

# Challenges affecting the OSS adoption rate in the SA government

Jabu Mtsweni<sup>1</sup>, Elmarie Biermann<sup>2</sup>

<sup>1</sup>Dept Computer Engineering, Tshwane University of Technology, Pretoria, [MtsweniJ@tut.ac.za](mailto:MtsweniJ@tut.ac.za)

<sup>2</sup>F'SATIE, Tshwane University of Technology, Pretoria, [Biermanne@tut.ac.za](mailto:Biermanne@tut.ac.za)

## Abstract

*The Open Source Software (OSS) market is growing across all domains of information technology in both the public and private sectors. The South African (SA) government also acknowledges that OSS is a viable choice when it comes to software adoption and implementation in the public sector. SA government is also regarded as one of the most progressive countries when it comes to advocating the use of Open Source Software (OSS) and this is evident by the approval of the OSS policy and strategy by the Cabinet. Although the discussions regarding the adoption and the implementation of OSS in the government sector began as early as in 2000, it still does not appear that OSS is widely used within the SA government. SITA has also acknowledged that the process of implementing OSS within government departments is not progressing without challenges. Mark Shuttleworth further indicated at the GovTech'07 Conference, that the SA government is lagging behind other countries with regards to OSS implementation. The key objective of this paper is to provide some insight into the challenges and issues hampering the implementation of OSS within the SA government. This is achieved through an empirical analysis of an extensive survey conducted from November 2007 to March 2008 amongst all national governmental departments. The findings provide valuable insights into the challenges and obstacles hampering OSS adoption rate within the SA government. The paper concludes by suggesting some guidelines that can assist in dealing with the challenges affecting the implementation of OSS within government departments.*

**Keywords:** South Africa; open source; adoption rate; government; open source policy

## 1. Introduction

The South African (SA) government acknowledges that open source software (OSS) is a viable alternative for proprietary software (PS), in particular when it comes to software adoption and implementation in the public sector (SA, 2006). On a strategic level, the SA government has progressed quite well, for instance an OSS policy is now in place indicating that the SA government is on the positive route towards full OSS implementation. Moreover, according to SITA (SA, 2002) and Vital Wave Consulting (2006:2), the SA government is one of the largest procurers of

Information and Communication Technologies (ICTs) in Africa. The expenditure for proprietary software licenses amounts to R3.7 billion annually and most of this expenditure is channelled to foreign companies (Gopalakrishnan, 2006) such as Microsoft. In 2006, the OSS working group (GITOC) proposed extensive targets for OSS implementation within the SA government (Vital Wave Consulting, 2006:4). These targets were stated in terms of state budget (10% of ICT expenditure in government for 2006); installations (60% of web servers running on OSS and 30% of desktop applications; skills level of key personnel). So far, few government departments and agencies that are in the process of migrating fully to OSS include SITA, CSIR, and South Africa Receiver of Revenues (SITA, 2007; Archibald, 2007; Vital Wave Consulting, 2006).

Although it is a challenge to acquire reports that discuss the current status of OSS implementation within the SA government, it is evident within the open source community that not much had actually been achieved over the last few years (Archibald, 2007). This is further supported by Mark Shuttleworth, who at the GovTech'07 conference, mentioned that the SA government was lagging behind other countries who indicated their intentions to move towards OSS at the same time.

The overall objective of this study is to determine the challenges encountered by the SA government departments when implementing OSS within their respective environments. This is achieved through a quantitative approach, whereby a secured online survey was conducted amongst national government departments, mostly based in Pretoria. The survey aimed at the following objectives:

- Investigate the current status of OSS usage within departments both on the server and desktop environment.
- Determine the benefits and challenges influencing or inhibiting OSS implementation within government departments.

In the following sections of this paper, a general background on open source is concisely discussed. Then, we consider the SA OSS policy, including its main justifications as concluded by Government Information Technology Officers Council (GITOC). In addition to that, we explain the survey in detail, including methodologies used. Survey results are then presented, starting with the current status of OSS usage within different government department, mainly focusing on open source applications on the server and desktop. Benefits and challenges affecting OSS implementation are then analysed and interpreted. The paper is then concluded by suggesting OSS implementation guidelines that can assist departments in dealing with the challenges and obstacles as discovered from the survey.

## 2. Background

Although the concept of free software has existed since the early 60's; proprietary software (PS) still attracts great support and usage globally. Nevertheless, internationally, governments adopting and implementing open source software (OSS) are beginning to emerge (Hahn, 2002:4). In particular to realise various OSS benefits such as reducing software costs, growing local IT industries, and bridging the digital divide (SA, 2002; Mampu, 2008). Open source can be described as a collaboration to develop software in a way that maximises the benefit of the software (Gorling 2003:1). In addition, Johnston & Seymour (2005:438) and Waring & Maddocks (2005) simply define OSS as the *software that allow access to its source code, allowing users to modify the software to make improvements, detect and fix bugs, and redistribute the software to others for free or for a small fee*. The basic idea behind OSS is to share knowledge and software products for free, as that enables others to improve upon what has been shared (SA, 2002). On the contrary, proprietary software is owned by individuals or corporations. It is not freely available and cannot be modified as the source code is normally not released into the public domain. Proprietary software attracts annual licensing fees while OSS is based on free licenses.

OSS is generally presented as software that offers better quality, higher reliability, more flexibility, lower cost, and no vendor lock-in. Although the promise does not hold true for all open source applications (Gorling, 2003:52), OSS has proven to offer great benefits to both the public and the private sector (Hahn, 2002:7). This is also proven by the support of OSS by big corporations such as IBM, Novell, Red Hat and recently even Microsoft. Although OSS offers great benefits, there are several challenges that are being experienced within the OSS domain such as lack of support from vendors; security; indirect costs; and usability (Rose, Johnston & van Belle, 2006; Hoepman & Jacobs, 2007).

On the server environment, OSS is widely accepted and implemented as compared to the desktop environment (Brink, Roos & van Belle, 2007). Apache web server has a market share of above 50% of the world's web servers, whilst Sendmail and Postfix servers are regarded as one of the most used mail transporters on the internet (Zuliani & Succi, 2004). Other open source applications such as MapServer; a web based mapping tool and Grass GIS viewer are also starting to be widely implemented both in government and private sector (Kumar, 2007).

## 3. OSS Policy

An OSS policy that mandates SA government departments to choose, adopt, use, promote OSS, and also develop government's software solutions in open source was first drafted by GITOC in 2002 (SA, 2002) and was later adopted by the government in 2006/2007 (DPSA, 2007). The policy details the following five key points:

- **Choose OSS**

The policy states that government departments should adopt and implement OSS unless PS is demonstrated to be superior to OSS.

- **Migrate to OSS**

Whenever OSS alternatives for PS exist, then the departments should migrate from PS to OSS.

- **Develop in OSS**

The policy states that all emerging IT solutions for or by the government should be based on open standards and open source principles.

- **Use open content licensing**

Content produced by the government (e.g. documents and software systems) should be open content and licensed under OSS licenses. If a need to apply PS licenses for government content is warranted such as for confidentiality purposes; then PS licenses can be used (Vital Wave, 2006).

- **Promote OSS in South Africa**

The policy further indicates that the government should create an environment that advocates OSS. The environment should encourage the use of OSS in government, private sector, and within the education sector.

### **3.1 Implementation plan**

A three-phased implementation plan is proposed on how departments should move towards the actual implementation of OSS (SA, 2002). The plan spreads over a three (3) year period before reaching the mature phase. The plan recommends a gradual OSS adoption approach, but does not highlight or recommend suggestions to obstacles or challenges that might be encountered during the actual implementation of OSS.

### **3.2 Policy justification**

The main reason for moving towards OSS within the SA government revolves around costs savings (DPSA, 2007); where license costs and software acquisitions costs can be minimized; thus channeling additional funds into projects such as growing local IT skills, in particular software development. Other reasons that are cited within the OSS policy include improving security of government software, and minimizing vendor lock-in.

## **4. Survey administration**

An adaptive online questionnaire was prepared using LimeSurvey. LimeSurvey is a dynamic OSS-based survey system, with options to create various types of questions. The prime purpose of designing the questionnaire was to gather extensive data that would assist in achieving the objectives of this study. The questionnaire was structured into five (5) sections, namely: organizational profile (1), ICT infrastructure (2), OSS usage, benefits, and challenges (3), planning

to adopt OSS (4), and OSS training, support, participation and development (5). The complete questionnaire can be obtained from the authors. The questionnaire consisted mainly of close-type questions, with most questions having pre-defined alternatives with an option to type in *other* unavailable choices. The target population for the survey was mainly the national government departments and agencies such as SITA and CSIR. Within the departments, ICT directors/managers were targeted, as we viewed them as key informants, who are extensively involved with regards to IT systems and solutions used within their departments. In total, forty (40) departments including agencies were surveyed. Prior to sending the survey link to participants, departments were contacted telephonically in order to get direct contact details (email address and telephone numbers) of ICT directors. The survey link was then e-mailed directly to the participants. It was an anonymous survey and could only be completed once through the use of tokens and cookies. At the end, thirty-one (31) completed surveys were recorded out of forty (40) surveys sent out.

## 5. Current Usage

In this section, descriptive statistics are discussed with the view of highlighting the current status of OSS usage within the government departments.

In general, most (23 out 31) government departments indicated that they are using OSS in any form. This indirectly suggests that most departments are aware of OSS. However, the study discovered that on the desktop side, proprietary software is widely used, in particular Microsoft operating systems such as Windows XP. As depicted in Figure 1, 97% of respondents indicated that on their desktop machines, Microsoft operating system was being used. Only 35% of government departments indicated usage of Linux operating systems on their desktop machines. The study did not focus on the versions of operating systems being used

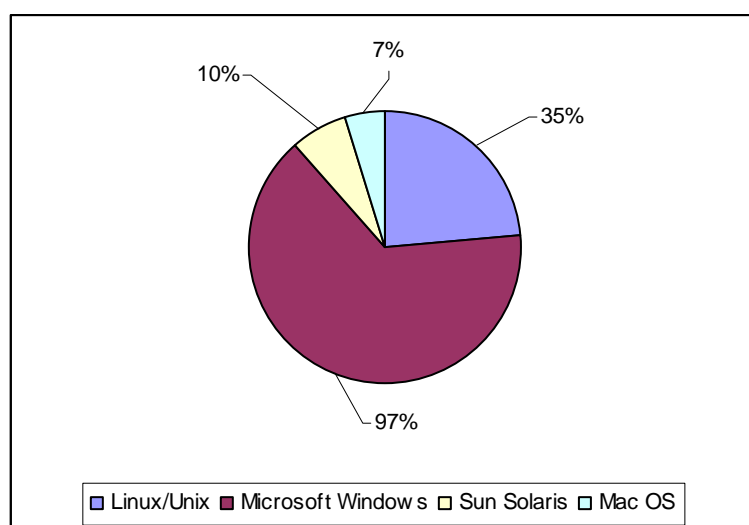


Figure 1. Operating Systems on desktop computers

In order to understand the level of usage on the desktop side, the study also investigated the usage of other OSS applications. Table 1, describes the usage of OSS applications on the desktop side. Only 12 departments out of 31 are using OpenOffice.org, which is considered a viable alternative for Microsoft Office. For web browsing, Mozilla Firefox seems to be used comparably with other proprietary web browsers such as Microsoft Internet Explorer.

Table 1. OSS desktop applications used within government

Desktop Applications	Departments Using	Percentage
OpenOffice.org	12	38.71
KDEOffice	2	6.45
SquirrelMail	1	3.23
Mozilla Thunderbird	12	38.71
Mozilla Firefox	17	54.83
Konqueror	6	19.35
Lynx	1	3.23

On the server side, the results indicated high usage (74%) of Linux operating system within the departments that responded as using OSS in any form. It is also important to note that although Linux/Unix operating system is widely used on the server side; proprietary operating system such as Windows 2003 dominates the server environment across government departments with 94% of the department indicating usage. Even though Linux operating system has a great market share within government departments, other OSS applications are not used extensively. Nevertheless, OSS applications on the server-side such as MySQL database and Apache web server are widely deployed in government servers. Table 2 shows OSS usage on the servers within different government departments. Although the SA government planned a project in 2005 to implement Grass GIS viewer (Levin, Ackerman & Neville, 2005); a desktop based open source geographical information system, for the purposes of enabling the public to access GIS data such as maps; from our results, no department indicated to be using any open source based GIS tools both on the server and desktop side.

Table 2, OSS applications on different servers

Server Type	Open source	Departments	%
Mail	SendMail	4	12.90
Web	Apache	13	41.94
	Tomcat	5	16.13
Database	MySQL	20	64.52
	PostgreSQL	3	9.68
FTP	FileZilla	2	6.45
	ProFTP	2	6.45
Proxy	SquidProxy	9	29.03
	Linux Proxy	1	3.23
File/Print	Samba	7	22.58
	HTTP	3	9.68
	CUPs	1	3.23
Application	JBoss	1	3.23
Telnet/SSH	OpenSSH	2	6.45

According to the results, only three (3) departments have been using OSS for more than five (5) years. 65% of the departments who indicated some OSS usage have been using OSS for at least a year and at most for two years. This suggests that many departments are actually at the early stages of OSS implementation.

## 6. Benefits and Challenges

One of the objectives of this study was to determine the benefits and challenges that affect OSS implementation within government departments. In our survey, we questioned why departments were using OSS, especially if a respondent indicated some OSS usage. We also determined the challenges that departments were experiencing when migrating to OSS. With regards to the benefits question, compliance to government OSS policy was indicated as the main reason for using OSS by at least 87% (21 out 23) of the departments. Cost savings was chosen by 57% of the departments using OSS. Freedom of use and better performance share the same percentage (52%). Other benefits cited by the respondents and were not part of the pre-define list are security (4%), interoperability (4%), and availability (4%).

With regards to the “*challenges question*”, a list of challenges was compiled by selecting common challenges mentioned by various researchers for example (Waring & Maddocks, 2005). Respondents were also permitted to enter additional challenges next to the *other* option. Our investigation indicates that OSS non-compatibility with PS is the main challenge that government departments (83%) are facing in moving towards OSS (see Figure 2). Other challenges indicated as hampering OSS implementation are lack of support (26%), migration costs (17%), lack of approved standards (17%), and User resistance (35%).

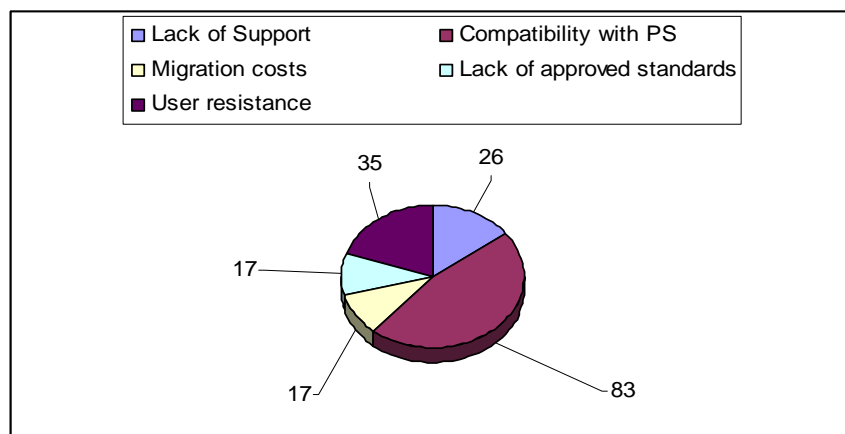


Figure 2. OSS implementation challenges in government

Although OSS adoption enablers and barriers have been fairly researched, not much investigation has been conducted, specifically focusing on the government sector. Nevertheless, the benefits and challenges discovered from the survey are consistent with the ones found in literature such as those by Rose, Johnston & van Belle (2006) and Munoz-Cornejo, Seaman, and Koru (2008). Although

some of the challenges found in literature are only relevant to the private sector, there are those that are directly relevant for OSS implementation in government such as lack of OSS support and training. The following section concludes this study by proposing implementation guidelines that can assist departments in minimizing the challenges discovered.

## **7. Recommendations and Conclusions**

From our study, it is evident that on a strategic level; the SA government is supportive of OSS, but on a technical level; OSS usage is minimal across all departments, in particular on the desktop side. In order to realise the benefits that OSS offers, it is essential that the challenges hampering smooth OSS implementation in government be minimized if not subdued. Even though OSS promises various benefits, it is not easy to implement in a bigger environments such as in government. It is usually recommended that for OSS implementation to be successful, a gradual approach must be followed. However, even with a gradual approach, it has been shown that OSS implementation usually comes with obstacles and challenges, in particular where proprietary software has been dominating.

In order to contribute to the elimination of the challenges reported above, we suggest that government departments start off their implementation process by comparing all OSS alternatives available for their environment with current proprietary solutions, in particular focusing on functional and technological requirements, costs implications, systems interoperability, and training requirements. We further suggest that in order to minimize the non-compatibility issues, it is important for departments to thoroughly train and re-skill their IT staff for OSS support and development. To ensure that OSS support is available even to the IT staff, it is vital to create partnerships with well established OSS companies and organizations. OSS in-house development is also encouraged, since that could likely grow internal OSS development skills and enable departments to modify non-compatible OSS. In order to ensure that user resistance is at the lowest, we recommend that government departments involve all relevant stakeholder including end users, in particular when implementing OSS within the departments. It is our view that if OSS implementation is mandated by government and reasons and benefits are communicated to users regularly, then user resistance can be lowered. In order to minimize migration costs involved when migrating to OSS, we suggest that before embarking on a complete OSS implementation, pilot projects on few selected sections be conducted. Pilot projects are recommended as they enable departments to understand if selected OSS alternatives are feasible to implement and also to experience likely problems that come with using selected OSS alternatives.

Finally, the above guidelines are recommendations and from the research point of view, they have not been practically tested. However, OSS have been implemented successfully in other countries by following simple guidelines similar to the ones suggested.



## 8. References

- Archibald, J. 2007. SA government's OSS plans revealed. *Tectonic*, 23 August, viewed 20 September 2007, <http://www.tectonic.co.za/view.php?id=1684>
- Brink, D., Roos, L., Van Belle, J.P. 2007. A model for successful migration to desktop OSS in St-Amant & Still, B. (Eds) *Handbook of Research on Open source software*, Information Science Reference, Herschey (NY), pp. 154-167. ISBN 978-59140999-1
- Department of Public Service and Administration (DPSA). 2007. *Policy on Free and Open Source Software use for South African Government*, viewed 22 September 2007, [http://www.doc.gov.za/index.php?option=com\\_docman&task=cat\\_view&gid=81](http://www.doc.gov.za/index.php?option=com_docman&task=cat_view&gid=81)
- Gopalakrishnan, J. 2006. Lessons in open source wisdom from South Africa. *Linux for you*, April 6, viewed 12/02/2007, <http://www.meraka.org.za/docs/GOSC.pdf>
- Gorling, S. 2003. *A critical approach to open source software*. Masters thesis, Royal Institute of Technology, Stockholm.
- Hahn, R.W (ed). 2002. *Government policy toward Open Source software: an overview*. US: Brookings Institution Press, Washington DC.
- Hoepman, J. & Jacobs, B. 2007. Increased security through open source. *Communications of the ACM*. Vol 50, no 1, pp 79 – 83.
- Johnston, K.A. & Seymour, L.F. 2005. Why South Africans don't floss? *Proceedings of the International Business Information Management Conference (IBIMA)*, 438-446, July, Lisbon, Portugal
- Kumar, VR. 2007. *Free and open source GIS*, viewed 19 July 2007, <http://www.space-kerala.org/fsc/index.php/Fsc/FreeAndOpenSourceGIS>
- Levin, A, Ackerman, K & Neville M. 2005. *A report from the Go open source task team conference*, viewed 25 July 2008, [http://radian.co.za/fossconference/GOSS\\_TTC\\_final1p14.pdf](http://radian.co.za/fossconference/GOSS_TTC_final1p14.pdf)
- Mampu, 2008. *The Malaysian public sector open source software master plan: phase II - accelerated adoption*, viewed 20 May 2008, <http://www.mampu.gov.my/seminar%20ict/kk2-OSS.pdf>
- Munoz-Cornejo, G., Seaman, C.B & Koru, A.G. 2008. An empirical investigation into the adoption of open source software in hospitals. *International Journal of Healthcare Information Systems and Informatics*. Vol 3, issue 3, pp 16-37.

Rose, M., Johnston, K. & Van Belle J. 2006. Barriers and enablers of OSS-on-the desktop adoption. In: *Proceedings of Conference on Information Science and Management (CISTM)*, held in India on 16-18 July. Chardigarh

SITA. 2007. *Introducing the SITA free Open source software project office Open source booklet*. Internal document.

South Africa (SA). Department of Public Service & Administration. 2006. *Policy on free and open source software use for South African government*, viewed 22 September 2007, [http://www.doc.gov.za/index.php?option=com\\_docman&task\\_doc\\_view&gid=49](http://www.doc.gov.za/index.php?option=com_docman&task_doc_view&gid=49)

South Africa (SA). Government IT Officers' Council Work Group. 2002. *Using Open Source Software in government: a discussion document*, viewed 16 June 2007, <http://www.oss.gov.za/docs/ossreportv2.pdf>

Vital Wave. 2006. The South African adoption of open source: a white paper created by Vital Wave Consulting, viewed 13 May 2007, <http://www.vitalwaveconsulting.com/insights/South-African-Adoption-of-Open-Source.pdf>

Waring, T. & Maddocks, P. 2005. Open source software implementation in the UK public sector: evidence from the field and implications for the future. *International Journal of Information Management*, Vol 25, pp 411-428

Zuliani, P & Succi, G. 2004. *Migrating public administrations to open source software*, viewed 04 August 2008, <http://www.cospa-project.org/Assets/documents/Articles/MigratingPAsToOpenSourceSoftware%20-%20final.pdf>