of Queensland (LGAQ). This initiative delivers Integrated Development Assessment System (IDAS) as an interactive internet based service. It is a modular platform with OSS utilisation in various modules, i.e. Orchestration services, including Apache Axis; presentation services, including J2EE based web applications; process and workflow services, including intalio BPM suite, BPMN, BPEL; development and deployment services, including Eclipse, Subversion, Maven; and management services, including Hyperic application management. Victoria, however, is the state with least OSS utilisation in government departments, where some departments are using OSS based content management systems and web serves.

In Australian environment, there are no standardised guidelines for software procurement. However, there are broad guidelines from Australian states' treasuries that govern the financial aspects 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 implies that proprietary products like Microsoft's Sharepoint or MS SQL do not incur any licensing costs to an agency if there is an enterprise agreement in place. Hence, in these circumstances the agency would actually prefer the proprietary software because support costs would not strain their budget (Queensland). However, almost all interviewees agreed that up-front expenditures are only small part of all costs involved when taking the full lifecycle of software into account. Total cost of ownership, products' compliance with industry standards, and the availability of ongoing vendor support were most frequently cited as additional selection criteria by most of the interviewees. 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, commented that agencies should concentrate on ICT (Information and Communication Technologies) services rather than ICT products. Types of technology and its investment related decisions would then be irrelevant as long as the specified business needs are covered. In doing so, the choice of technology would 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 the absence of suitable proprietary solutions, agencies in New South Wales use open source components; however, they look for open standards compliant options and adapt them to their core business. It was also pointed out that the enticing factor for choosing the open standards compliance is the flexibility that it grants to developers, rather than being locked-in with one standard.

Most interviewees agreed that open source systems have to overcome a confidence gap that the decision makers face in terms of application robustness and availability of enterprise support. This is often associated with the question of how much risk an agency is willing to accept, and accepting support from non-certified vendors. 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 lack of experience and uncertainty that decision makers associate with projects involving the use of OSS, more documentation and ongoing communication is needed to get the necessary management approval (Queensland). An interviewee from Victoria stated that "we don't aim to use OSS or otherwise. We evaluate each system on its own merits. The State Government's Services Group has been considering officially supporting MySQL as a database platform, as well as re-evaluating all options around the desktop and productivity applications. At the same time software as a service is also gaining traction. Whether this results in more OSS use, remains to be seen." Almost all 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). During the interviews, a common theme that emerged from all the three jurisdictions was the feeling that running OSS requires detailed knowledge about licensing mechanisms and an extra effort is needed to organise enterprise support for less common OSS applications.

Almost all the interviewees were aware of advantages that OSS provides to government agencies. However, it was not surprising that all the agencies focused on financial and operational aspects more than the organisational aspects of OSS. For example, OSS was seen as a viable solution to interoperability, which was identified as the most significant issue within different government departments in a state as well as between different states. Apart from this, most interviewees agreed that since OSS is build for interoperability, it allows them to move from one product to another if necessary, i.e. OSS avoids or eliminates vendor lock-in. This reduction in dependencies is also acknowledged to give rise to the availability of software development expertise locally. However, since many government departments support major vendor's products for policy or political reasons, 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, that is just a slice of the overall cost profile of a software, since most costs are incurred after its uptake. The interviewees highlighted that for them the use of open standards is much more attractive than open source, since that helps them with interoperability and integration. 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 and have been successfully running Australia's largest trial court system (New South Wales).

Proprietary software is not updated frequently; open source, on the other hand, is subjected 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 other 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 based 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 (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 exists 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 if content management system is to be implemented in agencies state wide, a substantial obstacle to innovation is operational cost. Even if there are no up-front purchasing costs, the ongoing development costs are to be paid for by the first agency that asked for it. However, 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).

DISCUSSION

It is clear that OSS presents itself as an economically advantageous, reliable, and flexible alternative to proprietary software systems. However, success of OSS in Australian government agencies is contingent upon critical aspects such as, confidence level in OSS; appreciation of its technical and economic value; and maintainability and availability of support to sustain its utilisation. This study reveals that there is no concerted effort for OSS implementation in Australian government agencies. At the same time, the confidence level in OSS has a fair way to go before it is considered seriously. Although, OSS has been used successfully in the judicial system in New South Wales, yet the other instances of OSS implementation have been limited to narrow work areas and have not been hailed as success stories. It should also be noted that the software procurement is tilted towards proprietary software, due to policy or political considerations. One of the senior participants in the study commented that there has to be a good business case to displace Microsoft products from its current position in the IT infrastructure in out department. However, it was also revealed that IT infrastructure development in Australian government agencies has also been in reactive mode rather than proactive, which is why there are no standard guidelines regarding software procurement in government agencies. As a result, governments have not felt the need to think outside the box and experiment with the idea of OSS. It may also be due the fact that value proposition of OSS in Australian government has not been established, not only for the government use but also for the wider industry, e.g. the local developer community and the public economy in general. An important point highlighted during this study was to take ICTs as a service rather than a product which will help in a paradigm shift towards the use of IT as an enabler of e-government initiatives. At the moment it's the software, rather than the service that it enables, that governs the decision making process of software procurement. That is why, it is evident from the study that there is considerable recognition of OSS's advantages and benefits, yet no clear direction exists about its utilisation.

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 this study, and the 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. There are relatively small scale incidences of OSS utilisation evident in different government agencies, however, a full scale policy to utilise advantages of open source phenomena is missing. In these circumstances, it is important to bring together these isolated ventures and create a cross-jurisdictional knowledge clearinghouse to advance and support the uptake of OSS in government, when it is strategically and economically beneficial. 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. This form of collaboration can be supported by vendors, but it is the community that drives development according to their needs. Community sourcing can be seen as a sub-set of the open source development model, except that organisations rather than individuals commit to a development project. Typical community source projects like uPortal should serve as good examples, whose development is sponsored by more than 40 universities in collaboration with IBM and Sun, and dSpace, an institutional repository system, a development project initiated by MIT and Hewlett-Packard Labs. Research has shown that with increasingly complex forms of knowledge, social links are more effective than databases in disseminating knowledge to other organisations (Hansen, Nohira, and Tiemey 1999). It will, therefore, be extremely beneficial to bring together Australian universities, government agencies, and major vendors to create a partnership that drives OSS development, so as to provide support to development initiatives geared at creating a quality and robust technical infrastructure for government agencies. The concept of inter-institutional cooperation on intellectual and financial resources creates mutually beneficial software (Wheeler 2004). Moreover, an open source community of practice could have additional benefits, such as, promoting a consistent understanding of OSS and its implications in terms of intellectual property rights and sharing; fostering best practice in OSS applications which is a crucial part of managing the risks associated with OSS (e.g. by having a trouble shooting database); and encouraging re-use of proven OSS applications in order to utilise existing skills more efficiently.

CONCLUSION

This paper has highlighted why OSS has not made any inroads into Australian government agencies or departments, whereas it has been successfully implemented and utilised in different countries of the world. This paper analysed the issue of OSS in Australian government agencies from three angles, i.e. procurement and selection of OSS, current level of OSS usage, and managing the risks and benefits of OSS. In doing so, it highlighted that an efficient advancement of open source needs to be approached within the context of an agency's business processes and ongoing ICT related projects. After analysing the potential of OSS and the current level software procurement utilisation practices, this paper proposed a community of practice to be formed between government agencies, universities, and government agencies in order to share operational knowledge and expertise, software artefacts, pool funding, and coordinate cross-agency trials. OSS recognition in Australian government agencies will greatly profit from such collaboration, where vendors, government agencies, and universities, as well as wider software developer community share their efforts and experiences to create effective software solutions for governance Australia. This would help the efforts towards recognition of OSS as an efficient and cost effective alternative to proprietary software for creating an e-governance infrastructure, as well as rally support for its enhancement and on going maintenance and support.

REFERENCES

- AGIMO. 2005. A guide to open source software for Australian government agencies. Retrieved 14 April 2009, from http://www.finance.gov.au/publications/guide-to-open-source-software/docs/A_Guide_to_Open_Source_Software.pdf
- Alexy, O., and Henkel, J. 2006. Promoting the penguin: who is advocating open source software in commercial setting?, Technische Universitat Munchen, Munchen, Germany.
- Banda, R.K.J. 2005. *Open source software: an introduction*. ICFAI University Press, India.
- Chesbrough, H.W. 2003. *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press, MA.
- Creswell, J.W. 1998. *Qualitative inquiry and research design: choosing among five traditions*, Sage Publications, UK.

- Gartner, 2007, Hype Cycle for Open-Source Software – 2007, ID Number: G001489202007, USA.
- Godfrey, M.W., and Tu, Q. 2000. *Evolution in open source software: A case study*. Software Architecture group (SWAG), Department of CS University of Waterloo.
- Haider A, and Koronios A. 2008. 'Issues of open source software uptake in Australian government agencies', *The 10th IBIMA conference on Innovation and Knowledge Management in Business Globalization*, 30 June - 2 July 2008, Kuala Lumpur, Malaysia.
- Hamel, M.P. 2007. 'Open source collaboration in the public sector: the need for leadership and value', National Centre for Digital Government working paper, Retrieved 13th June 2009, from <http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1024&context=ncdg>
- Hansen, M.T., Nohria, N., and Tierney, T. 1999. What's your strategy for knowledge management? *Harvard Business Review*, (77: 2), pp 106-116.
- Kovacs, G.L., Drozdik, S., Zuliani, P., and Succi, G. 2008. 'Open source software and open data standard in public administration'. *Proceedings of IEEE Computational Cybernetics*, 2004. ICC 2004. pp. 421-428.
- Latteman, C., and Stieglitz, S. 2005. 'Framework for governance in open source community'. *Proceedings of 38th Hawaii International Conference on System Sciences*, Hawaii.
- Lerner, J., and Tirole, J. 2002. 'Some simple economics of open source'. *Journal of Industrial Economics* (50:2), pp. 197-234.
- Maxwell, E. 2006. 'Open Standards, Open Source, and Open Innovation: Harnessing the Benefits of Openness'. *Innovations: Technology, Governance, Globalization* (1: 3), pp. 119-176.
- Mockus, A., Fielding, R.T., and Herbsleb, J.D. 2002. 'Two case study on open source software development: apache and mozilla'. *ACM Transaction on Software Engineering and Methodology* (11: 3), pp.309-346.
- Ouédraogo, L. 2005. Policies of United Nations System Organizations Towards the use of Open Source Software (OSS) in the Secretariats, Report No. JIU/REP/2005/3, United Nations, Geneva.
- Raymond, E.S. 2001. *The cathedral and the bazaar* (Revised ed.). O'Reilly Media, Inc. Sebastopol, CA.
- Raymond, E.S. 2003. Jargon File: the new hacker dictionary. Retrieved 11 October 2008, from <http://www.catb.org/~esr/jargon/>
- Reimer, U., Heck, U., and Streit, S. 2008. Collaboration-Oriented Knowledge Management Using Interaction Patterns. **Lecture Notes In Artificial Intelligence; Vol. 5345, Proceedings of the 7th International Conference on Practical Aspects of Knowledge Management**, pp. 26-37.
- San, G.B. 2008. 'In praise of open source', *The Business Times*, weakened edition, 8th November 2008, Singapore.
- Sandred, J. 2001. *Managing open source project*. John Wiley & Sons Inc., Canada.
- Simon, K.D. 2005. 'The value of open standards and open source software in government environments'. *IBM Systems Journal* (44: 2), pp. 227-238.
- Taylor, P.W. 2004. 'Open Source: open government', Centre for digital government. Retrieved 10 may 2009, from http://media.centerdigitalgov.com/reg2view/CDG04_OpenSource.pdf
- Unsworth, J.M. 2004. 'The Next Wave: Liberation Technology'. *The Chronicle of Higher Education* (50: 21).
- Vujovic, S., and Ulhoi, J.P. 2008. 'Online innovation: the case of open source software development'. *European Journal of Innovation Management*, (11: 1), pp. 142-156.
- Wheeler, B. 2004. 'Open Source 2007: How Did This Happen?' *EDUCAUSE review* (39), pp. 12-27.
- Woods, D., and Guliani, G. 2005. *Open source for the enterprise* (1st ed.). O'Reilly Media Inc., Sebastopol, CA.
- Zeitlyn, D. 2003. 'Gift economies in development of open source software: anthropological reflection'. *Research Policy*, (32), pp. 1287-1291.

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