

The Adoption of Free and Open Source Software in Teaching and Learning: Case Study Zanzibar Education Institutions

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Abstract: *While developing countries and their education institutions try to improve themselves to the use of ICT in their daily activities, news from other parts of the world prove the quite revolution awaited by free and open source software fans is on its way. On 27December 2010, the Prime Minister of Russia, Vladimir Putin issued an order for the Russian government to switch to open source. In fact, the main drive to this strategy are cost reduction, improve independence to the technological goods, and increasing computing power to students who will be competitive in the international market.*

Keywords: *Free and open source software, cost saving, computing power, education institution, and Zanzibar*

1. INTRODUCTION

The development and innovation of Information technology gave rise to new opportunities for learning, better ways of studying and engaged in easy accessibility with cost reduction. Educational institutions have been using modern technologies with effective use of the internet to expand and distribute education to students. Unfortunately, much of learning software and materials were cost effective, particularly for developing countries within proprietary systems. The free and open source movement aims to break such barriers and to encourage and enable free sharing and distribution of software for serving the community.

Educational institutions are facing a number of challenges: globalization, an aging society, growing competition between educational institutions, both nationally and internationally, rapid technological development and limitation of budget for acquiring hardware and software issues. ICT policy is mandatory for educational institutions to formulate proper missions and visions of the institutions. At the same time, Open source is a vital issue, for advancing the effective use of technology in education [1].

FOSS communities have been increasingly influencing teaching and learning and deliver quality content for both software development and education over history. Further, as recommended by the Ministry of education in their proposed program for education plan in Zanzibar that Ministry of education Zanzibar needs to put open source standard guideline in school curriculum in the reform of ICT with education program [2]. FOSS foster skill workforce, community driven and consists of individuals who contribute to write and develop numerous applications with the intension of backing FOSS development. However, the volunteers need to be unselfish to contribute in the community's activities rather than the realms of software development.

Furthermore, FOSS projects build and maintain not only software applications, but also offer incredible amounts of knowledge that intended to the society. Besides, FOSS has an evident impact on education and has already produced highly successful tools related to education, such as Course Management Systems (CMS) e.g. MOODLE, web portal and media wiki which is a known as a popular source of materials for students and teachers. In addition, major FOSS distributions, such as the education version of UBUNTU (EDUBUNTU) specialize in education is a great choice for the computing needs of students, teachers and schools [3]. Further, Tigris

¹provides information resources for students and software engineering professionals and a home for open source software engineering tool projects [4].

Moreover, this study paper intended to develop the framework for the adoption of free and open source software for Zanzibar education institutions to reduce costs, increase collaboration and integration between Zanzibar education institutions and increase computing power to students.

2. REVIEW AND ANALYSIS OF FOSS

The general concept of FOSS is allowing the source code of software publicity available to everyone. The software or binaries are available via Internet and freely downloaded and used to who want to use it. The promise of FOSS is lower cost, better quality, higher reliability, more flexibility, and an end to predatory vendor lock-in [6].

The Open Source Initiatives (OSI) is a non-profit corporation formed to educate about and advocate the benefits of FOSS and to build bridges among different constituencies in the open source community [6]. Hence, for the country or education institutions to adopt FOSS will bridge the digital divide between the rich countries and poor countries. Whereby countries are enabling to download the software from the internet or sharing with each other without any payments.

2.1. FOSS in Government and Schools

The government, education system and schools across the world is either opting for a vendor neutral approach to the acquisition and use of software, or are choosing to use FOSS [7]. Many countries and education system around the world has been adopting FOSS. The study conducted by Sterling found that, since 2002, the State of Extremadura in Spain has deployed over 80,000 copies of LinEx (a locally developed version of Debian) to schools [8]. In addition, the Shuttle worth Foundation in South Africa funded open source in education, whereby one of the project able to translate Open Office, Mozilla and KDE into the eleven official South African languages [9].

Several countries in the Asia-Pacific such as Thailand have used FOSS as a negotiating tool with Microsoft, where the government has backed up negotiation with a government supported GNU/Linux distribution for schools and government desktops [7]. In India, the Department of Information Technology, Ministry of Communication and Information Technology, has been encouraging GNU/Linux and FOSS as standards in academic institutions. Moreover, some countries like China, Japan, and South Korea collaborates with their FOSS communities to challenge Microsoft products [7] in schools

2.2. Total Cost of Ownership (TCO)

TCO refers to all costs associated with the use of computer hardware and software, including the administrative costs, license costs, hardware and software updates, training and development, maintenance, technical support and any other associated costs [7]. In order to get a clear picture of the true cost saving of open source, the study reveals some studies to explore TCO of open source.

The study conducted by Kavanagh from USA found that systems employing open source will usually be less expensive than with proprietary software. He compares open source price with the cost of closed system software. The cost elements that he used were staffing, hardware and software [10]. The cost of acquisition of Linux is cheaper than proprietary software. Hence, the support cost of Linux is also lower that proprietary software due to an increasing in the system stability, reduction of the rampaging virus and the absence of the need to reboot or reload the operating system [11].

2.3. Open Source Education Models

FOSS community based approach in education has developed several FOSS models. Some of these models and schools of thought have thrived and been implemented successfully in the industry.

¹ www.trigris.org

Whereas, the success of the FOSS project like the Moodle², Sakai, uPortal³ and many more are being closely watched by the industry [12].

To contextualize the issue, the main purpose of academic teaching now is no longer to offer a systematical theory framework as formal education does, but to provide the kinds of theoretical analysis tools and perspectives, through project-based and case-based learning. Hence, the power of case study for school is potential to bridge gap connections between theory and professional practice [13]. Case content and case discussions can help teachers develop flexibly powerful pedagogical understanding and judgment. Furthermore, case contents provide students easy to remember facts, concepts and principles. The teaching scheme will involve the following stages:

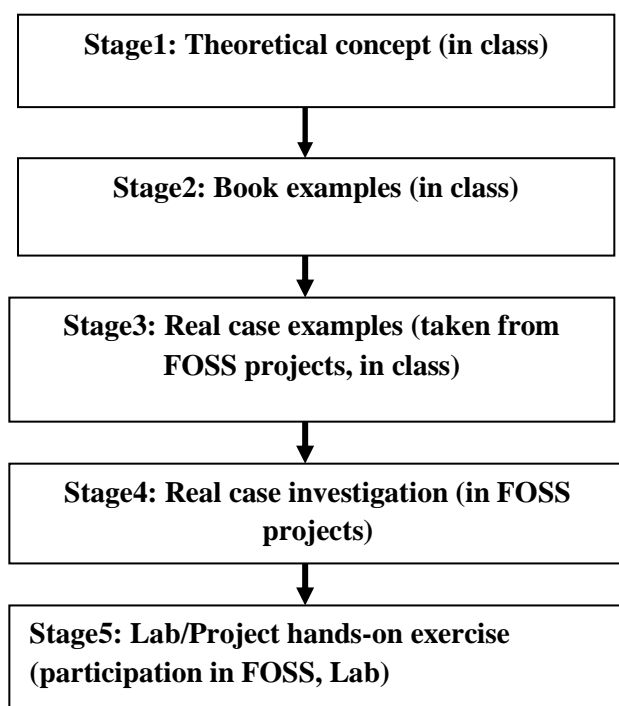


Fig.1: FOSS teaching scheme (adapted from Stamelos, 2008)

3. BENEFIT OF FOSS FOR EDUCATION INSTITUTIONS

FOSS has got many benefits compared to proprietary software. The benefit may vary from one institution to another depends on the expertise the institutions has.

3.1. Ability to Customize

Since the source code of Linux is open, the institutions can customize the software to meet their needs. As far as programming skills are available within the educational institution, the programmer may expand an existing functionality to provide totally new features or system. Because of its customization, the modularity of Linux enables it to be used in a wide range of system, from supercomputer to a refrigerator and is more preferred over Windows NT for isolated, single task servers, such as DNS, File, Mail and Web [14].

3.2. Availability/Reliability

This is the amount of time a system is up and running. The survey, conducted by Blood Research company found that, after running both Linux and Window system for a one year test, Linux

² Sakai is an enterprise teaching, learning and academic collaboration platform that best meets the needs of today's learners, instructors and researchers. www.sakaiproject.org

³ uPortal is a most successful open source enterprise portal framework developed for the higher education community. www.jasig.org

crashed once due to hardware fault (disk problems), which took 4 hours to fix. Window NT crashed 68 times, caused by hardware problems, memory (26 times), file management (8 times), and various odd problems (33 times). All this took 65 hours to fix. These showed that Linux is more reliable than Window system [15].

3.3. Performance

Performance is the ability to use computer resources (e.g. Processors, memory, and disk) efficiently. The good performance of the software that can be used in the institutions results the education activities such as studies, digital library to be performed efficiently. The performance tests conducted by System Admin Magazine examined high-performance architectures of Linux and found that Linux beat its competition when compared with Window system. The test used the latest versions of Operating systems and the exact similar machine [15].

3.4. Security

By comparing security issues, Linux is more secure than Windows systems. Windows machines are attacked more by virus, Trojan, worms and other malware. Because windows are more vulnerable by viruses is not probable that windows desktop software dominate the desktop computers. In fact, many viruses, Trojan, worms and other malware that infect windows machines do so through a vulnerability in Microsoft Outlook and internet explorer [16]. The design of Window is a source of this vulnerability. The Windows origin is single-user system, which was designed to allow both user and applications free access the entire system. This means even viruses could tamper with any critical system program or file. Although Windows XP, Window 7 and Windows Server 2003 represented progress to isolate users and applications from sensitive areas of the operating system towards true multi-user capabilities. However, the systems haven't escaped all the leftover single-user security holes. On the other hand Linux has been designed from the ground-up to isolate users from applications, files and directories that affect the entire operating system. Each user is given a user directory where all of the user data files and configuration files are stored. So that it is nearly impossible to send an email to a Linux user that will infect the entire machine with a virus, but even if they did, the most damage or delete is the user's own files. 92 percent of those surveyed conducted have never experienced a virus, Trojan, or other malware infection on Linux [16].

4. DATA COLLECTION RESULTS

The study involved One hundred and five lecturers, teacher and students from universities, colleges and schools in Zanzibar. 52.4 percent of the respondents were from the Universities, 30.5 percent from Colleges and 17.1 percent of secondary schools. Whereby 31.8 percent were lecturers, 23.4 percent were teachers and 43.0 percent were students. The main aspects of the questions were based on FOSS awareness, type of software used and affordability to buy the software.

4.1. FOSS Opportunities

The opportunities of adoption of FOSS are not only save cost to educational institutions, free to use source code, free to make copy and distribute the software to others but also FOSS is increasing the computing power to the students by making them interact more with hands-on practices. In this study, the respondents were asked whether they think the use of FOSS in their institutions will assist education level because the money that supposed to be used to purchase the software can be used to other educational activities. If the chosen answer was "Yes" the respondents should select the reasons. Out of 105 respondents 90 (85.7 percent) chosen save cost are the main reason, 44 (41.9 percent) chosen increase computing power to students and 47 (44.8 percent) chosen free to make copy and distribute the software to others. However, only 3 (2.9 percent) of the respondents were not agreed that FOSS will assist educational level of the institutions, as shown in Table 1 below. This response comments that FOSS strategy needs to be implemented in the education institutions in Zanzibar, the clients (lecturers, teachers, and students) agreed that there is a lot of opportunities of FOSS that not only will benefit the institutions but also the students will be more empowering in the computing activities thus will assist education development. These findings were not differing from other studies such as the

conducted at South Africa [17] whereas the study revealed cost saving is the main reasons of the South Africa to adopt FOSS.

Table 1. FOSS Opportunities

Selection options	Responses		Percent of Cases
	Total	Percent	
Save cost	90	48.9%	85.7%
Increase computing power to students	44	23.9%	41.9%
Free to make copy and distribute	47	25.5%	44.8%
No	3	1.6%	2.9%
Total	184	100.0%	175.2%

4.2. FOSS Against Pirated Copy

Due to the fact that Zanzibar is among poor countries, its citizen can't able to buy proprietary software. Findings from the study as illustrated in fig 2, showed that 60.95 percent of the respondents never buy proprietary software such as Microsoft Window and Microsoft Office and few (26.67 percent) do buy proprietary software for some time and very few (12.38 percent) were buying proprietary software most of the time. Eventually, this data was not surprising and is the reflection of poverty and low living standards in Zanzibar so that people are not able to buy proprietary software. This results prove that the use of FOSS which is available free, free to use source code, free to make copy and distribute is a proper decision for poor country like Zanzibar.

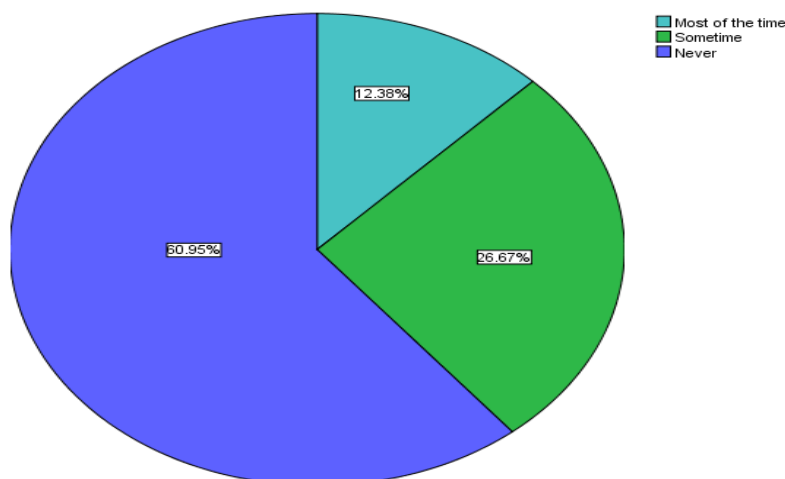


Figure.2. Show the percentage of respondent who buy proprietary software

5. THE PROPOSED FRAMEWORK

Open source process doesn't only save costs and other benefits to the education institutions but also bring huge influence on learning and teaching process. The new modern way of teaching and learning which emphasize the use of project-based and case-based is an improvement of the existing traditional approach. The framework shown in Figure 3 divided in four phases; each phase describing the teaching and learning circumstance in which students being involved in FOSS activities.

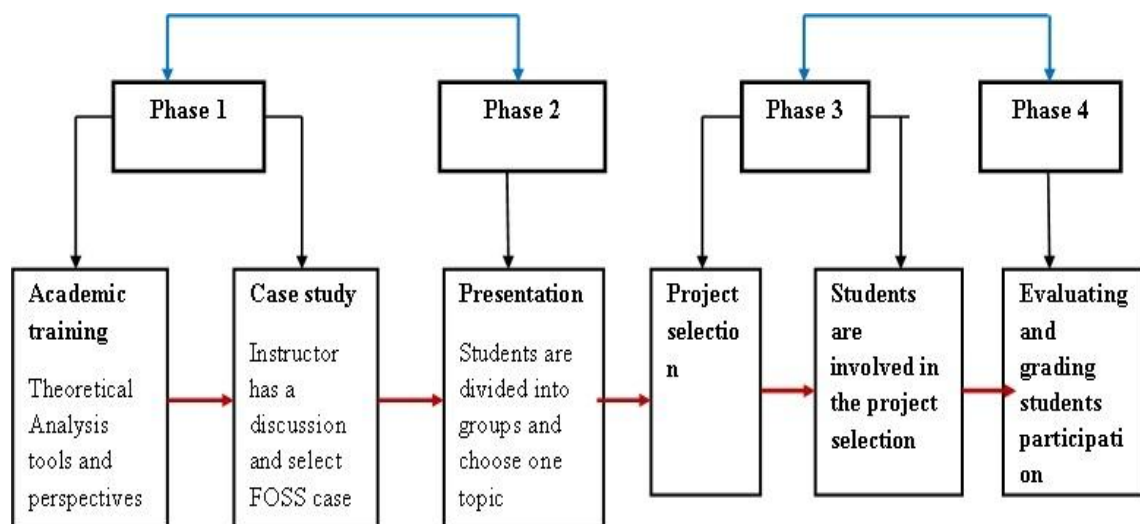


Figure 3. Teaching and Learning Framework

6. DIFFICULTY AND CHALLENGES

Free and open source learning process is in fact the injection of informal learning factors to traditional classes, it demands some adjustments. There are some challenges that this reform will face to education institutions.

The first challenge is academic staff resistance to change. The experienced shows some academic staffs are resistance to changes. The management of the institutions should try to convince their clients and prepare special training programs on the new way of teaching to ensure well utilization of this approach.

Other challenges are the perception. The Linux is said to have a less Graphical User Interface (GUI) compared with Microsoft Windows and other proprietary products. However, the improved features of new Linux versions came with closer similar user-friendly features as Microsoft Windows. Moreover, Open Office has nearly the same usability features and more comparable functionality to Office 2003 and Office 2007 [18].

In addition, support is another challenge that education institutions will face. It's true that most of education institutions in Zanzibar have little understood of FOSS. However the adoption of FOSS will starts to the university level (such as SUZA and Zanzibar University) which has been got familiarity of FOSS in their teaching and learning. These universities will offer additional support to other institutions and their graduate's who may be employed to other institutions will be able to use FOSS and to support others.

The last challenge is the boundary. When the students have completed their studies, in other words the formal process will come an end, how to maintain informal process? Solving this problem demands continuing and long-term lasting effort to break the boundary [5]. Thus the government should create employment opportunities for students after graduating there studies.

7. CONCLUSION

The detailed analysis must be made for the developing country like Zanzibar to determine the impact of FOSS in education before adaptation in teaching and learning [20]. The analysis will show the gaps and the successful strategy to adopt FOSS as a new teaching and learning approach in the education sector. The syllabus should be modified and FOSS experts should be motivated to spare their free and valuable time for the community development

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