Open Source Software in Education

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Abstract
Open source describes practices in production and development that promote access to the end product's source materials—typically, their source code. Open source software has become the most prominent face of open source practices. In recent years the open source alternative options are gaining popularity over their proprietary counterparts which has led researchers in all related fields to re-think and re-evaluate the studies and concepts especially in higher education management and talent acquisition .

Keywords
Free and Open Source Software F/OSS , Education Management, Proprietary Software

I. Introduction

Open source describes practices in production and development that promote access to the end product's source materials—typically, their source code. Open source software has become the most prominent face of open source practices. Free and open source software, also F/OSS, FOSS, or FLOSS [1] (free/libre/open source software) is software that is liberally licensed to grant the right of users to use, study, change, and improve its design through the availability of its source code.

II. What does Open Source free software mean?

- The freedom to run the software , for any purpose .
- The freedom to study how the software works and adapt to its needs i.e. access to the source code .
- The freedom to redistribute copies to help another user without the payment of royalties or exorbitant license fees.
- The freedom to improve it and release the improvements to the public .

Some examples of Open-source software products are:

- Linux - operating system based on Unix
- Apache - HTTP web server
- Tomcat web server - web container
- Moodle - course management system
- Mozilla Firefox - web dbrowser
- Mozilla Thunderbird - e-mail client
- OpenOffice.org — office suite
- OpenSolaris- Unix Operating System from Sun Microsystems
- Mediawiki — wiki server software, the software that runs Wikipedia
- Drupal — content management system

Open source code evolves through community cooperation. These communities are composed of individual programmers as well as very large companies. It is supported and promoted by many organizations that include academic bodies , software developers , and other communities dedicated to open source software and open standards development such as OSI and OGC .

III. Market Study of Open Source Software

In recent years the open source alternative options to Microsoft's Operating System -Windows like Linux are gaining popularity [2]. Another area where FLOSS is popular is the webserver i.e Apache the free open source web server that is used by more than 70% of the internet sites . In numerous corporations Webpages once delivered by Netscape and Internet Explorer are now served by Mozilla Firefox and Apache, supplemented by Tomcat, an open-source Java servlet engine. Surveys say that "Firefox 3.5 gained 4% global share last year , bringing its share to 12.7%" [3].

The largest share growth comes from Nginx (a free, open-source, high-performance HTTP server) with a 1.1 million increase in a single month bringing its total up to 15 million. Over the past three months the number of nginx's sites has increased by 3.5 million, matching Apache for growth, and far surpassing Microsoft's 200k increase.

Fig. 1 : Market Share for Top Servers Across All Domains August 1995 - November 2009

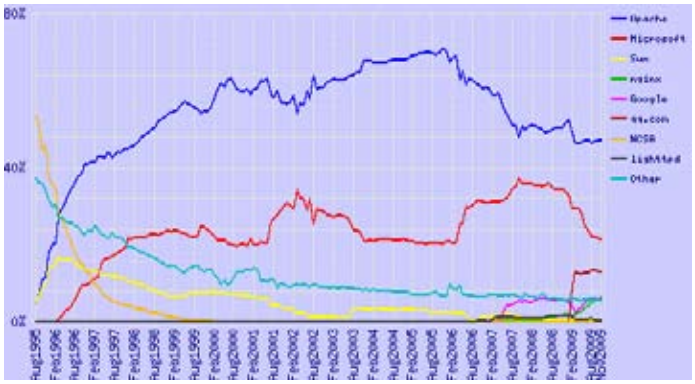

Table 1 : Top Developers

Developer	October 2009	Percent	Nove. 2009	Percent	Change
Apache	108,078,535	46.90%	110,201,883	47.17%	0.27
Microsoft	49,723,999	21.58%	49,691,412	21.27%	-0.31
qq.com	30,069,136	13.05%	30,069,189	12.87%	-0.18
nginx	13,813,997	5.99%	14,988,610	6.42%	0.42
Google	13,819,947	6.00%	13,771,004	5.89%	-0.10
lighttpd	1,020,227	0.44%	1,113,605	0.48%	0.03

Another domain where many home users and corporations and governmental bodies will eventually move to FLOSS is the office suite . The immensely popular and costly proprietary office products like Microsoft Office from Microsoft and IBM Lotus will be replaced with OpenOffice and Linux operating system . OpenOffice is an office productivity suite sponsored by Sun Microsystems .

In the field of databases , huge and costly proprietary database engines such as Oracle , Sybase or Microsoft SQL Server are being replaced by various FLOSS alternatives like MySQL, MaxDB and PostgreSQL .

A very successful example of such companies is Sun Microsystems who is major contributor to Open Source

providing many open source products like the Java platform , Open Office and Net Beans .

In October, 2009, the White House launched a new version of its website .While little has changed on the surface, the underlying technology is now powered by the open source Drupal content management system.

Companies show a dedicated indication of a sea of change in corporate attitudes toward open-source software which was once seen as cheap and amateurish .The big attraction of open source is that there's a zero marginal cost of scale because open source doesn't require additional licenses as an installation grows. As a result, the cost per transaction plummets as you add more systems. Exact comparisons are difficult, but where we can make feature-for-feature comparisons, at least an 80 percent reduction in running cost is expected .

Even though open source has various benefits in working, requirement of a good coordination process, redundancy of development, versioning problems, etc. pose limitations.

IV. List of some of the formerly proprietary software

This is a list of some software packages which were published under a proprietary software license but later released as free and open source software [4].

Table 2 : List of some of formerly proprietary and closed-source software

List of some of formerly proprietary and closed-source software				
Title	Original release	Relicensed release	New license	Notes
Adobe Flex	2004	2007	MPL	
AdvFS	1990s	June 2008	GPL v2	HP opened up AdvFS from Tru64 UNIX.
Apache Derby	1996	Aug 2004	Apache License 2.0	RDBMS originally called Cloudscape; released as FLOSS by IBM in 2004 and donated to the Apache Software Foundation
Blender	1996	2003	GPL	
CuneiForm	1993	2008	BSD	Optical character recognition software
Free Download Manager (FDM)	2003	August 2007	GPL	Free since version 2.5
Java	1995	2006-2007	GPL	On 13 November 2006, Sun Microsystems released much of Java as FLOSS
Jumper 2.0	2007	2008	GPL	Publicly announced on 29 September 2008
Movable Type	October 2001	Dec 2007	GPL	Weblog software
NetBeans	1997	Oct 2007	GPL, CDDL	An integrated development environment (IDE) for Java and other programming languages
Netscape Enterprise Server		Jan 2009	BSD	Sun Microsystems open sourced it.
Netscape Navigator/ Communicator	1994	1998	MPL	Mozilla
Open Sound System	1992	2007	GPL, CDDL	
Quake III Arena	1999	2005	GPL	
Solaris	1989	2005	CDDL	Free version released as OpenSolaris
StarOffice	1986	2000	LGPL/SISSL	Free version released as OpenOffice.org, now released only under the LGPL).

A. Programming Language Support in Open Source

- ArgoUML — ArgoUML is a modelling tool that helps you design using UML diagrams
- CLISP — a Common Lisp interpreter and bytecode-compiler
- Experix — command line and stack system for data acquisition and analysis and graphics
- GCC — a set of compilers for multiple programming languages and platforms, including C,C++,Ada ,Java ,Pascal , Fortran
- LLVM — Optimizing compiler toolkit
- Logo — Derivative of Lisp without parenthesis, for kids, with Turtle Graphics
- ManyDesigns Portofino — ManyDesigns Portofino is a model-driven web application framework that allows you to build high-quality enterprise information systems in shorter development times
- MinGW— Windows port of +GCC
- Mono development platform — Multi-platform .NET implementation (C#) based on the ECMA/ISO standards
- OpenCOBOL — an open source implementation of the COBOL programming language
- OpenJDK — Sun's Java Development based completely on F/OSS code
- PHP — a scripting language designed for web site applications
- Prolog — Logic programming
- Perl — a programming language strong on text processing
- Python — A high-level scripting language
- Ruby — A high-level scripting language
- Ruby on Rails — Ruby-based web development framework
- StarUML — a software modeling tool and also platform that is a replacement of commercial UML tools such as Rational Rose
- Tcl/Tk — A high-level scripting language with a graphical toolkit

V. Major Concerns –The Present State of Knowledge

1. In spite of its various benefits to both consumers and businesses , many have kept a safe distance from it . The reasons may range from security vulnerabilities and other concerns that have not been examined thoroughly before taking the decision for not implementing F/OSS .

2. Education institutions spend huge sums of money as unreasonable license fees for acquiring proprietary software catering to the software specified by the curriculums .

3. There is a constant reliance upon a single vendor thus the educators are promoting proprietary software vendors indirectly.

4. The sudden rise in open source projects , use of open source technologies and their success are creating a gap between the demand and available skilled human resource .

5. Software patents have been a concern in the Free/Open Source Software (F/OSS) community for many years. F/OSS advocates can create a new balance of power by focusing on F/OSS community interests rather than bothering about software patents.

6. Research done so far has tackled the Open source business phenomenon itself and only few have researched the technical aspects of using open source as compared to that of proprietary software in the field of higher education[5] . The educational methods and software used in higher education of information technology need to be addressed . [6]

VI. Conclusion -Where Does All This Lead To ?

The phenomenal success of Free/Open Source Software during the recent years has led researchers in all related fields to re-think and re-evaluate the studies and concepts, Education management and talent acquisition being two of them.[7]

- Educators in particular stand to gain from open source alternatives. They may also find a new and improved way to teach .[8]
- The motto of the educator would be to deliver concept based education rather than vendor centric teaching . The

software prescribed must not be vendor specific thereby promoting particular proprietary software companies

- Educational institutions need not spend huge sums of money acquiring proprietary software [9]. Free/Open Source Software are freely available for download from the Internet.
- Creating a new category of market ready workforce .The real key to developing open source technology is having the personnel on-hand to develop the software. Hiring managers have started looking for broader skill sets. So, when an open source projectcomes along you have the personnel to get going.

One of the reasoning as Mulholland claims is that standardization is better than differentiation"[10]. As seen in the past decade, standardization can be done with a proprietary software too. For example Microsoft., it has its drawbacks: bloat ware, security loopholes, unreasonable license fees and a disturbing and continuous reliance upon a single vendor. It is important to begin an era of open-source standardization .

References

[1] Verts, William T. (2008). "Open source software". World Book Online Reference Center.

[2] "Web Statistics, web analytics": [Online] Available : http://maketshare.hitslink.com .

[3] [Online] Available : http://news.netcraft.com/archives/web_server_survey.html

[4] "List of some of the formerly proprietary software (From Wikipedia, the free encyclopedia) ": [Online] Available : http://en.wikipedia.org/w/index.php?

[5] Giles, J., Ryan, D., Belliveau, G., De Freitas E., Casey R., "Teaching style and learning in a quantitative classroom", Active Learning in Higher Education, Vol. 7, No. 3, pp. 213-225 (2006)Giorgi, A. (1986). A phenomenological analysis of descriptions of concepts of learning from a phenomenological perspective. Publikationer fran institufionem for pedogogik, Goteborgs universitet, 18.

[6] Glott, R., Schmidt, P.: Learning Opportunities in FLOSS. Presentation given at the FKFT Free Knowledge, Free Technology Conference on Education for a free information society, Barcelona, July 15th to 17th, 2008

[7] Brown, J.S., Open Learning Broadly Construed, Keynote at the OpenLearn Conference 2007, The Open University, UK, [Online] Available : http://kn.open.ac.uk/public/document.cfm?docid=10605, 2007

[8] Brown J. S., Adler R. P.. "Minds on Fire: Open Education, the Long Tail, and Learning 2.0." EDUCAUSE Review Vol. 43(no. 1): pp. 16–32. [Online] Available : http://net.educause.edu/ir/library/pdf/ERM0811.pdf, 2008

[9] Troy Benjegerde, "Industry analysis paper". [Online] Available : http://www.dodds.net/~hozer/opensource.html, 2006

[10] "The Myths of Open source" [Online] Available : http://www.freeopen.org/ws_os5002/the_myths_of_open_source.pdf

[11] [Online] Available : www.opensource.org

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