Organizational Determinants in Adoption of Open Source Software (OSS) in Institutions of Higher Learning: A case of Innorero University, Kenya.

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ABSTRACT

With the rapid development of Information and Communication Technologies (lCTs) use in public and private sectors and the fast growing Internet access, Institutions of higher learning have no choice but to adopt these technologies if they have to be relevant in this information age. This study aimed at examining the organizational determinants affecting the adoption of open source software in institution of higher learning in Kenya with special reference to Inoorero University. The specific objectives of the study were; to find out how organizational size affects the use of OSS, to examine the effect of organizational structure on the adoption of OSS, to assess the effect of organizational culture on the adoption and use of OSS in the institution of higher learning and lastly to assess the role of the management in the adoption of OSS in institution of higher learning in Kenya. The study used descriptive survey in carrying out the investigation. This study adopted comprehensive qualitative analysis where a careful and complete scrutiny and understanding of the situations in the institutions was done. The target population of the study consisted of; students, teaching staff and management at Inoorero University, School of Information Technology who were 500 in total. The study used both the stratified sampling techniques and the simple random sampling in the determination of the sample. A sample of 150 respondents was selected from whom data was collected. The study used the questionnaire to collect the data of which 137 were returned and analysed. The Cronbach's Alpha reliability coefficient was used to test the reliability of the instruments which yielded a value of 0.891, hence the instruments were considered reliable. The data collected was summarized and presented using both descriptive such as frequencies and percentages and inferential statistics such as the correlation and regression analysis. The results show that the adoption of OSS in the institutions of higher learning was determined by organizational size, organizational structure, role of management and the organizational culture. The correlation analysis showed that organizational size had the highest influence in the adoption of OSS in the learning institution. From the regression analysis it showed that the four factors considered in the study influenced the adoption of OSS by only 22.5%. The study recommends that if the results of this research are implemented by the government of Kenya they can be beneficial to the students and staff of the university and shall form a basis for more research involving the public and private sectors in Kenya. The results would also help in ensuring quality and standardization of the various educational programs at the university level.

INTRODUCTION

The development and distribution of computer software has undergone an evolutionary process. This has seen it move from a largely customer-specific product during the period from the mid 60s to the early 80s, to one that is both highly generic in nature and protected by intellectual property laws. Open source software is defined by its attached license which abandons the essential rights granted to the original creator under copyright law. This gives anyone the opportunity to distribute and modify any received open source software (Evers, 2000).

Open Source Software (OSS) is defined as computer programs with licenses that conform to the Open Source Definition (OSD) as outlined in the Open Source Initiative (OSI, 2005). It is free software that is built, modified and enhanced through public collaboration and gives the user unrestricted access to the source code. Great media coverage of the technology for the past few years has increased interest in organizations to adopt OSS for running their businesses.

The interest shown by organizations towards OSS makes the present study to investigate how the software is being adopted in organizations.

Open source software (OSS) has grown in importance based on its wider diffusion and its reliability, both of which have improved at an outstanding pace at the public and private levels (Cassell, 2008). This upsurge in interest in OSS has been accompanied by lively debate on the role of OSS in institutions of higher learning, which has attracted the interest of policy makers and practitioners in the field, and scholars in several disciplines ranging from computer science to management (Von, Krogh & Spaeth, 2007; Cassell, 2008).

One notable example of the growing significance of open source software is the Linux operating system. Linux has gained a 1 % market share in the client operating system market and a 27% market share in the server market (Kusnetzky & Gillen, 2001). Other examples, such as the Apache web server, My SQL database and send mail server, are expected to play an increasingly important role in the Information Systems (IS) function of organizations in the future. According to (Sykes, 2009) the extent to which open source software (OSS) has been adopted and developed varies a great deal among the different geographical regions of the world, and this variability is correlated with the degree to which the information society (IS) has developed. Countries with the strongest economies demonstrate a high level of both IS adoption and the use of OSS.

The United States, Australia and the Western European countries lead the development and adoption of open source software. (Von, Krogh & Spaeth, 2007) noted that the level of OSS adoption and development in India, China and Brazil is higher than expected, considering their level of IS advancement. In the public sector, Europe has experienced greater penetration. Germany, France and Spain lead Europe in the adoption of OSS. Government support for OSS adoption has been key, although different instruments have been used to implement policies. (Bierhals, 2009) asserts that in the Pacific region, Australia stands out as one of the countries with the highest degree of open source software adoption in the world, thanks to its active communities of OSS developers who participate in international projects. The Australian business sector spends a significant part of its research and development budget on OSS projects, which results in the country having a large sub sector of open source software companies within the ICT sector and in the presence of OSS centres of excellence in the country.

Related to such rationales for national adoptions, (May's, 2006) argues that open source software adoption in sub-Saharan African nations can help curtail the costs and problems associated with closed software licenses and intellectual property rights issues. Public organizations such as UNESCO are contributing to the expansion of OSS across Africa through projects such as the MIFTAAH memory stick, already implemented in Algeria, Libya, Morocco and Tunisia. OSS is provided in Arabic, English and French, with the academic institutions providing the main focus for running the project.

School Net Namibia is a volunteer organization devoted to providing Internet and computer access to every school in Namibia. (Bruggink, 2003) notes that Open Source Software initiatives in Africa are still very limited. Except for the South African government, governments in Sub Saharan Africa do not take an explicit position promoting the use of OSS. This may be partly due to fact that they are not well informed about the possibilities of OSS, but it may also be caused by the fact that these countries 'have a low level of expertise in the ICT field.

Many previous studies focused on how OSS provides potential benefits and opportunities for reducing organizational costs but placed much less consideration on the software's capacity to fully meet the needs oftoday's organizations (Gacek & Arief, 2004, Bergquist & Ljungberg, 2001). Many of the surveys in the studies have focused much on the technical aspects of the OSS while neglecting the social aspect of the OSS especially the perception of the stakeholders other than the developers. This study sought to fill the gap by studying the organizational determinants of OSS adoption in the institutions of higher learning, but also the perception of the stakeholders towards the adoption of this technology in making the institutions more effective. (Rogers, 2003; Sykes, 2009).

The rise of open source software during the last decade has been phenomenal. Linux was created by Linus Torvalds in 1991 and the number of users increased to half-a-million in 1994. Linux now holds approximately 30% share in the market of server operating system, second only to Microsoft's Windows, which holds approximately 50% market share as noted by (Bruggin.1(, 2003).

Apache web server, open source software, was developed in 1994 and has become the dominant program in the web server market with 68.71% market share in June 2004.
(Wheeler, 2004), According to Gonsalves, (2003), in 2002, Microsoft gained a bigger share in the segment of server operating systems, accounted for 55. 1 % of new license shipments, compared to 50.5% in the prior year. Linux's share of new paid license shipments in 2002 only increased to 23.1 % from 22.4% in 2001, taking market share from other vendors while rendering Microsoft a more dominant position.

The history of Open Source Software is considered to have started at the dawn of computer technology (Murray 2000, Evers, 2000), research on its impact on business has only begun during the late 1990s. Very few empirical studies have been undertaken on the subject despite its wide media coverage and a vast number of practitioners' articles. According to Murray, (2000) has addressed Open Source Adoption in Ireland and (Evers, 2000) also addressed its impact on software development in Germany. The most recent work done in the adoption of Open Source Software at the time of this research was (Mindel, Mui, and Verma's, 2007). Open Source Software Adoption in Association of South East Asian Nations (ASEAN) Member Countries. Unfortunately, this research

was severely limited as it only examined whether organizations in ASEAN member countries used open source in their web server applications and not what factors had driven them towards the use of Open Source Software. Institutions of higher learning are expected to play leading role in ICT adoption in developing countries (Rogers, 2003). Rogers further notes that the role and importance of computer-based information systems in institutions of higher learning (and in many other sectors) in Kenya today is fully recognized. Klang, (2005) contents that the role of institutions of higher learning is changing as most of the information are currently being distributed electronically. The university user has also changed from an in-house patron for printed sources to remote information user looking for answers in a variety of computerized sources. The focus of this study was Inoorero University which was using purely proprietary software; it was the purpose of this study therefore to find out the reasons why the university had not adopted OSS.

Statement of the problem

Despite OSS being considered as cost effective by many organizations, OSS implementation still encounters many challenges. A number of studies have been done to analyze the factors affecting the adoption of Open Source technologies (Evers 2000, Murray, 2000) but most of these studies have been explorative in nature and none of these studies have specifically addressed the adoption of OSS in learning institutions in Kenya. The low rate of adoption of the OSS in institution of higher learning in Kenya is making the Universities not reap from the technology (Klang, 2005). In recent past, studies have been done in the area of OSS adoption at different fields and in this regard (Ardito and Constabile, 2006) states that despite these recent advances in the adoption of OSS, there is little consolidated evaluation for its applications by universities in Kenya.

This research therefore sought to address the following research hypothesis: whether there are no significance associations between organizational size, culture, role of management and structure and of adoption of OSS in institution of higher learning in Kenya.

Objectives of the study

The main objective of this study was to examine the organizational determinants in the adoption of open source software in institutions of higher learning in Kenya, and more specifically, to:
  i.   Analyze the effect of organizational structure on the adoption of OSS in institutions of higher learning.
 ii.   Examine how organizational size affects the adoption of OSS in institutions of higher learning.
iii.   Assess whether organizational culture affects the adoption of OSS in institutions of higher learning Evaluate the role of management in enhancing adoption of OSS in institutions of higher learning.

Research hypothesis

The following four null hypotheses were tested by the study:

HO_1 There is no significant association between organizational structure and the adoption of OSS in institutions of higher learning.

HO_2 There is no significant association between organizational Size and the adoption of OSS in institutions of higher learning.

$H0_3$ There is no significant association between organizational culture and the adoption of OSS in institutions of higher learning.

$H0_4$ There is no significant association between role of management and the adoption of OSS in institutions of higher learning.

Conceptual framework

To implement the study various independent variables were defined and a relationship between them and the dependent variable were shown on the conceptual framework. The independent variables are organizational size, organizational structure, organizational culture, and the role of management while adoption of OSS is the dependent variable. It is evident from the existing literature that there are identified organizational determinants which influence the adoption of the software in the organization. It is also clear from the literature that there is low adoption of the software by many organizations. This study sought to make use of this conceptual framework in order to establish the organizational determinants affecting the use of OSS in most institutions of higher learning. The conceptual framework can be seen from the following schematic diagram (Figure 1.1).
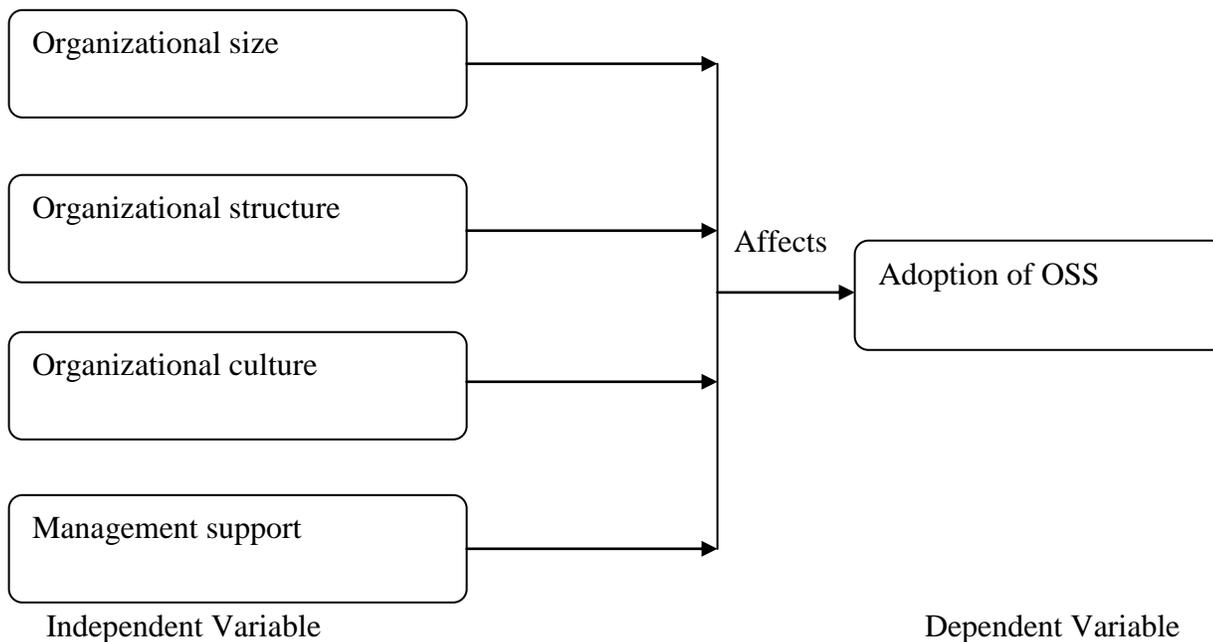

Figure 1.1: Organizational determinants of OSS adoption in learning institutions

Organizational Size Verses Adoption of OSS

Organizational size is identifies as a factor in many recent studies of innovation adoptability, probably reflecting the reservations of the need to broaden the focus beyond the individual level. Large organizations are likely to have access to pool of specialists IT staff who can assist in solving technical issues that arise in OSS adoption.

Organizational structure Verses Adoption of OSS

This study establishes that organizational structure has an effect on the adoption of OSS in the organization. It is noted that failure to recognize the importance of organizational structure on the performance of firms will lead to serious bias in estimation of the costs or benefits of a change in external circumstances. Organic structures, on the other hand, are characterized by informality, decentralization of authority, open channels of communication, and flexibility (Khandwalla, 1997). Based on above, in this study, the organizational structure is viewed as facilitating interaction and communication for the coordination and control of the organization's activities. Considering the characteristics of IT capability, it can be argued that organizational structure will have some interaction with IT capability in the organization.

Organizational culture Verses Adoption of OSS

Organizational culture determines the way things are done in an organization and it is obviously an important consideration for OSS adoption. Controversially, the organizations that will adopt the use of OSS are seen to have a culture that will support the adoption process.

Organizational management and Adoption of OSS

Classical innovation adaptability theory emphasizes the importance of individual factors for innovation adaptability. This is further justified on the basis that OSS has such a strong underpinning arising from ideological motivation, and this typically occurs at the individual level. A common view to software users is that existing proprietary options do not have the features required or allow for cost-effective customization. Many administrators are concerned that academic institutions are ceding too much control for mission-critical tasks to an increasingly concentrated field of commercial vendors. This study takes note that an effective management system will enhance the employee's motivation and acceptance to adopting the new technology.

The Concept of Free and Open Source Software

Free Software as a political idea has been popularized by Richard Stallman since 1984, when he formed the Free Software Foundation (FSF, 2006a) and its Genuinely Not Unix (GNU) Project (FSF, 2006c). The freedom envisioned by FSF which was formalized in the General Public License (GPL) concerns four freedom to (FSF, 2006b): run the program, for any purpose; study how the program works, and adapt it to your needs; redistribute copies so you can help your neighbour; and improve the program, and release your improvements to the public, so that the whole community benefits. Klang, (2005) describes the term free software as including a philosophy, an understanding that software is an important building block in the information society and that the control of this infrastructure needs to remain accessible to all (Klang, 2005). However, opponents of Free Open Source Software (FOSS) see the FSF's GPL license being constraining the user since it requires any derivative to be licensed under the same terms (Rosen, 2004).

In 1998, the Open Source Initiatives (OSI) movement was launched with the term Open Source Software. The Open Source definition includes many of Stallman's ideas. Explaining open source and the way open source works, Weber argues that, the philosophy of open source is not the software but it is the process by which software is created (Weber, 2004). For example, today there is ongoing Open Source Car (OSCar) project (Tucci, 2000). (Klang, 2005) describes the essence of open source as a software development model acceptable to corporate developers, who had been reluctant to adopt a methodology connected to the free software. The Open Source definition coined by (Perens, 2005) defines nine terms of rights that a software license should conform in order to be certified as Open Source Software (OSS).

OSS rights address the rights of users as well as the rights of programmers. This provides users with the option of providing their own support, or the economy of a number of competing support providers. The fact that any programmer can tailor an Open Source program to specific markets in order to reach new customers adds strength to the open source movement. This is because people who do these things are not compelled to pay royalties or license fees to the original author of the software. Although there are some ideological differences between Free Software Foundation (FSP) and Open Source Initiative (OSI), in this paper the two ideologies will be treated the same.

International perspective of OSS adoption in Education sector

Over the past few years, a small number of researchers have focused on the study of the potential advantages and risks of adopting OSS in the domain. Prior research encouraged the adoption and use of OSS in organizations because of OSS's potential to both enhance delivery, and lower software acquisition costs (Carnall, 2000; Kantor, Wilson, & Midgley, 2003; McDonald: 2003; Valdes, Kibbe, Tolleson, Kunik, & Petersen, 2004).

OSS could potentially be more reliable and secure than proprietary software because its source code can be inspected and reviewed (Carnall, 2000). Past research introduced and extended the idea of OSS as a software development model that could definitively improve and research software in the field of academics (Yackel, 2001). Kantor, Wilson, & Midgley, (2003) presented the potential benefits that OSS could provide in education sector. Kantor, (2003) also proposed that the adoption ofOSS would reduce [he excessive costs, the frequent turnover of vendors, and the lack of common data standards that are aftlicting electronic records (E R) systems in sector.

More recently, McDonald, Schadow, Barnes, (2003) also investigated the potential role that the OSS model of software development may have in the informatics area. They also described a number of OSS products that have been used in the informatics domain over the years, including: office management and academic record system; as well as the internationally. A more recent study by Valdes, (2004) also pointed out that OSS could be an effective solution for the problems that distress the higher industry such as high costs, business failures and barriers of standardization (Valdes, 2004). Other papers by Erickson, Langer, and Nagy, (2005), Scarsbrook, (2007) and Nagy, (2007) supported the growth and adoption of OSS in different academic sectors because OSS may significantly lower the entry cost for standards-compliant practices in the industry.

They also proposed that OSS might allow rapid scientific advancement due to the sharing of information and software (Van Latum, 1998). Other authors such as DeLano, (2005) presented some reasons for the potential success of OSS predicting that the entire system may bring great discoveries and potentials in the sector.

Open source software adoption in institutions of learning

Research on OSS adoption was conducted in Ireland education sector, where the IT department, under limited financial resources, made the decision to adopt OSS. Several OSS products were adopted and implemented successfully. Research shows that the authors reported that there were important initial start-up and future operational costs when OSS products were preferred in the institutions (Fitzgerald & Kenny, 2004). Another study by Glynn, Fitzgerald and Exton, (2005) investigated the commercial adoption of OSS using an innovation adoption theory framework based on (Tornatzky and Fleischer's, 1990) model.

The OSS products and processes were also seen promising in terms of enabling rapid evolution and proliferation of applications in the medical domain through their use of open standards and higher degrees of intcroperability (Raghupathi & Gao, 2007). The authors argued that the development processes in the eclipse project could improve scalability, prevent vendor lock-ins, and reduce costs in the institutions information systems including electronic education record and decision support systems. There are some recent studies focusing only on the managerial and technical barriers to the adoption of OSS in the learning institutions (Holck, Larsen and Pedersen, 2005).

Past research on OSS and also proposed that OSS would reduce the number of bugs and failures in the systems, as well as reduce their overall cost (Yackel, 2001). A study by Hogarth and Turner, (2005) focused on creating a catalogue of existing OSS projects and on determining metrics for their viability. The authors mentioned that many of the factors that are required to make a "successful and vibrant" OSS community within the mainstream software applications systems (e.g. Linux, Apache, etc...) may not necessarily be applicable to the al software applications systems.

Kantor, Wilson, and Midgley, (2003) presented a set of potential advantages that the adoption of OSS may provide with regards to lowering the resistance of institutions to the adoption of Electronic Records (E R). These included: the potential of OSS to reduce ER ownership and software development costs, the removal of vendor lock-in, and the adherence of OSS to standards for the compatibility and data interchange among systems. The authors mentioned that, for example, interconnectivity problems are more easily solved when using OSS, since no technical information can be hidden.

Although this study presents a good case for the adoption of OSS solving the barriers that the systems are facing, there are continuing debates over the competition between OSS and proprietary software. Proponents of open source software contend that developing countries find ICT to be too expensive to afford but with Open Source Software they will manage to leap frog and address the digital divide. We found it useful to establish more evidence of the usefulness of open source software. In this study, the consequences of adoption and use of OSS was investigated in a cross sectional interpretive case study in selected Institutions in Tanzania and Norway. The empirical material suggests that OSS products are enterprise dependent software. They lower ICT expenditure, support open standards implementation, and promote creative knowledge on the use of local languages.

A **theoretical view of adoption of open source system in learning institutions**
Open Source Software adoption in organizations is a form of technology adoption. It is important and would be useful to study, apply and enhance the theoretical underpinnings of technology adoption in organizations to OSS adoption. The two main technology adoption theories used to test the adoption of new technologies are Innovation Theory (Rogers, 2003) and Technology Acceptance Model (TAM) (Davis, 2000). Innovation Theory identifies a series of factors such as relative advantage, compatibility, complexity; trialability and observability determine an innovation's rate of adoption.

Innovation Theory in IS research has been used in different ways including the examination of factors involved in technology adoption (Tung & Rieck, 2005). Tornatzky and Klein, (2001) reviewed 75 examples of innovation literature examining the relationships between the attributes of an innovation and its adoption. Even though ten attributes had been cited in studies, only three innovation characteristics (compatibility, relative advantage and complexity) had the most consistent significant relationships with innovation adoption. Rogers, (2003) also identified organizational characteristics (formalization, centralization, system openness, intercolulectedness, organizational slack and size) this study shall be focused on these organizational factors in examining their.

METHODOLOGY

Area of the study

The study area was Inoorero University based in Nairobi County. Inoorero University was selected because it has all the essential characteristics that any other institution of higher learning is expected to have. It is a large private institution which has been in operation for a number of years and it has been relying on the Proprietary Software in its operations. The Inoorero University was chosen because based on the preliminary data gathered, it was found that the university has a very well defined IS in place to support both teaching and other institutions operations.

Therefore, it would be a revelatory survey to understand what factors affects the institution's OSS adoption (Library data, 2012).

The methodology used for the collection of data was descriptive survey method based on secondary and primary sources of data collection. The design was most appropriate as it helped in establishing the views and opinions of the respondents. According to William, (2006) descriptive surveys are more formalized and typically structured with clearly stared investigative question. Descriptive research was used to investigate the determinants of OSS adoption in institution of higher learning. Mugenda, (2003) notes that descriptive research reports the way things are and collect data from the respondents in their actual environment. The design is restricted to fact findings and may results in the formulation of key policies and principles. Descriptive research permits the explanation of phenomena as they naturally transpire and without intervention from the researcher (Bernard, 2005).

This study undertook a similar approach as (Fichman and Kemerer, 1997), by narrowing the survey to a specific group of students in the Information Technology department at lnoorero University. The study targeted the management who are involved in the decision making process of ICT implementation in the university, teaching staff who require the use of the software's for their development and to assist them in teaching. The students who were in their third and fourth year from the school of ICT because of their perceived knowledge and understanding of the IT environment in the university. The non-teaching   staff were excluded from the study because of their minimal involvement of the university software and little input in decision making concerning the software to be adopted in the university. The total target population was 500 respondents. The students in the schools of IT of Inoorero University were 440; 30 were the teaching staff and were the university management.

In this study ten percent of the accessible population constituted the sample size. For the purpose of this study a sample of 30% of the target population was taken as being appropriate. The sample distribution was done as given in table 3.1

Table **3.1 Sampling table**

Category	Total number	Percentage sample	Sample
Students	440	30%	132
Teaching staff	30	30%	9
Management	30	30%	9
Total	500		150

Source: survey 2011

The sample was selected through stratification and simple random sampling, the stratified sampling method assisted in classifying the population into three stratus of students, teaching staff and the management and the simple random sampling method was used in selecting the sample from each stratum. The research selected 30 % of the population in each category as shown on table 3.l.

A total of 150 questionnaires were self administered to the respondents accompanied.The semi structured questionnaires were constructed using the 1-5 Likert scale type of statements, where the respondents were required to either to indicate strongly agree (5), agree (4), not sure (3), disagree (2) and strongly disagree (1), the questionnaire had also open ended questions to establish the opinion of the respondents. For the data analysis the total of the strongly agree and agree statement were treated together while the response for disagree and strongly disagree were also treated together.

For the pilot test, a sample of 30 questionnaires was prepared and given to equivalent number of students, lecturers and management who were excluded from the study. In order to test the reliability of the instrument the alpha reliability coefficient was performed using the SPSS package, An alpha reliability coefficient of 0.7 was accepted for this study as provided by (Kathuri & Pals, 1999).

Table 3.2 *Cronbachs alpha reliability table.*

Cronbach's Alpha	N of Iterns
89	61

The cronbach's alpha reliability score was used to test the internal consistency of the questionnaires. The data was entered into the SPSS system and the overall reliability coefficient was established using SPSS version 16 which yielded a coefficient of 0.89 as shown in the reliability table 3,3 hence the instruments were accepted as being reliable. On individual objectives it was noted that the first objective which sought to establish whether organizational structure has an effect 011 the adoption of OSS in institutions of higher learning, the statements in

the objective yielded a reliability of 0.75, the second objective sought to establish how organizational size affects the adoption of OSS in institutions of higher learning, the statements yielded a reliability coefficient of 0.819.

Objective three on the effect of organizational culture on the adoption of OSS in institutions of higher learning yielded a reliability coefficient of 0.79 and the last objective which sought to evaluate the role the management in the adoption of OSS yielded a reliability coefficient of 0.84. This indicates that all the statements that were considered for the study were found to be reliable and were accepted for use in the study. This showed a high acceptability index of the instruments as reliability coefficients a value of at least 0.7 is accepted for any research (Kathuri & Pals, 1993).

After data collection, the questionnaires were coded, summarized, and analyzed using descriptive and inferential statistics. The first section of the questionnaire contained question for the background information and was analyzed through descriptive statistics where the percentage and frequencies was computed. Subsequently, second and third sections were analyzed by use of linear regression and simple correlation respectively,

Factor analysis was used to assist in ranking the determinants in order to establish how they influence the adoption of the OSS. This analysis helped to show the relationship that existed between the independent and the dependent variables. It also showed the strength a total of 150 questionnaires were distributed to the students were collected back after a period of two weeks. The researcher was able to collect back a total of 143 questionnaires, however a total of 137 questionnaires were used for the analysis; this represented a response rate of 91.33 % response rate. The questionnaires were evaluated for completeness and 6 questionnaires were discarded because they were incomplete where by the major areas of the questionnaires had not been filled and hence could affect the overall results of the study.

RESULTS AND DISCUSSIONS

The study sought to examine the organizational determinants in the adoption of open source software in institutions of higher learning in Kenya. It sought to meet the following objectives; Analyze the effect of organizational structure on the adoption of OSS in institutions of higher learning, Examine how organizational size affects the adoption of OSS in institution of higher learning, Assess whether organizational culture affects the adoption of OSS in institution of higher learning and Evaluate the role of management in enhancing adoption of OSS in institution of higher learning. The results of the overall study are discussed in details.

Distribution of the respondents

The study respondents were distributed as shown in table 4.1

Table 4.1 Distribution of the study respondents

Respondents	Frequency	Percent
Student	84	61.3
Management	18	13.1
Lecturer	35	25.5
Total	137	100.0

From the results presented in table 4.1 the various categories of the respondents were students 84(61.3%), the management 18(13.1%) and the lecturers 35(25.5 %). The students and the lecturers were considered as the users of the software while the management was considered as the main decision maker on which type of softwares are to be used.

Demographic Profile of the Study Respondents

The respondent's characteristics were important to this study in that it helped to establish the respondents' differences and find out how they may affect the outcome of the results. For this study the various demographic characteristics of the respondents that were considered were; gender, age, professional qualification, teaching experience and years of service at the current station.

Gender of the respondents

Gender was considered as an important factor in this study both for the students and the lecturers in relation to the OSS adoption. Since different gender has different perceptions and the factors affecting the adoption of OSS are seen differently from the perspectives of the male and the female, it was important for this study to look into this factor in order to establish whether it had any relationship with the OSS adoption in institution of higher learning. The results obtained from the study were presented in table 4.2.

Table 4.2 Gender of the respondents

	Gender of respondent		
	Male	Female	Total
Student	57	27	84
Lecturer	24	11	35
Management	15	3	18
Total	96	41	137

The results presented in table 4.2 shows that most of the respondents were students because of their large numbers at the university. A total of 84(61 %) students of whom 57(68 %) were male and 27(32%) were female. Among the lecturers a total of 35(26%) participated in the study of whom 24(69%) were male and 11 (31 %) were female. The last category was the management, a total of 18 (13%) respondent to the study questionnaire of whom 15(83%) were male and the rest 3(17%) were female. This means that majority of the respondents who respondent to the questionnaires were males.

This could be attributed to the fact that they were the majority respondents and were the ones directly involved in the decisions involving software adoption in the institution.

Age of the respondents

Age is also an important issue considered in this study as it helps to give a varied experience and opinion of the respondents. It is noted that the opinion of various people can be analyzed effectively by considering their age groups. The results were presented in table 4.3.

Table 4 3 *Age of the respondents*

	Age of respondent			
	18-34 years	35-45 years	46-54 years	Total
Student	74	7	3	84
Lecturer	31	4	0	35
Management	16	1	1	18
Total	121	12	4	137

The results shows that majority of the respondents 121(88%) were aged between 18-34 years of whom 74(61%) were students, 31(26%) were lecturers and 16(13%) were in management. The next age bracket of 35-45 years consisted of 12(9%) and the last category of 4(3%) were in the age bracket of 46-54 years and it consisted of 3-(75%) students and 1(25%) in the management.

Year worked in the University

The use of OSS in the institution is affected by the years of service of the users because they gain experience in the use. This was an important aspect of this study as it helped to establish how OSSis alleged among the different users with different years of service. This also helped to establish the change to use OSS in the institution and how the situation has changed since the introduction of the OSS in the institution of higher learning. The results were presented in table 4.4.

Table 4.4 *Years worked in the university*

Response	Frequency	Percent
Non employed	78	56.9
1-5 years	34	24.8
6-10 years	16	11.7
11-15 years	7	5.1
Above 15 years	2	1.5
Total	137	100.0

From the results presented on table 4.4 it is clear that majority of the lecturers and the management team selected for the study 34(24.8%) had below 5 years of working experience in the institution of higher learning. This was followed by 16 (11. 7%) of the respondents who had 6-10 years in service, 7(5.1 %) of the respondents had 11-15 years in service and 2(1.5%) had above 15 years of work experience, while the rest 78(56.9%) of the respondents were student in the institution of higher learning and therefore had no work experience.

Types of software

The respondents were asked to indicate whether they were aware of the open source software's. The results were presented in table 4.5.

Table 4.5 *Awareness of the type of software used*

Response	Frequency	Percent
No	103	75.2
Yes	17	12.4
None response	17	12.4
Total	137	100.0

The results on the table 4.5 shows that majority 103(75.2%) of the respondents who responded to the question were not aware of the open source software in the institution, while only 17(12.4%) were aware. This indicates that very few of the respondents in the institutions are aware of the use of the OSS as a software in their daily operations.

Software used by the University

In order to establish the preference of certain software's in their operations the respondents were asked to respond by indicating which software they were using at the moment. The response was presented in table 4.6.

Table 4.6: *Software used at the University*

Response	Frequency.	Percent
IOpen source software	12	8.8
Proprietary software	117	85.4
Both	8	5.8
Total	137	100.0

From the response it is clear that majority of the respondent 117(85.4%) indicated that the university uses the proprietary software to a wider extend in comparison to the 12(8.8%) who indicated that they use open source software while 8(5,8%) indicated that the university uses both software's. This shows that the university still uses the proprietary software despite its challenges over the existence of the free software's such as the OSS.

Organizational structure as a determinant of adoption of OSS

This section sought to establish whether the organizational structure of the organization affects the adoption and use of OSS in the university. Seven statements were used to establish the characteristics of the organizational structure of the university and its influence on the adoption of OSS.

Table 4.7 *Response on the organization structure as a determinant of OSS adoption*

NO	Characteristics	Disagree	Not sure	agree -_
1	OSS supports an informal kind of structure which is open to allow freedom in service provision at the university.	(15.8%)	(40.8%)	(43.4%)
2	The university considers the performance efficiency of the software in facilitating the decentralization of the services at the university.	(35.8%)	(24.2%)	(40.0%)
3	The university considers the communication flow before adoption in ensuring an open channel of communication in the institution	(35.0%)	(25.8%)	(39.2%)
4	Ability of the software in ensuring that it supports the flexibility of the entire organizational structure of the institution	(14.2%)	(29.2%)	(56.7%)
5	Open and/or modifiable source code /Customizable is an important characteristics universities considers when selecting the type of software to be used.	(17.5%)	(39.2%)	(43.4%)
6	All level of management is considered by the university when selecting the type of software to be adapted.	(5.8%)	(21.7%)	(72.5%)
7	Conformity to the structure is an important characteristic of the software that universities considers when identifying the type of software to be used	(22.5%)	(14.2%)	(63.3%)

It is noted that organizational structure is an important factor in influencing the choice of softwares in the organization. It was noted that majority of the respondents 72% indicated that the usability of the softwares *is* considered by the university in the selection of the softwares to be adopted for operations. 63.3% indicated that the university considered compatibility of the software before adapting to it and 56.7% indicated that the university considered software flexibility before adapting to it.

On average it was noted that most of the respondents 54.4% said that the University considered various aspects of organizational structure characteristics before they decided on which software to adopt to. The main consideration according to the respondents included; performance efficiency of the softwares, reliability of the software, support for flexibility, usability and compatibility of the software. This shows that the respondents

were well aware of the factors that the organization put in consideration when deciding on the most appropriate software to adopt.

Structure is probably the most investigated organizational characteristic in organizational literature. It institutionalizes how people interact with each other, how communication flows, and how power relationships are defined (Hall, 2002). The structure of an organization reflects the value-based choices made by the company (Quinn, 1988); it refers to how job tasks are formally divided, grouped, and coordinated. This study results are therefore in line with these arguments and it shows that the organizational structure determines the ability of the firm to adopt to new technologies.

This objective was hypothesised to show that there is no significant association between organizational structure and the adoption of OSS in institutions of higher learning. The correlation and regression analysis was presented in table 4.7.1

Table 4.7.1 *Correlation and regression analysis between the organizational structure and the adoption of OSS by the university.*

Model	R	R Square	Adjusted R Square	Std. Error the	Change Statistics					
					R Square Change	F	df1	df2	Sig. F Change
1	.20Sa	*.042*	*.035*	.348	.042	5.990	1	135	.016

From the results presented It IS clear that there IS a positive correlation of 0.206 which is significant at a p-value of 0.016 between the organizational structure and the adoption of OSS by the institutions of higher learning. Regression analysis revealed that the adoption of OSS is influenced by the organization structure by a magnitude of 4.2%.

Organizational size affects the adoption of OSS.

In order to establish whether the organizational size has effects on the adoption ofOSS, the statement were formulated for the respondent to rate them. The result was shown in table 4.8.

Table 4.8 *Response on the effect of organizational size on the adoption o,f OSS*

No	Statements	disagree	Not sure	agree
1	The institution considers cost as a factor in setting of software to be used	(36.8%)	(15%) -	(48,2%) --
2	The source code of the software is an important factor considered by the organization when selecting the type of software to use	(0.3%)	(60.5%)	(39.2%)
3	Training of implementers/users is an important organizational factor to be considered by the university in selecting the type of software to be used	(46.7%)	(13,3%)	(40%)
4	Resistance to change from one software to another affects the choice of software selected by the university	(12,5%)	(48,3%)	(39.2%)
5	The university considerers the security of the software when selecting the kind of software to use	(25%)	(30%)	(45%)
6	Share of information and! or integrity of data is an important factor university considers when selecting the type of software to use	(15%)	(30%)	(55%)
7	Support and maintenance of the software is an important factor university considers when selecting the ~e of software to use	(7.5%)	(30%)	(62.5%)
8	The university considers the resources at their disposal when selecting the kind of software to use	(19,2%)	(19.2%)	(61.7%)
9	The university considers the performance of the software during the selection of the type of software for adaption	(6.7%)	(2l.7%)	(71.7%)
10	The university considers the professionals / expertise in the field of ICT during selection of the type of software for adaption	(7.5%)	(30.8%) -	(61.7%)
11	I The university considers the cost of the software from vendors to be used	(15%)	(37.5%)	(47.5%) ~
12	The university considers the sustain ability of software's when selecting the one to adapt.	(11.7%)	(13.3%)	(75%) I

The results presented shows that the university considers the cost of the softwares, the level of expertise and professionalism, the general performance of the software 71.7% and the sustainability 75% of the software in relation to organizational size. This shows that organizational size has an effect on the decision made by the organization on the type of software to adopt. The studies that have defined the effect of organizational size on

the adoption of new technologies in the organization are in support of the current findings where by organizational size is identified as a factor in many recent studies of innovation adaptability, probably reflecting the reservations. Eveland & Tornatzky, (1990) and Fichman, (J 992) noted that the need to broaden the focus beyond the individual level. It is noted that organization size appears relevant in that the few published cases of OSS implementation all tend to trumpet the number of desktops that will be converted from proprietary to OSS.

The second hypothesis was hypothesized that there is no significant association between organizational size and the adoption of OSS in institutions of higher learning; the results were presented in table 4.8.1.

Table 4.8.1 *Correlation and regression analysis between the organizational size and the adoption of OSS by the university.*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	dfl	df2	Sig. F Change
1	.365 a	.133	.126	.331	.133	20.689	1	135	.000

The results presented show that there is a significant relationship which is positive between the adoption of the OSS in the public institution and the adoption of OSS by the University. The correlation was positive 0.365 and the p-value was 0.000 showing high level of significance in the relationship with magnitude of R-square of 13.3 %. This shows that organization size has a bigger effect on the adoption of OSS compared to the organizational structure of the firm.

Effects of Organization culture on the adoption

It was also important to establish whether organizational culture was a factor determining the adoption of softwares in the learning organization. The results were presented on table 4.9.

Table 4.9 *Response on the effect of organization culture on the adoption of software*

No	Statement	Disagree	Not sure	Agree
1	Defects in purchase of the software	(50.0%)	(27.5%)	(22.5%)
2	IeT suppliers lack of flexibility	(24.2%)	(55.8%)	(20.0%)
.)	Lack of integration between applications (interoperability)	(29.2%)	(40%)	(30.8%)
4	Lack of qualified JeT staff	(68.3%)	(12.5%)	(19.2%)
5	Difficult to recruit or retain ICT qualified staff	(29.2%)	(25%)	(45.8%)
6	Lack of an updated ICT strategy	(39.2%)	(44.2%)	(16.6%)
7	ICT expenditure too high	(41.7%)	(36.7%)	(21.7%)
8	Lack of appropriate collaboration with software suppliers	(52.5%)	(30.0%)	(17.5%)
9	Rigidity in the leadership of the organization	(49.2%)	(50.8%)	-
10	There is no mission supporting the adoption of new systems	(21.7%)	(55.8%)	(22.5%)
11	Organization lacks the drive of change to facilitate the adoption of new technologies	(57.5%) (20.8%) .I-		(21.7%)

From the respondents in table 4.9 it is very clear that the organizational culture has an effect on the adoption of OSS software. In this case the respondents were required to respond to the various statements, it was noted that most of the respondents 68.3% disagree that the organizations lack qualified ICT staff, Role of management in enhancing adoption of OSS in institutions of higher learning. 57.5% disagree that the organization lacks the drive of change to facilitate the adoption of new technologies. However 45.8% agreed that it is difficult to recruit or retain ICT qualified staff 55.8% were not sure that ICT suppliers lack flexibility and a similar response was noted for the fact that there was no mission supporting the adoption of new systems.

This simply explains that the organizational culture has an effect on the adoption of the OSS software in the learning institution. These results are similar to what other authors have established. A similar view was established by Swanson's, (1994); Rogers, (2003) and Dedrick and West, (2003) who indicated that organizational culture plays an important role in the success of any new adoption in the organization. These

three studies noted that in more risk-averse industry sectors, one might expect to see more reluctance to engage with inherently risky implementations such as that represented by a new phenomenon like OSS, which does not offer the traditional comforts. Organization culture defines the state at which the organization would want to avoid any risky challenges which they are not sure of its outcomes.

In order to establish the relationship that exists between the adoption of OSS and the organizational culture, the third objective was hypothesized as there is no significant association between organizational culture and the adoption of OSS in institutions of higher learning. The results were presented in table 4.9.1.

Table 4.9.1 *Correlation and regression analysis between the organizational culture and the adoption of OSS by the university*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.364^a	.133	.126	.331	.133	20.646	1	135	.000

The results on table 4.9.1 shows that there was a positive correlation of 0.364 between the adoption of OSS in the learning institutions and the organizational culture with a p-value of 0.000 showing a very high level of significance with a n R- square of 13.3 %. This shows that organizational culture also has a very high influence on the adoption of *OSS.*

Role of management in enhancing adoption of OSS

It was also important for the researcher to examine the role of management in enhancing the adoption of OSS in the institution of higher learning and the result was as shown in the table 4.10

Table 4.10: *Response on the role of management in enhancing adoption of OSS*

No	Statement	Disagree	Not sure	Agree
1	Senior management leadership is critical to the success of OSS adQ1JtiOll in the institutions	*(9.2%)*	55.5%)	35.3%)
2	The top management team (steering committee) must involve the entire team manager, any consultants working with the committee, and agency staff to pave way for the adoption of the system	(12%)	(33%)	(55%)
3	Considerable attention and support need to be provided by senior management to ensure that the OSS adoption has been well understood in the entire institution.	(16.7%)	(30%)	(53.3%)
4	The executive management team is responsible for setting the vision and goals	(26.7%)	(10.8%)	(62.5%)
5	It has the responsibility of bringing about collective commitment for change in process and organizational structures	(10%)	(37.5%)	(52.5%)
6	It is the role of the management to formulate the policies and strategies necessary to put an e-Procurement initiative in place	(15.8%)	(17.5%)	(66.7%)
7	The management is ready to provide the necessary financial investment in the new development.	(7.5%)	(50%)	(42.5%)
8	The management supports the use of OSS availability due to the source code which might not provides more trust in the program	(21.7%)	(15.8%)	(62.5%)
9	The management finds it more convenient to use OSS in its operations as it is cheaper	(10%)	(49.7%)	(40.3%)
10	General, the management feels vulnerable to issues of security by use of OSS in the institutions operations	(37.5%)	(2.7%)	(59.8%)
11	More people are pressing for OSS usage in the institution but the management is not keen to have the OSS implemented.	(27.5%)	(11.7%)	(60.8%)
12	Employees make an effort to convince managers of the benefits of OSS but the managers are not yet keen to establish the benefits	(33.3%)	(25%)	(41.7%)
13	There are one or more people in our organization who are pushing for OSS very enthusiastically	(21.7%)	(19.2%)	(59.2%)
14	Nobody in our organization management team has taken the lead in pushing for adoption of OSS	(42.5%)	(15.8%)	(41.7%)
15	The management feels that developing procedures to deal effectively with OSS would , take a.lot of time hence it's not supporting its adoption.	. (27.5%)	(30%)	(425%) I

From the table 4.10 various statements were made known to the respondents for them to respond on what they felt was the role of the management in the adoption process of OSS. It was noted that most of the respondents 60.8% agreed that most people are pressing for OSS usage in the institution but the management is not keen to have the OSS implemented. 59.8% notes that the management feels vulnerable to issues of security by use of OSS in the institutions operations. 62.5 % noted that management does not supports the use of OSS availability due to the source code which might not provides more trust in the program. Glynn, (2005) note that the success of any OSS adoption relies heavily on the top management support which is also clearly depicted in this study. It is clearly noted that the respondents feels that lack of top management support has resulted in the low adoption of OSS in the learning institutions. Eveland & Tornatzky, (1990) observed that top management support is undoubtedly critical for radical, high risk initiatives such as OSS deployment as it contravenes the traditional model where ongoing support is legally guaranteed by a vendor.

The last objective of the study sought to establish whether there is no significant association between role of management and the adoption of OSS in institutions of higher learning. Table 4.10.1 presented the findings.

Table 4.10.1 *Correlation and regression analysis between the role of management and the adoption of OSS by the university*

Model	R	R Square	Adjusted Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.076[a]	.006	-.002	.355	.006	.774	1	135	.381

The results of the study showed that there is a positive correlation of 0.076 between the adoption of OSS and the role of the management which is not significant at a p-value of 0.381 and an r-square which is very small at 0.6 %. This means that the role of the management has a minimal influence on the adoption of OSS in the institutions of higher learning.

Reasons that make organizations adopt OSS

In order to establish the reasons that make organization want to adopt OSS in their operations the respondents were asked to indicate whether they agree or disagree with various statements provided in table 4.11 it was noted that majority of the respondents agreed that the adoption of OSS will assist in reducing the cost of commercial packages softwares. It was also noted that most of the respondents noted that the adoption of OSS reduce the cost of custom software that is used widely in the organization. Adoption of OSS was also noted to have an effect by reducing dependence on the commercial packages softwares.

Table 4.11 *Response on the reasons that make organizations adopt to OSS*

No	Statement	Disagree	Agree
1	Reduce cost of commercial package software	(13.3%)	(86.7%)
2	Reduce cost of custom software	(15.8%)	(84,2%)
3	Lower support and maintenance cost of commercial package software	(i5.8%)	(84.2%)
4	Higher quality, more secure software	(53.3%)	(46.7%)
5	Reduce computer hardware cost	(44.2%)	(55.8%)
6	Reduce dependence on commercial package software	(36.7%)	(63.3%)
7	Build custom systems faster	(39.2%)	(60.8%)
8	Create software standards across departments, functions and/or business units or divisions	(15.8%)	(84.2%)
9	INeed for functions not available in commercial package software	(30.8%)	(69.2%)
10	Interest by technologists in gaining new knowledge and skills	(22.5%)	(77.5%)

The adoption is also seen to have an influence on the need for functions not available in commercial packages software. This findings are similar to those established by (Ven, 2007; Cassell, 2008; Huysmans, 2008,) who noted that the adoption of OSS reduces expenditure on information technology (IT) by reducing the licence fees paid to proprietary software vendors. Similarly, Waring & Maddocks, (2005) noted that OSS is basically a free alternative to proprietary software and, for this reason, an organization wanting to reduce the amount of licence fees paid will benefit from OSS adoption. This indicates that this study results are in line with other researchers findings.

Regression model showing the relationship between factors determining adoption of OSS.

In order to determine whether the factors under study have significance in influencing the adoption of OSS in leaning institutions. In order to establish the regression analysis the type of software used was considered as the dependent variable while the factors that were considered for the independent variable were; organizational culture, organizational size, the role of the management and the organizational structure. The regression model was summarized in table 4.12.

Table 4.12 *Regression model*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	dfl	df2	Sig. F Change
1	.474[a]	.225	.195	.318	.225	7.599	5	131	.000

And it is clearly indicated that the four factors under study have significant effect on influencing the adoption of OSS the learning institution. The regression coefficient (R) was established to be a positive of 0.47 meaning that organizational culture, organization size, organizational structure and the management all play a role in the adoption of OSS in the learning institution. Thought the (R square) was only 22.5 %. This means that the adoption of the OSS in the learning institutions can only be explained by 22.5 % of the four factors under study. It is also clear that at a confidence of 95% the results show high significance at a p-value of 0.000.

Correlation analysis

In order to establish the regression coefficients between the determinants the summary was provided on the regression coefficient table 4.13

Table 4.13 *Correlation coefficients*

	I	Organ. structure	Org size	Organ. culture	. Organ. management	Benefit OSS
Organizati onal structure	Pearson Correlation	1.000	.464'*	.495^H	.410'·	-.136
	Sig. (2-tailed)		.000	.000	.000	.112
	N	137.000	137	137	137	137
Organizational size	Pearson Correlation	.464·'	1.000	'·.563	.441 ,.,.	-.100
	Sig. (2-tailed)	.000		.000	.000	.243
	N	137	137.000	137	137	137
Organizational culture	Pearson Correlation	.495"*	.563**	1.000	.533*"	-.118
	Sig. (2-tailed)	.000	.000		.000	.169
	N	137	137	137.000	137	– 137
Role of management	Pearson Correlation	.410*	.441*	*.533	1.000	.081
	Sig. (2-tailed)	.000	.000	.000		.344
	N	137	137	137	137.000	137
Benefits of OSS	Pearson Correlation	-.136	-.100	-.118	.081	1.000
	Sig. (2-tailed)	.112	.243	.169	.344	
	N	137	137	137	137	137.000

From the results of the study presented in table 4.13 it is clearly indicated that all the factors under study correlated positively with each other and they were all significant, Apart from organizational structure which had a negative correlation coefficient of -0.136 with the benefits of OSS which was very significant in relation to the other factors. Organizational structure correlated positively with Organizational size at a value of 0.464 and has a p-value of 0,000 showing significance. It also correlated positively with organizational culture at a value of

0.495 and a p-value of 0.000 also showing significance: With Top management influence organizational structure also showed very high significance at a p-value of 0.000 and a correlation of 0.410. This clearly indicates that a change in all the other factors is likely to lead to a change in the way OSS is adopted in the institution.

Factor analysis results

The last section of the analysis sought to establish the extend of the effect of the determinants and therefore rank them in the order of their importance. It was established that using the factor analysis, communalities were used to establish the factor with the highest effect. The results were presented in table 4. 14

Table 4.14 *Factor analysis*

Response	Initial	Extraction
Organizational Culture	1.000	.702
Role of Management	1.000	.669
Organizational Size	1.000	.627
Organizational Structure	1.000	.579

From the table it is clear that the organizational culture has the highest influence as a factor determining the adoption of OSS In the institutions of higher learning with a factor of 0.702 , this is followed by organizations management with a factor of 0.669 , organizational size with a factor of 0.627 and lastly organizational structure with a factor of 0.579. This shows that the management of learning institutions should consider making adjustments on the factors that define organizational culture in order to make appropriate decisions on the software to adopt.

CONCLUSION, RECOMMENDATIONS AND THE WAY FORWARD

The study sought to examine the organizational determinants in the adoption of open source software in institutions of higher learning in Kenya so as to meet the objectives of the study. Section 5.2 discusses findings related to the first objective of the study that aimed at analyzing the organizational Structure on the adoption of OSS in the institution of higher learning, section 5.3 discusses findings related to the second objective that aimed at examining how organizational size affect the adoption of OSS in institutions of higher learning, section 5.4 discusses findings related to the third objective that aimed at assessing whether organizational culture affect the adoption of OSS in institutions of higher learning, and section 5.5 discusses findings related to the fourth objective that aimed at evaluating the role of management in enhancing adoption of OSS in institutions of higher learning. The reliability of the instruments was determined using SPSS where the Cronbach alpha reliability coefficient which yielded an overall reliability of 0.891 was determined. Since the study presumed a reliability of 0.7, the questionnaires were accepted as reliable.

Majority of the respondents among the students were in the age bracket of between 18-34 years while among the lecturers and the management the majority were in the age bracket of between 35- 46 years, Majority of the respondents were male, this shows that the opinion generated from the results will therefore include the opinion of both the males and the females in the institution.

From the results it is clear that majority of the lecturers and the management team selected for the study had only worked for 5 years and below. This might be explained by the fact that the institution under study is a young institution which has operated for less than 10 years. The results indicated that very few of the respondents in the institutions are aware of the use of the OSS as a software in their daily operations. This was because many institutions prefer the use of the commercial softwares over the OSS.

From the response it is clear that majority of the respondent 117(85.4%) indicated that the university uses the proprietary software to a wider extend in comparison to the 12(8.8%) who indicated that they use open source software while 8(5.8%) indicated that the university uses both software's. This shows that the university still uses the proprietary software despite its challenges over the existence of the free software's such as the OSS.

Organizational structure as a **determinant of adoption of OSS**

It is noted that organizational structure is an important factor influencing the choice of softwares in the organization. It was noted that majority of the respondents 72% indicated that the usability of the softwares is considered by the university in the selection of the softwares to be adopted for operations. 63.3% indicated that the university considered compatibility of the software before adapting to it and 56.7% indicated that the university considered software flexibility before adapting to it. On average it was noted that most of the respondents of the university considered various aspects of organizational structure characteristics before they decided on which software to adopt. The main consideration according to the respondents included; performance efficiency of the softwares, reliability of the software, support for flexibility, usability and compatibility of the software. This shows that the respondents were well aware of the factors that the organization put in consideration when deciding on the most appropriate software to adopt.

Organizational size affects the adoption of OSS.

The results presented shows that the university considers the cost of the softwares, the level of expertise and professionalism, the general performance of the soft ware 71. 7% and the sustainability 75% of the software in relation to organizational size. This shows that organizational size has an effect on the decision made by the organization on the type of software to adopt.

Effects of Organization culture on the adoption

From the respondence in table 4.9 it is very clear that the organizational culture has an effect on the adoption of OSS software. In this case the respondents were required to respond to the various statements it was noted that the most of the respondents 68.3% disagree that the organizations lack qualified ICT staff, Role of management in enhancing adoption of OSS in institutions of higher learning. 57.5% disagree that the organization lacks the drive of change to facilitate the adoption of new technologies. However 45% agreed that it is difficult to recruit or retain ICT qualified staff 55.8% were not sure that ICT suppliers lack flexibility and a similar response was noted for the fact that there was 110 mission supporting the adoption of new systems. This simple explain that the organizational culture has an effect on the adoption of the OSS software in the learning institution.

Role of management in enhancing adoption of OSS

From the table 4.10 various statements were made known to the respondents for them to respond on what they felt was the role of the management in the adoption process of OSS. It was noted that most of the respondents 60.8% agreed that most people are pressing for OSS usage in the institution but the management is not keen to have the OSS implemented. 59.8% notes that the management feels vulnerable to issues of security by use of OSS in the institutions operations, 62.5 % noted that management does not supports the use of OSS availability due to the source code which might not provides more trust in the program.

Reasons that make organizations adopt OSS

Majority of the respondents agreed that the adoption of OSS will assist in reducing the cost of commercial packages softwares. It was also noted that most of the respondents noted that the adoption of OSS reduce the cost of custom software that is used widely in the organization. Adoption of OSS was also noted to have an effect by reducing dependence on the commercial packages softwares. The adoption is also seen to have an influence on the need for functions not available in commercial packages software.

In order to determine whether the factors under study have significance in influencing the adoption of OSS in learning institution. The factors that were considered were; organizational culture, organizational size, the role of the management and the organizational structure. The regression gave summary of the results where it *is* clearly indicated that the four factors under study have significant effect on influencing the adoption of OSS the learning institution. The regression coefficient (R) was established to be a positive of 0.47 meaning that organizational culture, organization size, organizational structure and the management all play a role in the adoption of OSS in the learning institution. Thought the (R square) was only 22.5 %. This means that the adoption of the OSS in the learning institutions can only be explained by 22.5 % of the tour factors under study. It is also clear that at a confidence of 95% the results show high significance at a p-value of 0.000.

Correlation analysis shows that the organizational culture has the highest influence as a factor determining the adoption of OSS In the institutions of higher learning with a factor of 0,702 , this is followed by organizations management with a factor of 0,669, organizational size with a factor of 0.627 and lastly organizational structure with a factor of 0.579. From the results of the study presented in table 4.12 it is clearly indicated that all the factors under study correlated positively with each other and they were all significant. Apart from organizational structure which had a negative correlation coefficient of -0.136 with the benefits of OSS which was very significant in relation to the other factors. Organizational structure correlated positively with Organizational size at it value of 0.464 and has a p -value of 0,000 showing significance. It also correlated positively with organizational culture at a value of 0.495 and a p-value of 0.000 also showing significance. With Top management influence organizational structure also showed very high significance at a p-value of 0,000 and a correlation of 0.4O. This clearly indicates that a change in all the other factors is likely to lead to a change in the way OSS is adopted in the institution.

Conclusions of the study

The result of this study shows several interesting insights about OSS adoption by institutions of higher learning. This study has a theoretical implication in that this study has presented a model describing and evaluating the organizational determinants that influence the adoption of OSS in the higher learning institutions in Kenya. The study was grounded in OSS adoption and literature was reviewed in line with the organizational determinants that affect the adoption process. Based on the finding of the study, much of the evidence on the organizational determinants affecting adoption of OSS; that is, organizational structure, organizational size, organizational culture and the role of the management were confirmed or rejected.

The study provides managers with information on the most important determinants that facilitate the adoption of OSS in institutions of higher learning. This enables managers to take appropriate measures if they consider adopting OSS. This should also allow them to make better informed choices on how to select the type of software to use in the institution. 'The results also show which organizational determinant has the most effect on OSS adoption and this provides insight to the organization to understand how the institutions can deal with these determinants. This is useful for individuals and vendors who want to promote the use of OSS. From the results, it would make more sense to put more emphasis on the reliability, flexibility, performance and usability of OSS as a software, rather than the availability of the source code. Finally, the importance of the role of management in the adoption of OSS is a major implication for organizations considerations.

Managers may consider employing and using employees with experience in OSS who can provide the organization with advice on the use of OSS in future operations of the institution. On the other hand, given the influence of these major determinants, it is important for institution to remain pragmatic in their promotion of *OSS*. The findings of this study are in line with those of future research which may try to gain a better understanding of the role of organizational size and culture in the adoption decision. Such studies could provide more information on who tries to promote the use of OSS in their organization. It may also be interesting to know if the opinion of the employees is valued and taken into account by decision makers when making decisions on adoption of softwares.

Recommendations and the way forward

For OSS adoption to be implemented and used in the institution of higher learning top management support is required (Glynn, 2005). Therefore, this study recommends that institution of higher learning should remain pragmatic in their promotion of OSS with top management working closely with the experts in the University to enable them make more informed decisions about the software. Top manageiTI.el1t should also need to be aware of the potential costs that are associated with implementing OSS in institution of higher learning and understand that it is the long-term benefits of the institution and focusing on University change, not any possible short-term financial returns (Rogers, 2003). Therefore this study recommends that institution of higher learning to employ ICT experts who has technical know how on how Open Source Software is implemented and considering the other determinants linked to the benefit of OSS rather than employ commercial software.

This study also recommends that adoption of OSS should be properly established and implemented in order for the institution of higher learning to show improvement on the flexibility and usability of the software. This will make an efficient and effective running of *systems* in the university.

There was no doubt that there were other determinants that could affect the adoption of OSS in institution of higher learning; however the study recommends that emphasis need to be placed on developing an effective adoption of OSS to enhance flexibility and usability of the software in the institution of higher learning.

Suggestions for further study

Although this study looked deeply into the organizational factors as determinants of OSS adoption in higher learning institution the study was found to be limiting because there are other determinants related to the infrastructure and resources which were not addressed and have an effect on the adoption of OSS. The fact that the study focused on only the organizational determinants and the higher learning institutions with a focus on private university influenced the results of this study on the adoption decision of OSS. Future research should be conducted to see whether these findings also hold in public institutions. Another avenue for future research is to determine whether there are other determinants to be considered while adopting OSS and its applicability.

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