

Investigating Open Source Software Benefits in Public Sector

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Abstract

This paper investigates the benefits of OSS in public sector organizations in order to understand the trends and patterns in different regions over time. Although open source software is used widely, in this study the authors examine the adoption of open source software in the public sector. As such, the paper uses content analysis to review published articles on open source software in the public sector or government organizations between 2003 and 2012 across the regions (Africa, America, Asia, and Europe). The results suggest that there is no-one-size-fit-all to open source software adoption benefits to the public sector in different regions. The results also show that technical benefits, vendor independence and customization are considered to be important for open source software adoption in public sector organizations. While this suggests that public sector organizations perceive open source software as one step towards vendor independence, customization is considered a very important benefit of open source software adoption in Asia than is the case in America.

1. Introduction

The global economic downturn is increasing the adoption of open source software by many organizations as users are becoming practical in their opinions and perceptions of the value of open source software [11]. Many researchers concur that in the current economic climate organizations faced with increased costs of operations and decreases in revenue are looking at OSS to reduce IT expenditure [33, 29]. Open source software adoption has received attention in the last two decades; despite the abundance of literature on open source software adoption, there are still several questions which remain unanswered, which is common with complex phenomena [3]. Although there has been much interest in open source software, the interest has not yet been turning into widespread OSS adoption in many countries. Identifying and understanding open source software adoption benefits in public sector organizations is important for better decision making. Open source

software is proffered as a solution to many computing challenges facing public sector organizations [9].

The objective of the paper was to understand the benefits of open source software in public sector organizations across different regions. In order to achieve this objective the following questions were used: What are the main benefits of open source software adoption in public sector organizations? What are the main benefits of open source software adoption across different regions?

The outline of this paper is as follows: section 2 presents a brief literature review on the benefits of open source software adoption in public sector organizations. Section 3 discusses the methodology used in the study to understand the adoption benefits in the different regions. Section 4 of the paper presents the results from the study and finally section 5 presents the discussion and conclusion of the study.

2. OSS adoption benefits in public sector

Open source software may have the potential to deliver cost savings in public sector organizations, as well as delivering other downstream political, economic, social and technical benefits for the country [28]. However, the evidence is that the cost benefits of open source software are unlikely to be one-size-fits-all. Organizations differ in the level of benefits they achieve from open source software adoption because of the differences in their objectives. Many researchers concur that the benefits for OSS adoptions always vary since the factors to be considered are not the same among organizations [16, 29]. In addition OSS benefits are difficult to identify in isolation from the impact of changes in other areas.

From a public sector perspective, open source software adoption decisions are motivated by service delivery rather than the profit motive as in the case in the private sector [1]. This makes it easier for public sector organizations to justify open source software adoption. Besides cost saving, there are other benefits associated with open source software adoption in public sector organizations [29]. The next sections 2.1 to 2.4 discuss some of the benefits associated with

open source software adoption, such as political, economic, social and technical benefits.

2.1 Political factors

The idea of freedom, rather than control is at the heart of the OSS philosophy as it promotes a decentralized environment for digital creativity [22]. In some cases, the decision whether to adopt OSS is based not on technical and economic considerations but on political reasons. McNaughton [22] argues that the public sector's attitude to open source software is important for its adoption in the country.

However, some researchers criticize government's political involvement in OSS as unwarranted in what should be a technological and economic decision [22]. The involvement of government may negatively distort market mechanisms and thus may be socially undesirable. Therefore the real problem is discerning the optimal nature of government intervention, rather than figuring out how to avoid such intervention [21].

2.1.1 Reduce software piracy. One of the major drivers for a wider adoption of open source software at the global level is software piracy [31, 30, 14]. The Business Software Alliance estimates that unauthorized software copying in 2002 alone cost US\$13.08 billion [35]. A country with a poor track record in copyright protection is not attractive to foreign investors and access to World Trade Organization (WTO) benefits are strongly influenced by the level of protection given to copyrights and patents in a country [35].

Most developing countries are currently between a rock and a hard place as the cost of buying full licences for proprietary software is typically far too high to be a realistic option for already heavily debt-ridden economies [31]. As a consequence countries that want to continue to use information technology, are endorsing open source as a natural choice. A culture of software piracy hurts a local software industry, as there is less incentive for local software developers to create local products. For most countries, OSS adoption policies are therefore motivated by reducing copyright infringement issues [35].

2.1.2 Vendor Independence. Many governments are adopting OSS to avoid the problem of vendor lock-in and to reduce dependence on monopolistic technologies, as they are free to change service provider without worrying about changing the software currently being used [5, 24]. Restrictive licensing, vendor lock-in, and high switching costs can be eliminated by adopting OSS, which in the long term also reduces costs. The UK government has implemented open standard policies for all future IT projects to avoid the proprietary lock-in problem [35, 22]. Most governments around the world are

increasingly moving towards OSS in order to avoid vendor lock-in and to ensure that their data and software can be accessed across different platforms.

Most governments are worried about being locked-in by proprietary software companies and some believe that OSS might be a desirable way to seek greater technology independence [22]. An organization's desire for independence may make switching to OSS an ideal strategy regardless of high switching costs. The IT sector is not different from other business sectors where suppliers attempt to lock-in customers for the purpose of keeping and securing continued business [33, 22].

2.1.3 Improve security. Security and privacy concerns have prompted many governments to pause when considering the future use of proprietary software [35, 22]. France, China, Japan and South Korea also cited security concerns as a major driving force in their open source software initiatives [35]. Government organizations usually deal with sensitive data that need to be protected from hackers. Although it has been reported that using OSS or proprietary software does not lead to any security benefit, security is still cited as one of the major reasons of using open source software in organizations [24]. The proprietary software that cannot be audited, leading to mistrust, has been cited as one reason why many governments are considering adopting open source software [35, 22].

Although the opaqueness of the proprietary software offers limited protection to the intellectual property of the software market, it engenders mistrust and suspicion [35, 22]. Most governments have some mistrust of Microsoft's software, especially after the infamous NSA incident [35]. Other notable proprietary software weaknesses include the acknowledgements by Netgear and Cisco systems that there were secret user names and passwords hard-coded into certain models of their wireless routers [35]. Since software cannot be trusted to be secure, users and particularly governments must be able to examine the workings of software systems to be satisfied with its security.

2.1.4 Customization. Besides the perceived low cost, open source software is selected for other benefits such as the ability to adapt software for local needs [13, 22]. Most proprietary software companies make investments on the basis of global returns and may not pay sufficient attention to local needs [12, 22]. Customization can go well beyond language interfaces like the well known case of Extremadura a poor region of Spain, which developed a local version of Linux used by housewives, the unemployed and pensioners [13]. Proprietary software vendors may not choose to produce a localized version of their software in languages they deem not commercially important thereby increasing the barriers to ICT usage.

Most researchers concur that OSS becomes a preferred option because of its open nature which allows localization [22]. Users are able to modify OSS to suit the unique requirements of a particular cultural region, regardless of economic size. All that is needed is a number of individuals possessing the technical capability to create a minimally localized version of any OSS. While the development of a completely localized software platform is not easy, it is at least possible [22]. The next section discusses the economic benefits of open source software adoption from a public perspective.

2.2 Economic benefits

Most public sector organizations are increasingly considering open source software as a viable alternative to proprietary software, with potential, significant value for money benefits for the government [16, 22]. The cost incentive of open source software adoption is especially pronounced in developing countries where the cost of a proprietary software licence is enormous [22, 26]. Most developing countries are primarily reliant on technology from foreign countries [15, 26].

2.2.1 Cost saving. Many researchers concur that governments worldwide are already leveraging open source software to drastically reduce technology expenditure [8, 18]. However, the open source software cost benefit advantages are debatable since, with all things in the real world there is nothing for free as organizations have to put in place appropriate processes and resources to obtain the benefits. In most studies potential cost savings are often cited as the reason for OSS adoption. The South African government spends about R3.7 billion annually on proprietary software license fees and most of this expenditure is channeled to foreign companies [24].

Because most proprietary software in developing countries is imported, its purchase consumes precious currency, which could be better spent on other development goals. Despite the fact that open source software is often free, the question of whether open source software is actually cheaper than proprietary software is still debatable. The debates regarding the total cost of ownership (TCO) of open source versus proprietary solutions often results in questioning the variables used in the analysis [19, 32, 26]. The context of the organization is important in calculating a total cost of ownership of open source software [34, 26].

2.2.2 Develop local industry. The global software industry today is centralized in a few countries producing an enormous proportion of the world's software [14, 29]. The development of local industry and reducing money spent on royalties has been a

motivating factor for countries such as Brazil, Taiwan and South Korea to adopt open source software [35, 14]. Developing countries, which do not produce software, end up paying for importing software licenses. The cost of open source software is normally spent within the economy of the country and not paid to foreign companies, which has positive feedback regarding employment, the local investment base and tax revenue [19].

OSS supports the creation of new local businesses, which are able to provide commercial support, and builds upon its low entry barriers in a way that would not be possible with proprietary software. Whatever money is spent on OSS, usually stays in that country, benefiting the development of the local software industry [35, 13, 22]. Open source software support can be provided by access to the source code available to all users at no cost. The savings on software licence fees and royalties help improve the country's balance of payments. It has been argued that the current balance of payments situation has negatively impacted the economic development of countries [35].

2.2.3 Promote competition. The software industry often has high barriers to entry, especially in mature software markets where software applications have taken hundreds of years to research and develop. This research and development is an investment that small software companies cannot afford [38, 14]. This provides significant first mover advantages to initial market entrants and keeps competitors from entering the market at later stages, as well as effectively limiting competition in the market to a few large, established organizations. As such open source software has been credited with bringing new competition into markets that have traditionally been dominated by monopolies [35].

Open source software breaks down the barriers to entry by providing software companies with a base of software to build on [6]. Open source software also allows software companies to compete on services and innovations, rather than reaping financial benefits from research and development performed many years before. The benefits often find their way back into the OSS base, resulting in a larger base of software for new entrants to build on [35, 6]. New entrants into the software industry do not need to spend decades reinventing existing software, instead software companies are free to focus on innovations and additional functionalities which the markets demands [35, 14]. The competition from OSS has significantly challenged the dominance of proprietary software companies and forced them to give significant discounts.

The next section discusses the social benefits associated with open source software adoption from a public sector perspective.

2.3 Social benefits

The public sector OSS adoption decision is made in the interest of the society at large. The social value of OSS adoption is more important for the public sector to consider than it is for the private sector. Some of the social benefits from adopting open source software from a public sector's perspective include development of local IT skills, employment creation and bridging the digital divide [6].

2.3.1 Develop local skills. Open source software represents a possible route to develop local talent to contribute to a local software industry [34, 22]. Developing the local skills base is one possible way of responding to the digital divide. Additionally, the development of local skills is important to pursue IT revenue generating opportunities both locally and abroad. OSS has the potential to improve the local technological skill base of the country with positive spillover effects to other non-technology sectors [26].

Proprietary software does not create the same opportunities as manufacturers do not provide access code to users. Open source software that includes access to the source code allows users to modify and enhance the software. Government money saved on annual licence fees by adopting OSS can be invested in IT skills development in the country [11, 24].

2.3.2 Employment creation. Many researchers concur that open source software has the potential to create employment in the local software industry [6]. The support of open source software helps create employment in the country and allows citizens to participate in the global information society. The public sector has a social responsibility for promoting open source software as a means of creating employment through support of the local software industry [6].

2.3.3 Digital divide. Many researchers concede that OSS has the potential to bridge the digital divide between societies globally at minimal cost. The free or low cost benefit of OSS provides a means of extending the market for software because it serves those consumers who cannot afford proprietary software products, and in turn can bridge the digital divide to some extent [12, 22]. Therefore, it may be worthwhile for developing countries to make substantial investments in OSS rather than in less affordable proprietary software, from a social benefit perspective. The next section discusses the technical benefits associated with open source software adoption from a public sector perspective.

2.4 Technical benefits

Besides other benefits associated with open source software, one of the most important considerations for adopting OSS is the potential technical benefits [17]. Open source software adoption has technical benefits that lend it particularly well to the needs of public sector organizations [13, 31]. Besides the low costs, open source software offers possibilities for ensuring adherence to open standards and thus to improving interoperability and equal access to public sector information services.

2.4.1 Open standards. While open source software does not imply an adherence to open standards, open source software seems more aligned to open standards goals than proprietary software [17, 20]. The European Union has adopted an open standards policy to ensure that citizens have access to government applications without the need for specific vendor software [13, 14, 17]. E-Government services based on open standards provide access to citizens without the need to use a specific vendor's software to access the public services system [13, 33].

OSS's bias towards open standards will increase interoperability and information sharing among various technology constituencies. Open standards often has a complementary effect on software as it levels the playing field and introduces increased competition, not just between proprietary software and open source software but also between different proprietary software solutions [17, 22]. Open standards allows full competition in the market for products and services based on technology with no a-priori advantage based on the ownership of the rights, as access to the technology is available to all economic actors on equal terms. The Internet owes its explosive growth and impact to its foundation on open standards. Open standards is important for seamless inter-government and government-to-citizen communication.

2.4.2 Interoperability The government's support for increased interoperability between software standards necessitates the adoption of open standards so as to ensure that ICT systems interoperate in a trusted way with partners from industry and other governments [12, 22]. Interoperability is important for flexible ICT and better business agility. Most organizations build their architecture on the premise that different pieces of software and hardware can communicate with each other based on common principles, which is called open standards.

Interoperability allows organizations to combine software and hardware from different vendors based on best performance [16, 23]. An organization's IT strategy should ensure that the architecture supports long term robustness and interoperability. Open source

software support of open standards is generally recognized as a strategic advantage in enforcing interoperability policies between independently developed systems [5].

2.5 Summary

While the previous sections discussed the potential benefits of open source software from the public sector perspective, it must be noted that there are also challenges associated with open source software adoption. Some of the challenges of OSS adoption include lack of mature products on the market, lack of support and training, and lack of documentation. However, the reviewed literature seems to suggest there is unlikely to be a one-size-fits-all application with regard to open source software adoption benefits from a public sector perspective. Based on the literature review a summary of the benefits is listed in Table 1 below. The benefits will be important in categorizing the data from articles published between 2003 and 2012 on the open source software benefits from a public sector perspective.

Table 1: OSS Benefits

Benefits	Sub-benefits
Political	<ul style="list-style-type: none"> • Reduce software piracy • Vender independence • Security • Customization
Economic	<ul style="list-style-type: none"> • Cost saving • Develop local industry • Promote competition
Social	<ul style="list-style-type: none"> • Develop local skills • Create employment • Digital divide
Technical	<ul style="list-style-type: none"> • Open standards • Interoperability

3. Research methodology

This section presents the methodology used to address the research question, and the objectives of the study. The research used content analysis to review published articles on open source software adoption benefits in public sector or government organizations between 2003 and 2012. Payne and Payne [27:51] state that “content analysis seeks to demonstrate the meaning of written sources by systematically allocating their contents to pre-determined, detailed categories, and both quantifying and interpreting the outcomes”. Myers [25] states that content analysis can be defined as a quantitative method for analyzing the content of qualitative data. Coners and Matthies [7]

concede that content analysis is useful for understanding and explaining complex phenomena through transforming qualitative text into quantitative statements

Content analysis is a systematic and objective research method for describing and quantifying a phenomenon [28] and is more suitable for data that can be reduced to concepts by creating categories that describe the research phenomenon [10]. Content analysis’s main advantage is to provide a structured method for quantifying the contents of qualitative text in a simple way and is useful when the meaning of a text is straightforward and it is easy to look at frequencies of words in the texts [21]. Content analysis also allows the researcher to search for patterns based on predetermined categories, for further analysis [25].

The predetermined categories are based on words or phrases that can be coded to units of text to allow various statistical techniques to be applied. The analysis can involve looking at both historical trends and frequency of words. Baxter [2] states that qualitative content analysis does not have standard procedures like quantitative content analysis. Content analysis can use either inductive or deductive approaches to analyze qualitative data [10].

Content analysis uses either inductive or deductive approaches to generate categories (terms) or coding rules before transforming qualitative data to quantitative data. An inductive approach involves open coding and creating categories [10]. Schreier [28] states that content analysis results can be reported by describing the content of the categories using either a deductive or an inductive approach. Content analysis as a mode of analysis helps to categorize and transform qualitative text to quantitative data [7]. Since a theory of OSS benefits already exists in literature, the deductive approach was found suitable for the study. The main themes were categorized into four benefit classes: political, economic, social and technical. Themes and subthemes were coded to allow statistical analysis of the data.

3.1 Study sample

Convenience (opportunity) sampling was used to select the articles which were used in this study. The process involved searching for keywords in a scientific database. The keywords used included such terms as ‘*benefits of open source software in public sector or government*’. The literature search revealed 71 articles that met the study criteria. The selected articles were peer-reviewed, and published between 2003 and 2012. The period was later split into two to understand if there were changes in trends during the time with regard to number of publication on OSS adoption benefits in public sector organizations.

3.2 Data coding

The qualitative data from the articles were manually coded, which raised the issue of inter-coder reliability. Reliability is the likelihood that other researchers will produce the same results if the process is repeated. The manual coding process is dependent on the subjective interpretation of the coder. Coding rules, which are instructions to the coding process, are important to ensure reliability. The KALPHA test was used to test for inter-coder reliability with a sample of fifteen articles and produced a reliability of (.87). The qualitative data were coded by one coder after testing the reliability. The coding process involved identifying, counting and assessing predefined content from the qualitative data.

3.3 Data analysis

The analysis involved identifying and counting the existence of the pre-defined themes in the published articles. The predefined categories and coding rules were used to transform the qualitative text to quantitative data. The transformation of qualitative text to quantitative data was important to generate quantitative statistics using the SPSS statistical package. The transformed data were analysed using SPSS to generate descriptive (frequency counts) and inferential statistics (ANOVA) as part of the exploratory study.

4. Results

This section presents the results from data collected from 71 articles published between 2003 and 2012 on open source software adoption in public sector organizations. This section is organized as follows: section 4.1 discusses the demographic results of the study. Section 4.2 discusses the frequencies of the benefits from the 71 articles reviewed. Section 4.3 discusses the analysis of variance based on the demographic variables.

4.1 Demographic data

This section presents the demographic results of the study. Figure 1 below shows results from the frequency of articles published between 2003 and 2012. Results from the frequency show that 58 percent of the articles were published between 2003 and 2007 compared to 42 percent published between 2008 and 2012. The results suggest that there is a slight decrease in research output on open source software adoption in public sector organizations.

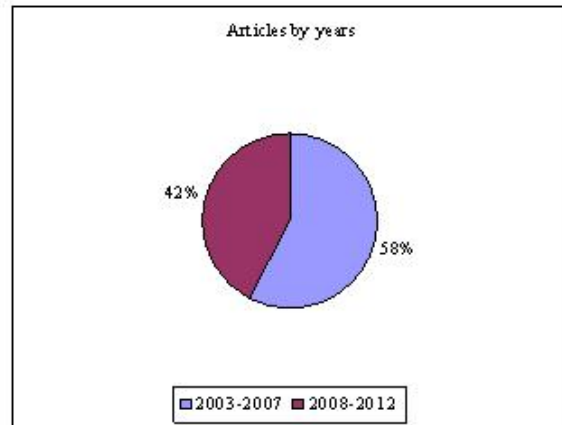


Figure 1: Article by years

Article distribution by region

Figure 2 below shows results from the frequency of articles published between 2003 and 2012 by region. Africa had the lowest number of articles 18 percent and America had highest number of articles 29 percent, Asia about 25 percent articles and Europe 27 percent articles on open source software benefits in public sector organizations. The frequency shows that most of the articles on open source software benefits were published in America followed by Europe, Asia and Africa.

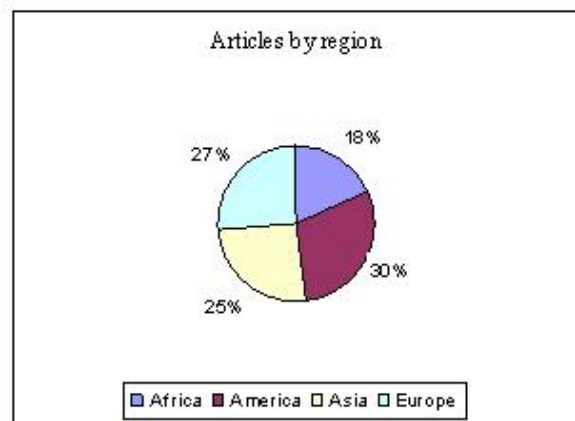


Figure 2: Article by region

Research methods

Figure 3 below shows results from the frequency of research methods of articles published between 2003 and 2012. Most of the articles published were qualitative, 52 percent, followed by quantitative, 44 percent and only a few, about 4 percent, were multi-method research. The results suggest that qualitative research was the most used research method in studying open source software adoption benefits in public sector organizations. However it is of major

concern that the multi-methods research is less used in studying open source software adoption benefits in public sector organizations.

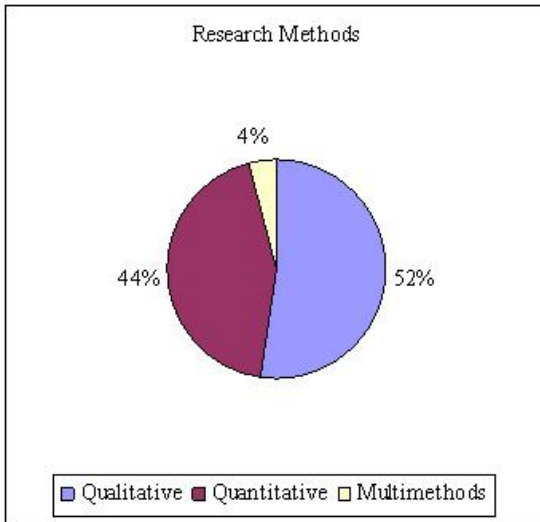


Figure 3: Research methods

4.2 Frequencies of OSS benefits

Figure 4 below presents the frequencies of benefits of open source software adoption in public sector organizations based on the 71 published articles. Only 42 percent of the articles mentioned avoiding software piracy as an important benefit of open source software adoption in public sector organizations. About 82 percent of the articles mentioned vendor independence as an important benefit for open source software adoption in public sector organizations. In addition 58 percent of the articles mentioned security as an important for adoption of open source software in public sector organizations.

Most articles, 66 percent, mentioned customization as an important benefit for open source software adoption in public sector organizations. The majority of the articles, 90 percent, mentioned cost savings as an important benefit for open source software adoption in public sector organizations. Only 38 percent of the articles mentioned developing local industry as an important benefit for open source software adoption in the public sector. Promoting competition was mentioned by 39 percent of articles. About 45 percent of the articles mentioned developing local skills as important for adoption of open source software in public sector organizations.

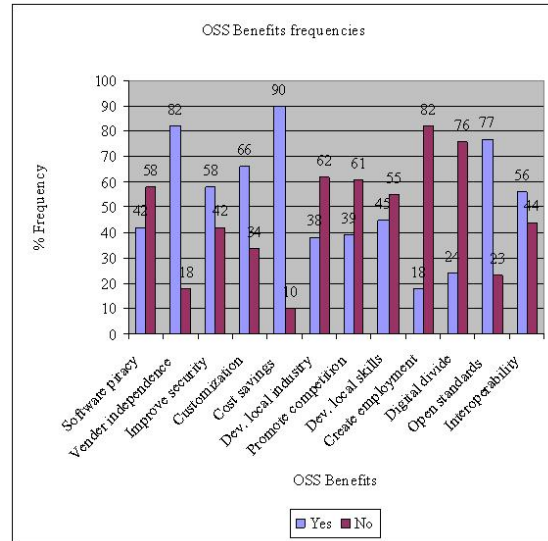


Figure 4: Frequencies of OSS benefits

It was quite strange that creating employment was the least mentioned as an important benefit for open source software in the public sector with only 18 percent. The digital divide benefit was mentioned by 24 percent of the articles. A majority 77 percent of the articles mentioned open standards as an important open source software adoption in public sector organizations. About 56 percent of the articles mentioned interoperability as an important open source software adoption benefit in public sector organizations.

The results reveal that three of the political benefits variables; vendor independence, security, and customization had more than fifty percent frequencies. On the economic benefits variables, only cost savings had a frequency above fifty percent. None of the social benefits variables had a frequency above fifty percent with developing local skills slightly below fifty percent. The technical benefit of open standards variable was above fifty percent with interoperability slightly below fifty percent. The results suggest that technical benefits are important for adopting open source software in public sector organizations.

4.3 Benefits analysis of variance by region

This section answered the research question of whether there are differences in perception of the importance of open source software adoption between regions. Analysis of variance statistics was used to test the existence of significant differences among the four regions. The ANOVA Post Hoc Tests helped to reveal the region with significant differences. Only three constructs showed significant differences among the

four regions as shown below. Constructs that did not show significant differences are not discussed below.

Region vs Develop local industry

Analysis of variance based on the variable Region in Table 2 showed that there was a significant difference in the importance of developing local industry among the regions. The Post Hoc Tests revealed that there were differences between America and Asia with regard to the benefit of developing local industry as a benefit of OSS adoption in public sector organizations. The results suggest that the two regions differ in perceptions with regard to the importance of developing the local industry as a benefit of adopting open source software in the public sector. The results suggests that the Asian region strongly agrees whilst the American region strongly disagrees that developing local industry is an important benefit for open source software adoption in public sector organizations. The results support literature that other countries are looking at open source software in public sector organizations as an opportunity to develop the local software industry.

Table 2. Develop local industry

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.555	3	.852	4.025	.011
Within Groups	14.177	67	.212		
Total	16.732	70			

Region vs Customization

Analysis of variance showed that there was a significant difference in the importance of promoting customization of software to the local needs of the country as a benefit of open source software from the public sector organizations' perspective (Table 3). The results suggest that the importance of customization is viewed differently among the regions. The results seem to also support literature that some countries view open source software as one way of customizing the software to local needs, which are not catered for by the proprietary software. Ability to customize might not be that important to countries. The results support literature that other countries are looking at open source software in public sector as an opportunity to customize software to suit their local needs as in the

case of Iceland, South Korea and Spain as highlighted in the previous section.

Table 3. Promote customization

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.815	3	.605	2.881	.042
Within Groups	14.072	67	.210		
Total	15.887	70			

Region vs Social benefits

After the sub benefits were added together to a total score, perceptions of social benefits showed a significant difference between regions, which suggests that regions had different perceptions with regard to social benefits as important benefits for adoption of open source software from a public sector perspective. This supports the literature that some public sector organizations view open source software as a way to address social problems in their countries. This is more so in developing countries, which are faced with problems of unemployment, skills shortages and the digital divide and so forth.

Table 4: Total social benefits

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.999	3	2.666	2.888	.042
Within Groups	61.860	67	.923		
Total	69.859	70			

5. Discussions and conclusion

The results from the study suggest a decline in the amount of research into open source software from 2003 to 2012. In addition, results suggest that although Africa has less research on open source software adoption per article, it is not too low compared to other regions. The results suggest that the qualitative method is the commonly used approach to studying open source software adoption in public sector organizations. It is however a concern that very little research used a multi-method approach. There is therefore a call for researchers to consider mixed methods for a complex research area like open source software adoption in the public sector, which can benefit immensely from mixing of two methods.

The results also suggest that while cost savings is perceived as an important benefit of open source software adoption, as supported by the literature, there are also other important benefits. The cost savings variable construct did not show significant differences, which suggests that there is agreement among regions on its importance on OSS adoption in public sector organizations. The results from the study show that technical benefits are also considered to be important for open source software adoption in public sector organizations. Most technical benefits variables on open source software adoption in public sector organizations were considered to be important, as shown in the graph, by recording percentages above fifty percent. The technical benefits constructs did not show significant differences, which suggests that there is agreement among regions.

In addition to that, vendor independence is perceived as an important benefit for adopting open source software in public sector organizations. This suggests that public sector organizations perceive open source software as one step towards vendor independence and controlling their destiny. The vendor independence variable did not show significant differences, which suggests that there is agreement among regions. In addition, the customization construct is perceived as an important benefit for adopting open source software in public sector organizations as shown in Figure 3. However, perceptions about customization were significantly different between Asia and America in terms of their views on the importance of open source software adoption in public sector organizations. The results suggest that in the Asian region, customization is a very important benefit of open source software adoption which is not the case in America. The results support literature in that some countries perceive customization as an important benefit for adoption of open source software.

As a conclusion, while the study is not exhaustive from an exploratory perspective, the results point to the fact that different regions have different perceptions with regard to the benefits of open source software adoption in public sector organizations. In summary, there is no one-size-fits-all answer with regard to the benefits of open source software adoption in public sector organizations. Although this study is by no means exhaustive, it is a modest attempt to fill the gap in the understanding of the benefits of open source software adoption and the differences in perspectives in public sector organizations from different regions, hence its contribution to the research area. The paper also acts as a stimulus for further research in an inconclusive topic of trying to understand the perceived benefits of open source software adoption in public sector organizations.

One of the limitations of the study is that it was based on convenience sampling, which makes it difficult to generalize the results. Furthermore the study involved manual coding of qualitative data, which raises reliability concerns. Although reliability checks and coding rules were used, they are largely subjective and dependent on coder interpretation and experience. However the stated limitation may be looked at as opportunity for further research in this complex topic. Further areas of research may also look at using advanced inferential statistics such as causal relationships and the predictive power of constructs.

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