

Factors influencing the adoption of free and open-source software for electronic records management by municipalities in Gauteng Province, South Africa

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Abstract

The South African cabinet adopted policy recommendations from the Government Information Technology Officer's Council pertaining to Free and Open-Source Software (FOSS). Even though the South African Cabinet has shown support for the use of FOSS through the enactment of a policy, the adoption of open source software in electronic records management seems to be slow. Proprietary software continues to be adopted and used by most public institutions, including local and provincial municipalities in South Africa. Therefore, this study aimed to investigate factors that may influence the adoption and use of FOSS for electronic records management by South African municipalities. The study adopted a qualitative research approach to collect data from 10 purposively selected municipalities in Gauteng. Data were analysed and presented thematically to address the research question. The findings of this study suggest that municipalities in Gauteng are not adopting FOSS for electronic records management as expected. This study established that top management support, reliability, affordability of the software, inadequate capability, contracts with proprietary software providers, organisational culture and organisational support are some of the factors that contributed to the low uptake when it comes to the adoption of Free and Open-Source Software by the municipalities.

Keywords: records management, municipalities, proprietary software, free and open-source software, South Africa

1. Introduction and background to the study

The adoption of free and open-source software (FOSS) has been limited in the management of electronic records by the public sector in South Africa (Ngoepe 2015). Factors that stifle FOSS in the civic sector include contractual obligations with existing vendors, technophobia of records management staff, information technology (IT) literacy among records management staff, adverse policy environment, insufficient training of personnel, inadequate promotion, advertising and awareness, and insufficient technical maintenance (Ngoepe 2015). FOSS is software that is developed, tested, or improved through public collaboration, and distributed with the understanding that it will be shared with others without limitations (Drake 2017).

The concept of FOSS emerged from the convergence of two organisations, namely the Free Software Foundation (FSF) and the Open Source Initiative (OSI) (Free Software Foundation 2018). Open Source Resources (2021) defines FOSS as software with a source code that anyone can inspect, modify, and enhance. Open Source Resources (2021) further emphasises that FOSS is software whose source codes are made obtainable and grant the users the liberty to run, duplicate, disseminate, study and modify the code. Richard Stallman, a long-standing member of the hacker community at the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) in the United States of America (USA) is credited with shaping open-source software in 1983 when he founded the Free Software Foundation (Free Software Foundation 2018, GNU Operating System 2020).

The notion of 'free' in free and open-source software is a matter of software liberty, not price; hence, the software is sometimes called 'libre' software, borrowing a French word for free, as in freedom (GNU Operating System 2020). Although it is not entirely free of charge, when compared to proprietary software, FOSS is less costly than proprietary software, mainly because the licence and the source code are not paid for (Ngoepe 2015). The term 'free' does not imply free of charge. It implies that the software is copyleft and does not have the constraints of copyrights. Ngoepe (2015) defines copyleft as an "arrangement whereby software or artistic work may be used, modified, and distributed freely on the condition that anything derived from it is bound by the same conditions." The term 'free' in FOSS means that the software should respect the user's freedom to run, copy, distribute, study, change and improve. If the software does not grant the user these freedoms, it cannot be recognised as FOSS but rather as proprietary software. Proprietary software is software in which developers solely have the right to run, copy, distribute, study, change and improve them (Drake 2017).

In developed countries, the adoption of FOSS is embraced and used for electronic records management and preservation. For example, in Australia, the national archives have developed FOSS techniques that are utilised for digital preservation and, consequently, it has formed a partnership with the National Library of New Zealand and the United Kingdom Web Archiving Consortium to yield an open-source web archiving technique (InterPARES 2012). In the United Kingdom (UK), the national archives have established a file format registry and a free and open-source software instrument for format documentation utilising the registry. A large-scale cooperative digital preservation project utilising free and open-source repository software was assumed at numerous universities in Britain since 2007 (InterPARES 2012). In the United States of America (USA), institutions have established and disseminated open-source equipment for electronic records management, including software and equipment for format documentation and authentication (InterPARES 2012). Buffett (2014) reiterates that organisational awareness, particularly with technology innovations, influences new technology implementation, especially when considering the adoption of new technology.

Developing countries, particularly African countries, are far behind in FOSS adoption and implementation (Cenatic Foundation 2010). The issue of access to the internet is an obstacle in Africa and it often hampers the adoption of FOSS. As Karume and Mbugua (2012) note, many parts of Africa have little or no internet connectivity. Although the discussions regarding the adoption of FOSS in African countries began around 2000, Oreku and Mtenzi (2013) report that it still appears that FOSS is not widely used on the continent. Amid the prevailing severe economic conditions and high monetary charges of proprietary software (PS), governments in

various countries have turned to FOSS as an alternative. Like many countries around the world, the South African Cabinet ratified and adopted a FOSS policy for government use. The South African government accepts that FOSS is a feasible alternative to proprietary software, and this is made obvious by the Cabinet's endorsement of the FOSS policy (Ngoepe 2015). Although the FOSS policy in South Africa gives preference to FOSS in the procurement of software in public institutions, the country still relies on proprietary software, which is very expensive. South African government institutions such as provincial municipalities still procure proprietary software rather than FOSS and continue to employ proprietary software for electronic records management. Given South Africa's current economic status, one would expect that government departments, including municipalities, would adopt FOSS as a natural choice to lower the costs associated with procuring proprietary software. In so doing, South Africa could break its dependency on overseas corporations and possibly develop to become one of the main contributors in the world of software development and software services markets. It is against this background that the study seeks to investigate the factors influencing the adoption of FOSS for electronic records management by municipalities in Gauteng. The specific objectives of the study were to:

- identify the software that are currently adopted for the management of electronic records in Gauteng municipalities
- establish factors influencing the adoption of FOSS in Gauteng municipalities.

1.2 Contextual setting

The study focused on the municipalities in the Gauteng province in South Africa. The municipalities under investigation are City of Tshwane, City of Johannesburg, Ekurhuleni, Sedibeng, Emfuleni, Midvaal, Lesedi, Merafong City, Rand West City, West Rand, and Mogale City municipalities. According to the South African Government (2021), Gauteng is divided into three metropolitan municipalities, namely the City of Ekurhuleni, City of Johannesburg and City of Tshwane Metropolitan Municipalities, as well as two district municipalities, which are further subdivided into six local municipalities.

Gauteng is the smallest of South Africa's provinces, covering an area of 18 178 km², approximately 1,4% of the total surface area of South Africa. Gauteng province is one of the nine provinces in South Africa. Other provinces include Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, North West and Western Cape. The neighbouring province or those bordering the Gauteng province are Free State, North West, Limpopo and Mpumalanga provinces. According to Statistics South Africa (2019), although it is the smallest province, Gauteng is South Africa's economic powerhouse; hence, it was chosen for the current study. Furthermore, Gauteng is the province with the highest population and it is home to over 13 million people and houses more than 24% of the national population. Gauteng lies on the highest part of the interior plateau on the rolling plains of South Africa's Highveld (South African Government 2021).

1.3 Problem statement

The disadvantages of propriety software, such as the costs involved, expensive upgrades, closed source code and the lock-in effect, have not stopped most South African public institutions such as provincial municipalities, from purchasing them. Municipalities continue to employ proprietary software for the management of their electronic records. The South

African government endorsed the FOSS policy as an alternative to proprietary software (Ngoepe 2015). Considering the current economic status of South Africa, one would expect that government departments, including municipalities, would adopt FOSS as a natural choice to lower the costs associated with procuring proprietary software. In so doing, South Africa could break its dependency on overseas corporations and possibly develop into one of the main contributors in the world of software development and software services markets. It is against the problem outlined above that this study seeks to identify software that is currently adopted for the management of electronic records, and further establish factors influencing the adoption of FOSS in Gauteng municipalities.

1.4 Conceptual framework

There are many theories used in technology adoption studies. The most commonly used ones are the technology acceptance model (TAM) (Venkatesh & Bala 2008), diffusion of innovation theory (DOI) (Rogers 1995) and the Technology Organizational and Environment (TOE) framework (Tornatzky & Fleischer 1990). The DOI and TOE views technology acceptance at an organisational level. The Technology Organizational and Environment (TOE) framework (Tornatzky & Fleischer 1990) was used as framework guiding this study (see Figure 1). The reason for choosing this framework is that the TOE framework provides links between the three contextual elements, which are technology, environment and organisation. Furthermore, the TOE framework is a well-established and comprehensive theoretical lens, used for understanding technology adoption at organisational level (Sila 2013). The TOE framework is also flexible and can be extended to accept more factors and categories that help explore drivers and barriers to technology adoption, meaning that the research can add more themes and sub-themes according to the study’s findings (Pudjianto & Hangjung 2009). It discusses three main variables: technology, organisation, and environment as follows:

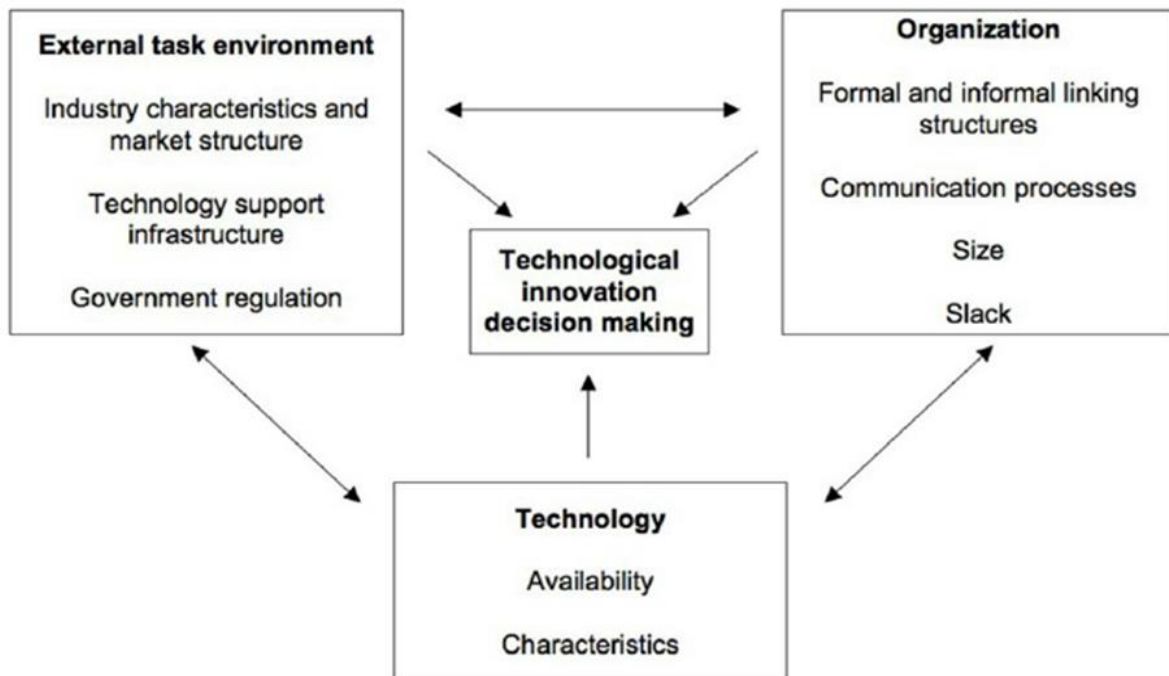


Figure 1: TOE framework (Source: Tornatzky & Fleischer 1990)

2. Literature review

According to GNU Operating system (2019), FOSS is software that should respect the user's freedom. For software to be recognised as free and open, the user should have the freedom to run, copy, distribute and study, change and improve the software. It is important to note that the notion of free is a matter of software liberty, not price; hence, it is sometimes referred to as 'libre' software, borrowing a French word for 'free', as in freedom (Drake 2017). FOSS does not mean non-commerciality of the software or program. In fact, according to GNU operating system (2019), a FOSS program must be made available for commercial use, commercial development, and commercial distribution. Even though it is not entirely free of charge, when compared to proprietary software, as Myeza (2010) points out, FOSS is less costly, mainly because the license and the source code are not paid for. Myeza (2010) further reiterates that the adoption of FOSS should be encouraged mainly because they are less costly than proprietary software.

The factors that influence the adoption and use of FOSS have been widely investigated. According to Bwalya, Akakandelwa and Dobreva-McPherson (2019), the motivation for the adoption and use of FOSS in developed and developing countries are different. These scholars point out that countries, institutions and individuals are migrating from proprietary software to FOSS due to the increased costs to purchase and maintain proprietary software and the increased commitment to open content and technologies in key areas such as research and education. Gangadharan (2017) mentions that the ability to achieve a higher degree of vendor independence, interoperability and potential cost reductions motivates countries, institutions and individuals to adopt and use FOSS.

Oreku and Mtenzi (2013) and Ngoepe (2015) indicate that FOSS integration reduces costs, which is the main motivation for their deployment. Oreku and Mtenzi (2013) further point out that in the software development field, the FOSS-based development model reduces cost and risk, while improving productivity and quality. FOSS also plays an important role in bridging the digital divide by providing low-cost applications that can localise content, particularly in developing countries of Africa, Asia, and Latin America (Oreku & Mtenzi 2013).

Sanchez, Ayuso, Galindo and Benavides (2020) classify factors that may influence the decision to adopt FOSS into technological, organisational and environmental factors. For many years, the Technology Organisational Environment framework (see Figure 1) has been used to understand how organisations adopt and implement technology (Sanchez et al. 2020). It is a fundamental approach to investigating an institutional context that influences the process through which it adopts and implements the TOE framework, which was initially established by Tornatzky and Fleischer in 1990. Technological context includes both the internal and external technologies used by the organisation and it looks at factors such as cost, reliability, compatibility, complexity, and performance expectancy. Meanwhile, organisational context refers to descriptive characteristics of the organisation, including the size, scope, and complexity of organisations' managerial structure, and quality and degree of its human resources, attitude towards change, time to adopt, training, top management support (Sanchez et al. 2020).

Environmental context refers to the organisation and its dealings with trading partners, competitors, government, suppliers, and customers (Abdullah, NurHaryani & Zahurin 2016).

In this context, businesses tend to outweigh each other in a bid to produce efficient technology in the market, which usually leads to other businesses copying from each other (Abdullah, NurHaryani, & Zahurin 2016). Competition and pressure from trading partners are the two key factors here. They refer to the pressure from both competitors and trading partners in the business to stay current and to adopt and implement new technologies (Abdullah, NurHaryani, & Zahurin 2016).

3. Research methodology

This multiple case study research adopted a qualitative research approach to collect data from 10 purposively selected municipalities in Gauteng through interviews and document analysis as data collection tools. Records managers in each municipality were purposively sampled because they were deemed to be in a good position to share reasons for or against FOSS adoption and reflect on factors that contributed to this decision. The researchers assigned the codes for records managers (RM) and in cases where a municipality did not have a designated records manager, acting records managers (ARM) was used. As such, two semi-structured interview guides were administered to gather data from records managers in the municipalities. The biographic details of the participants are indicated in Table 1.

Table 1. Biographic information of participants

Participant	Job position	Highest level of qualification	Professional qualification in records management	Mandate of the working unit
RM-1	Records manager	Diploma in computer studies	Postgraduate certificate in records management	To manage all the records of the municipality
RM-2	Records manager	National Diploma: Public Administration	Certificate in records management	To manage all the records of the municipality
RM-3	Records Manager	Four-year degree in library studies	Four-year degree in library studies	To manage all the records of the municipality
ARM-1	Acting records manager	National Diploma: Public Management and Administration	Certificate in records management	To manage all the records of the municipality
ARM-2	Acting records manager	Diploma Computer studies	Certificate in records management	To manage all the records of the municipality

ARM-3	Acting records manager	Degree: Information studies	Postgraduate certificate in archive and records management	To manage all the records of the municipality
ARM-4	Acting records manager	Diploma: Public Administration	None	To manage all the records
ARM-5	Acting records manager	Diploma: Computer Studies	Certificate records management	To manage records
ARM-6	Acting records manager	Diploma: Public Administration	None	To manage records
ARM-7	Acting records manager	Diploma: Public Administration and Management	None	To manage records

3.1 Ethical considerations

This study adhered to the ethical standards of upholding the privacy and protecting individuals who participated in the research. Ethical clearance was obtained from the University of South Africa (clearance number: 2019-DIS-0010). Furthermore, participants were given consent forms to read and sign, indicating whether they agreed to participate in the study or not. The researchers ensured that confidentiality was upheld in all the information and data gathered about these participants. One such measure was to ensure that individuals who responded to interview questions were not identified and codes were used to represent all participants.

4 Results and discussions

This section presents and discusses the results of the study as per the objectives of the study, which are:

- To identify the software that is currently adopted for the management of electronic records in Gauteng municipalities.
- To establish factors influencing the adoption of FOSS in Gauteng municipalities.

4.1 Background of participants

This is a qualitative study, and the study will not be looking at the issues related to response rates and representation, because the results will not be generalised. The participants of the study were mainly records managers from the 10 municipalities of Gauteng. Their qualifications were mainly diplomas and degrees from different subject areas, including public administration, information studies and computer studies. The majority had an additional qualification (mostly certificates) in archives and records management. Their duties centred on the management of all municipal records.

4.2 Software currently adopted for the management of electronic records

The aim of this objective was to determine the software used to manage electronic records in the Gauteng municipalities. The results of the study suggested that some of the municipalities do not have the infrastructure to manage electronic records in their organisations. These municipalities indicated that they rely solely on systems that manage traditional paper-based records. For instance, ARM-7 indicated that their municipality still uses traditional paper-based records management because they do not have an electronic records management system. This meant that no software was recorded or identified in ARM-7's municipality.

The persistent adoption of proprietary software by municipalities in Gauteng for electronic records management means that these municipalities are losing out on the benefits and advantages that are associated with the adoption of FOSS. Moreover, this means that the municipalities in Gauteng continue to rent software to manage their electronic records. Table 2 presents some of the software that is currently adopted for the management of electronic records in the municipalities.

Table 2: Software adopted by municipalities to manage electronic records

Participants	Software currently adopted for managing electronic records by municipalities in Gauteng
RM-1, ARM-2, ARM-3 and ARM-4	Quidity
RM-2	Orbit
RM-3	MUNAdmin
ARM-1	Electronic Document Management System
ARM-5	Collaborator
ARM-6 and ARM-7	No software adopted

4.3 Factors influencing the adoption of FOSS in Gauteng municipalities

The results suggest that municipalities in Gauteng prefer proprietary software for electronic records management and employed proprietary software for electronic records management. The results from the interviews suggest that there was not a single municipality among those investigated that had adopted FOSS in their electronic records management. Examples of software used by municipalities include Quidity, Orbit, MUNAdmin, Electronic Document Management System and Collaborator

When asked to what participants attribute the lack of FOSS solutions for electronic records management their municipality, RM-1 mentioned two factors as the main reasons for their municipality using Quidity, namely affordability of the software and organisational culture. RM-1 stated:

“From the day I started working in this organisation, this software was used to manage electronic records. Our records management staff are comfortable and understand the records management system and Quidity software. There is absolutely no need to change.”

When asked whether the municipality would be open to migrate to or adopt FOSS in the future, RM-1's response was:

“We tried to look at other options, but the high cost of the systems meant we continue with the current technology. It is working well for our municipality and I do not see any reason to change the current software for any other software. But as times are changing, so are technologies. Anything is possible. The fact that the current system is easy to use and require minimal training, especially for new recruits, makes it hard to think we can adopt any other software.”

RM-2 said the following when asked about the factors that influenced their municipality to use proprietary software instead of FOSS solutions in their electronic records management practices:

“Top management and the procurement department procure our electronic records systems and software. This has been the case here ever since I started working in this municipality.”

RM -2 further added that “Without the support of top-ranked members of our organisation, I do not see free and open-source software being introduced and actually implemented.”

RM-3 applauded the work that was done by their ICT staff to keep the MUNAdmin system afloat and the timeous response whenever the records management centre encounters a system malfunction. When asked how often they experience electronic records management errors, RM-3 said: “Not often. Maybe it is because our system is frequently upgraded and updated with the latest technologies. We hardly experience system shutdowns in our section.”

ARM-1 regarded the municipality's management committee and a lack of proper consultation as the key factors that may affect the adoption of FOSS. The participant's response suggested that they had little knowledge about FOSS. ARM-1 further indicated that “The municipality's top management committee does not change the way it is operating, I see no other records management introduced. Records management come second in our municipality. It is not prioritised as it should, if you ask me.”

ARM-2 stated that it might take a while before they change their software, owing to the well-functioning electronic records system currently used. Moreover, supporting FOSS may require greater training input than the equivalent proprietary software currently employed. ARM-2 believes that they “have a reliable, easy-to-use, less costly, and frequently updated electronic records management system changing the way they manage electronic records in their municipality may disrupt many things. Their records management staff will need to be equipped with new knowledge to effectively execute their duties. Training has to be done and, in so doing, a lot of could be compromised, especially records management.” ARM-2 was further asked if the municipality was resistant to change and the response was that they are not afraid of change. They have a working system and are happy with it.

ARM-3 embraces the Quidity software currently implemented and used as the most suitable software for electronic records management in their municipality. ARM-3 further highlighted that Quidity is the favoured software, even at the records management forum, of which the participant is part. When asked if that may be because they were unaware of other FOSS that can manage electronic records, ARM-3 indicated that “Quidity is reliable software and they see no reason to change something that really works for them.”

ARM-4 attributed the good partnership with the existing proprietary software service providers as the major factor. It was further stated that the company that develops their software provides training to staff and support is always available. When asked if they may be open to trying FOSS solutions to manage electronic records in the municipality, ARM-4 highlighted that their “records management is running very well. They were used to the system and its easy-to-use functionalities.”

When was asked about the factors that impacted the adoption of FOSS in their municipality, ARM-5 responded that “Our municipality has entered into a contract agreement with the service provider. The contractual agreement needs to be honoured before we can commence with the idea of finding new service providers. Secondly, our municipality consists of multi-political party members, where executives from different parties tend to not agree on certain decisions, including the ICT resources that are used and procured, and so forth.”

Both ARM-6 and ARM-7 indicated that they were unaware of FOSS records management software. ARM-7 mentioned that they never heard of FOSS, but they were aware of certain features of FOSS. The participant further showed interest in knowing more about FOSS by indicating that “Moving forward, they will keep a close eye on these FOSS solutions and their benefits.”

5 Conclusions and recommendations

Despite the endorsement of the FOSS policy by the South African cabinet, the adoption of FOSS for the management of electronic records is largely absent in the Gauteng municipalities. Several factors contribute to the low FOSS uptake by municipalities in Gauteng. Factors worth mentioning include a lack of support from senior management, contractual obligations, and resistance to change. Proprietary software was found to be largely used by municipalities in Gauteng to manage their electronic records. This means that municipalities in Gauteng continue to rent electronic records management software and pay installation, maintenance and monthly licence fees so that the service providers would continue to supply them with electronic records management functionalities.

FOSS solutions are not the panacea to all electronic records management problems, but they offer a solid and credible technological opportunity to municipalities in Gauteng. This study, therefore, recommends that municipalities in Gauteng should take advantage of the economic benefit that comes with the adoption of FOSS, which will also allow them to rapidly scale, evolve, and extend their existing technology stacks and systems, making them vital role players in the IT industry. The study also recommends that the FOSS policy be enforced by authorities because it is an approved government policy. Additionally, a detailed study on why the FOSS policy is not enforced by municipalities needs to be conducted. The study further recommends the participation of records managers in acquiring records management solutions, as they are the ones working with municipal records on daily basis.

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