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Deepika Satyarajan

Manipal University Dubai, deepuvarun@hotmail.com

Vishwesh Akre

Manipal University Dubai, vishwesh@manipaldubai.com

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Open source Software ADOPTION: an academic perspective

Deepika Satyarajan, Vishwesh Akre

Manipal University Dubai

deepuvarun@hotmail.com, vishwesh@manipaldubai.com

ABSTRACT : *Open Source Software (OSS) is defined as a computer software that is freely provided and which permits users to use, change, and improve the software, and to redistribute it in a modified or an unmodified forms. OSS is developed in a highly social online environment where developers are dispersed in space and time, but rarely interact in a face-to-face manner. Literature in this field specifies many successful OSS implementations in Academic Institutions globally. Educational Institutions have diverse opinion on the academic use of OSS. The concept of open access and the proliferation of academic blogs have broken down many barriers in the educational sector. With the reference of studies conducted in various countries such as Switzerland, USA, Australia, UK etc., it can be said that there are two distinct views on the academic acceptance of OSS. One view is in favor of the use of OSS, while the other is hesitant about OSS thinking that it could suppress the creativity of individuals. OSS represents a social dimension of Learning through a Persistent, Unified, Massively Multi-User, and Self-Organizing Virtual Environment extending beyond the traditional classroom into the universities common areas where learners build knowledge and understanding through serendipitous and collaborative exchanges both within and across subject area boundaries. The digitization of education is a relatively new phenomenon but has already transformed the education sector .Most Educational Institutions are operated on a non-profit basis and many of them are government funded. Open Source Software's are freely available on well-known OSS Project community providers such as www.SourceForge.net and hence can be implemented in Educational Institutions at no procurement costs. This research is an attempt to examine the differences between the implementation of OSS and Proprietary software's in Educational Institutions. Findings of this study could facilitate Universities and Educational Institutions to evaluate the options of using OSS for their Information Technology or Information Systems requirements.*

KEYWORDS

OSS - Open Source Software, OSI - Open Source Initiative

1. INTRODUCTION

OSS is software delivered with its source code and is an outcome of the convergence of Information and Communication Technologies (ICTs). OSS allows users to have access to the source code of the software, the freedom to use the software to create derived works and redistribute the derivative software for free or at a charge [19]. Open Source Software communities such as Sourceforge.net play a vital role in providing the platform for the creation, modification, maintenance, support and distribution of OSS [20].

OSS development process was initiated by the establishment of - Open Source Initiative (OSI), a non-profit corporation formed to educate about and advocate for the benefits of open source and to build bridges among different constituencies in the open-source community [1]. OSI's main activity consists of creation of OSI Approved License trademark so as to create nexus of trust around which developers, users, institutions and governments can consolidate open-source cooperation. The OSI actively promotes OSS by educating developers, decision makers, and users about its advantages and benefits. Its board members are active in the core open source development communities as well as in academic, government, and industry circles [1].

2. USE OF SOFTWARES IN ACADEMIC SECTORS

Academic Institutions have always used software for classroom teaching, lab room teaching, library management and other academic administration domains. Various Software Manufacturers have designed creative software products to be used in different functional realms of Educational Institutions.

As part of the OSI's mandate on education, board members present about open source technologies, collaboration and community at conferences and seminars across the world. OSI's Education Committee focuses on the use and teaching of OSS in the educational context, from earliest childhood instruction up through graduate and post-graduate levels. The Education Committee is responsible for developing, arranging, and conducting educational conferences, programs, courses of instruction, and online educational seminars covering open source software, licensing, and communities. Many researches have been done on OSS. It is very popular in other Western countries and has also been implemented in various Educational Institutions in the West [13].

OSS has proved to be a very good option for Educational Institutions as they help to create new innovative ideas of but the faculties as well as the students which enhance the learning ability and a new interesting and interactive approach to both teaching and learning [1]. The use of

OSS in Academic institutions would be beneficial to the students as some of these software's are linked to professional certifications (e.g.: Red Hat, Linux, Sun Java) and can add value for them in the job market. OSS not only would provide a new dimension to learning but also encourages students to participate in knowledge creation and enhancement activities, and sharing the findings through the public Internet. It improves interaction between students and teachers and develops individual skills on the whole. Students can learn new OSS software's as their codes are available. By studying the codes, the students can get knowledge about various development methodologies, complex logics and other programming techniques. Faculties can utilize OSS by interacting with students in a more efficient and effective way. Teachers can conduct lectures online, post lecture notes, assignments, tutorials, Projects etc. by making use of OSS software's such as Moodle[21, 22] and OpenMeetings [21, 22]. Most of the Educational Intuitions are non-profit organizations. Hence the use of OSS would be preferred in Educational Intuitions as less expenditure is incurred in procuring the OSS. This should indicate that the adoption of OSS in Educational Intuitions will increase in the days ahead. But the fact remains that most of the Educational Intuitions are still relying on Traditional or Proprietary Software's.

2.1 TRADITIONAL SOFTWARES USED IN ACADEMIC

Proprietary software is a software program that is offered for sale and comes with a license that provides the supplier control over the source code. The supplier holds ownership or intellectual property rights over the software and restricts modifications and the distribution of the source code. Academic software has become increasingly important for universities, since it automates a growing range of individual and institutional activities. It is important that such software reflects both - the procedures and the business models of academia. Commercial or proprietary software raise at least two intertwined problems as follows:

- Expenditure of software, costs which are hard to calculate and even more difficult to cover.
- Lack of technical transparency combined with strong dependency on the product in use.

Private institutions often have heavily promoted proprietary data formats to make users dependent on their products. This has proven to be a big handicap for higher Educational Intuitions that rely on the cross-institutional exchange of scholarly publications, course materials and the related meta-data. In the meantime, several companies have reacted to the respective complaints of higher Educational Intuitions and started to increase the interoperability of their products.

Consumers still depend on the vendors, since the knowledge about proprietary software and formats is normally a well-protected secret [17]. Some commonly used proprietary software's in academic sector are Microsoft Office, Blackboard etc.

2.2 OSS USED IN ACADEMIC SECTOR

OSS can prove to be a boon to Educational Intuitions, by providing solutions to some of the problems faced by using the traditional software's. The open source idea is thus increasingly becoming popular in higher education. The key characteristic of open source products lies in the fact that their source code is made public and freely accessible.

Openness of the source code is a prerequisite for the opportunity to publicly test, vary and improve software. This procedure is very similar to the scientific method of knowledge production, where all essential steps (hypothesis, method of observation, results) have to be made transparent and open for critique. Open source software is published and discussed in specialized communities. These documented debates are an efficient tool to safeguard and raise quality. In the long run, they also can lead to the development of open standards, which in return can guide future software developments. Open source products can become public domain without necessarily being for free [17]. Some common OSS used in Educational Intuitions are Open Office, GIMP, Moodle etc.

3 RESEARCH METHOD

Literature review on OSS was carried out to study the Open Source Methodology and the various OSS and Proprietary software's used in Academic Institutions. Over 20 research articles from journals and conferences were studied to explore the research done in the field of OSS, worldwide. Comparative analysis was done between features of OSS and Proprietary Software. The features were rated on three levels – Low, Moderate and High. Low rating indicates that the features were present in the software but at a very basic level. Moderate rating indicated that the features were present and had above average functionality. High rating was used only for exceptional functionality of features. On basis of the analysis, discussions were carried out by the authors and important conclusions were formulated.

4 COMPARITIVE ANALYSIS OF OSS AND TRADITIONAL SOFTWARES (EDUCATION)

Koha is the first open-source Integrated Library System (ILS). Its development is steered by a growing community

of libraries collaborating to achieve their technology goals. It includes modules for circulation, cataloguing, acquisitions, serials, reserves, patron management, branch relationships and a lot more [14]. Test Case Web (TCW) is an online Test Case Management System built with PHP and a SQL backend for online examinations. It provides an efficient means for generation, organization, and execution reporting of test cases among projects and by multiple testers and versions. It provides basic reporting capabilities and per-project access control [18]. Kuali is a collaborative approach to design, an open development platform, and a web-based operating environment having a modular architecture for the administration [26]. 20-plus universities have joined the Kuali Foundation, a nonprofit organization driving open source ERP forward. Bigname Kuali backers include Cornell University (NY), Carnegie Mellon University (PA), the Massachusetts Institute of Technology, and Indiana University [27].

Dim Dim [23, 24] is the world’s first free web meeting service based on the open source platform for virtual classrooms and can be integrated with the e-learning platforms Moodle, Claroline and Docebo. It also allows users to hold web meetings, customize and brand these meetings [23]. R.G. College Administration Software is the latest proposed software system from R.G. Software & Systems. It enables optimum utilization and enhancement of overall functioning of a college and integrates the functional and procedural requirements of a modern day university system onto a common platform. Office administrative affairs, student processes, examinations, resource planning are some of the subcomponents of this software [15]. Blackboard is a Web-based tool that is becoming an important and popular course management software application in higher education [25]. It provides a number of learning tools, including an online discussion board, course content management, a course calendar, information announcement, electronic mail, reviews, auto-marked quizzes and exams, navigation tools, access control, grade maintenance and distribution, student progress tracking, etc. [25].

Library for Universal (L4U) is a classic system for library management that uses data exported from Student Management Application and personnel database, after a previous filtering and transformation by a specially designed program [27]. Since 1986, L4U has been working with Librarians and Technicians from school libraries, public libraries, media management centers and special libraries to help improve access to resources, serials and textbook management [28]. Exam Software is a Test Management Software to create and conduct computer based online

examination. It is a most powerful user friendly test generator, exam generator educational software [29]. www.exam-software.com offers complete solution for online test, computer based test (CBT), quiz, eLearning online education through their powerful test engine. It is the most popular educational software in teachers and professors community [29].

Following tables depict the comparative analysis between OSS and proprietary software for following academic purposes:

- i) Virtual Classrooms
- ii) Online Examinations
- iii) Library Management Systems
- iv) Academic Administration and Accounting

Basis	Traditional Software (Blackboard)	OSS (Dim Dim)
Integration	Moderate [25]	Moderate [23, 24]
Customization	Moderate [25]	Moderate [23, 24]
Personalization	High [25]	High [23, 24]
Interactivity	Moderate [25]	High [23, 24]
Bandwidth	Moderate [25]	High [23, 24]

TABLE I: Virtual Classrooms

Basis	Traditional Software (R.G. College Administration Software)	OSS (Kuali)
Modular Architecture	Moderate [15]	High[26]
Resource Utilization	High [15]	Moderate [26]
Collaborative Approach	Moderate [15]	High [26]

TABLE II: Academic Administration & Accounting

Basis	Traditional Software (R.G. College Administration Software)	OSS (Kuali)
Modular Architecture	Moderate [15]	High[26]
Resource Utilization	High [15]	Moderate [26]
Collaborative Approach	Moderate [15]	High [26]

TABLE II: Academic Administration & Accounting

Basis	Traditional Software (Exam Software)	OSS (Test Case Web - TCW)
Reporting Flexibility	Moderate [29]	High [18]
Access control	Moderate [29]	High[18]

TABLE III: Online Examinations

Basis	Traditional Software (Library 4 Universal L4U)	OSS (Koha)
Ease of Operations	High [28]	Moderate[14]
Robustness	High [28]	Moderate [14]
Interface Usability	Moderate[28]	High [14]
Ease of Database Manipulations	Moderate [28]	High[14]
Learnability	Moderate[28]	High[14]

TABLE IV: Library Management Systems

5 CONCLUSION

This research was an attempt to compare the use of OSS and Proprietary software in various domains of academic institutions. This research is of exploratory type where extensive review of existing literature in the field was conducted and analyzed with respect to objectives of the research. The first phase of the study is focused on identifying proprietary softwares used in academic sectors and also to study their characteristics. The next and the most important phase were to identify equivalent OSS and compare their features with those of the softwares studied in phase one. After comprehensive analysis, the findings were portrayed in a tabular format so as to give a clear picture of the comparison of the two types of softwares. The software features were classified into 3 categories Low, Moderate, High. After studying the tables, it can be stated that the OSS product available for Virtual Classrooms, Academic Administration and Accounting, Online Examinations and Library Management System are not only equivalent to the proprietary equivalents but also rich in the features provided. These findings thus predict a possible bright future of OSS implementations in the academic Sectors.

OSS is available at minimal cost but certain enterprise editions may be only provided by value added resellers, and can involve high level of expenditure. OSS is available with the source code but it may be difficult to make

modifications to the source code if one does not have proper knowledge about methods used in the development of those software's. Moreover, the open availability of source code may pose serious security threats from hackers. Most of the proprietary software's are at a higher maturity level with respect to user acceptance worldwide, whereas OSS may not have reached the level of maturity yet. With proprietary software, technical support is available not only from the manufacturer but also from the vendors and resellers. In OSS technical support may be provided by the OSS development communities, but it may not be as extensive as compared to proprietary software's. From the above discussions, it is apparent that OSS to be used in academic sectors has many pros and cons. A proper strategy should be devised to weigh those pros and cons with respect to the technological resources available at the University and the existing skills of the employees so as to make use of the immense potential of OSS.

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