ROLE OF OPEN SOURCE IN HIGHER EDUCATION

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Abstract

Because of the rise in popularity and consideration of open source applications in all markets from education to government to business, it is critical for all decision makers to understand what open source applications are and what the implications are for their organization. This is especially true in the education market where budget pressures make the right decision an imperative. This paper describes what is open source, its comparison with proprietary source, attributes and its role in context of higher education.

Keywords : Open Source, Higher Education, Open Source projects

1. WHAT IS OPEN SOURCE ?

Traditionally, a program is defined as a set of instructions which tells a computer what to do. For example, the Windows operating system by Microsoft is a program, or a set of instructions, which tells the user's computer how to send information to the disk drive, how to take information from the user, and how to communicate with pieces of hardware such as the modem or the network card. However, these programs are compiled, which means that they are translated into the binary code which the computer understands. The lines of instructions, which are translated into the binary code, are called the source code of the program. If a user or a programmer has access to the source code behind the program, then the user is able to alter the program, changing the way that it works.

For most proprietary, or closed source, programs (such as Windows, WordPerfect, Oracle, Quicken, etc.),the source code is not available for users or programmers to alter. This means that if a user encounters a bug in the closed source program, they will not be able to fix it themselves, but must rely on the software vendor to fix the error. As many frustrated users know, this can often take a very long time. Open source software, by contrast, is software for which the source code is freely available. The web server Apache, for example, is a program which runs as many as two-thirds of the web servers on the Internet (Netcraft,2003).Apache is open source, which means that anyone can access the source code for Apache and make changes in how the program works.

2. OPEN SOURCE PLAIN AND SIMPLE

Open source software (OSS) refers to software programs that are distributed with the source code-hence open source. The open source license allows users the freedom to run the program for any purpose, to study and modify the program, and to freely redistribute copies of the original or modified program.

1.1. Open source is a way of building software

Open source software is often constructed using the same time-tested methodologies and practices used to construct proprietary software. However there are a number of interesting differences that result from the difference in rights conferred by the license:

- The software evolves more rapidly and organically. Many individuals and teams working in parallel produce advances beyond the capacity of a single team. The improvements are managed into releases by a core team much like the proprietary alternative.
- Users' needs are rapidly met as the OSS model harnesses their collective expertise and contribution. Improvements to the software are often contributed by users who have fixed a problem or added new features.
- New versions are released very often and rely on the community of users and developers to test it, resulting in superior quality software tested on more platforms, and in more environments than most commercial software.
- The development "team" is often largely volunteers, distributed, many in numbers, and diverse. Often, paid members of the development team will manage the project and organize the work of the volunteers.
- Security is enhanced because the code is exposed to the world. In proprietary packages, shortcuts and poor programming are more easily overlooked because only a select few see the code. Like peer reviewed papers, open source code is subject to much greater scrutiny and thus produces a higher caliber result.

1.2 Open source is a way of doing business

Open source is often thought of as free software. In fact, one of the benefits is that anyone can use, modify, and redistribute the software without a license fee. While the code is free, the benefits have much more to do with the freedoms than the cost. On the surface it may appear that free software is in opposition to the 'business' of software and, while the open source model challenges the traditional models, open source represents great opportunity for customers and businesses alike. Without the restrictions of a proprietary software license, any institution or company with the skills can use the software to solve their own needs or offer products and services of value to others. Businesses based on open source software typically add value by :

- Offering services such as implementation, training, and support;
- Packaging and integrating open source software to make its installation and use easier for a wider market;
- Creating complementary, add-on, or enhanced software for sale. Open source affords institutions, as consumers of software, unparalleled control over the use of software to meet business demands and control over where they deploy their budget dollars. Taking into consideration its core competencies and available resources, an institution may use its own people and resources, hire external resources, or partner to share costs. The principles of open source software-freedom to run the program for any purpose, to study and modify the program, and to freely redistribute copies and modifications-are simple, yet have powerful and far reaching implications.

2. COMPARISON TO PROPRIETARY SOFTWARE

One of the great misconceptions about open source is that it is an alternative to commercial software. Rather, open source software is an alternative to proprietary software, but often acquired through or supported by a company-in other words commercial. Fundamentally, the difference between open source and proprietary software has to do with control. Where the open source license imparts freedoms to use, modify, and redistribute the software, the proprietary license restricts use, modification, distribution, and more. Vendors of proprietary software restrict access to and use of the source code because the source is knowledge-and knowledge is power.The open source license corrects the balance of power between producers and consumers of software. Access to the source code is about freedom and choice. After all, most of us aren't software engineers-we can't start adding features and fixing bugs just because we

have access. Yet access to the source code is important to all of us because access is control. Open source clearly offers advantages for the consumer, but it also represents a significant competitive advantage to companies that adopt compatible strategies. IBM, HP, Sun Microsystems, Apple Computer, Red Hat, Novell, and many other companies attribute significant revenue from strategies built on commercialization of open source software. Mainstream press coverage of open source has been accelerating all over the world, but the press coverage in higher education has been nothing short of explosive in recent months. Vendors of proprietary software have been carefully crafting their powerful and influential messages about open source. Some attempt to categorize open source as something applicable to research and experimentation. Others cast open source as comparable to open standards. Still others warn about considering open source software for mission critical applications. Each of these messages uses generalizations that distort the truth. Let's examine some of the important attributes and how open source and proprietary approaches compare:

3. ATTRIBUTE OPEN SOURCE PROPRIETARY

License Licensed to provide freedom to use for any purpose, modify, and redistribute.Licensed to restrict use to "acceptable uses", protect against modification and redistribution.Control Balanced. Consumers and providers of commercial offerings have equal access. Vendor is in control. Often large up-front investments in the software, training, and other implementation costs create a lock-in situation that strips the consumer of control. Innovation Rapid and diverse. Leverages a very large community of users and developers working in parallel. Limited to vendor investments. Typically caters to the features sought by the largest audience. Low levels of innovation. Longevity / Risk of abandonmentSoftware will always be available as long as it serves a useful purpose. The larger the adoption the safer the investment. No single point of failure. Dependent on the success of the vendor. Single point of failure.Security and reliability As the great tradition of peer review produces high quality academic and scientific works, open source projects produce software that is generally more secure and reliable. Like peer reviewed papers, open source software is subject to greater scrutiny and leverages a larger collective intelligence than proprietary software. Total cost of ownership (TCO) Acquisition cost Low or no initial license cost. License costs on the rise in education. Implementation and support costs OS community support and competition for commercial support keeps costs low. Choice allows consumer to bear costs internally which may further decrease cost. Costs determined by and coupled to vendor. Lack of choice. Alternative service organizations often lead to higher costs. Costs of scale No additional license cost with additional users, servers, etc. License costs generally rise with increased use. Platform support Broader platform and server support increases leveraged investments in existing institutional infrastructure. Platform support limited to what the vendor offers. May not fit well with institutional infrastructure.

As we can see from the comparison, open source promises some impressive advantages over proprietary software. While open source has a rich history in education, a recent convergence of powerful drivers and enablers are precipitating a strong movement toward open source in higher education.

4. ROLE OF OPEN SOURCE IN HIGHER EDUCATION

Open source is changing the nature of the software business in many settings, but the movement is particularly impressive in education. While open source has nearly a 20 year history of success producing leading software, it has mostly been in the infrastructure domain-the protocol implementations, servers, development frameworks, and utilities that enable the email programs, browsers, and other applications we all depend on. Open source has not been a significant model for producing application software-until recently. In the past few years colleges and universities have begun to produce enterprise open source applications like course management systems and electronic portfolios that compete directly with their proprietary counterparts. These e-learning applications are leading a movement in higher education from proprietary software toward open source. A snapshot of the current proprietary software environment in education reveals some compelling drivers.

- Tight budgets have focused attention on software acquisition costs, and total cost of ownership
- Growing resentment of vendor power, particularly in the wake of price increases and licensing changes that many institutions felt powerless to reject.
- Lack of innovation. Learning technology has not lived up to its potential to improve learning . and some enablers of a more effective model:
- Collaboration technology has made large-scale collaborative work across institutional, geographic, and cultural boundaries more effective.
- Software design patterns, development technologies, and standards have evolved in a way that facilitates modular, interoperable software components.
- Proven business models and education focused companies that embrace open source.
- Strong cultural appeal of open source in academia

We observe many of these drivers and enablers beyond the context of higher education. Perhaps the cultural appeal in academia represents the 'tipping point' for a powerful movement unique to colleges and universities. At the heart of the cultural fit between academia and open source are common philosophy and values. Creating and sharing knowledge for public good is a key part of the mission of colleges and universities, and a core part of the philosophy driving open source software. Colleges and universities are also home to some of the best software engineers in the world. Yet most institutions don't have a plentiful supply of available talent to meet evolving needs-individually. The open source model provides colleges and universities a way to leverage cultural values of collaboration and sharing to gather resources and work together for the common good. Unlike contexts outside of education, working together doesn't blur institutional brand or threaten a school's income. As a result, higher education not only boasts some of the best software engineers, but also has a plentiful supply of willing talent- a critical success factor for open source. A common challenge to developing software is understanding the needs of the users and turning that understanding into a suitable software design. While there are many different approaches and software methodologies, the open source model clearly has an advantage since the individuals most involved in teaching and learning are deeply involved in the development of the software for teaching and learning. Another critical success factor for open source is the emergence of education-focused companies that embrace open source as the preferred model for business. Although colleges and universities are well suited to develop world class enterprise software, supporting that software for other institutions isn't an activity that helps fulfill their mission. A new ecology has emerged where commercial organizations, colleges, and universities play complimentary and collaborative roles. The Andrew W. Mellon foundation, the William and Flora Hewlett Foundation, and others have recognized the need and the potential and have made considerable financial resources available to seed open source projects and help create the new ecology. While there are literally thousands of active open source projects all over the world addressing most application domains, there are a number of notable projects particularly interesting for institutions of higher education. The following table illustrates some of the projects:

5. PROJECT DESCRIPTION

www.uportal.org uPortal is a free, sharable portal under development by institutions of higher-education. This group sees an institutional portal as an abridged and customized version of the institutional Web presence... a "pocket-sized" version of the campus Web. Portal technology adds "customization" and community" to the campus Web presence. Customization allows each user to define a unique and personal view of the campus Web. Community tools, such as chat, forums, survey, and so on, build relationships among campus constituencies. uPortal is a product of the JA-SIG collaboration

Shibboleth shibboleth.internet2.edu

Shibboleth, a project of Internet2/MACE, is developing architectures, policy structures, practical technologies, and an open source implementation to support inter-institutional sharing of web resources subject to access controls. In addition, Shibboleth will develop a policy framework that will allow inter-operation within the higher education community. The Shibboleth system provides a standards-based link between existing campus authentication systems and resource providers of all kinds.

Globus www.globus.org

The Globus Alliance is developing fundamental technologies needed to build computational grids. Grids are persistent environments that enable software applications to integrate instruments, displays, computational and information resources that are managed by diverse organizations in widespread locations. The Globus Toolkit is an open source software toolkit used for building grids. It is being developed by the Globus Alliance and many others all over the world. A growing number of projects and companies are using the Globus Toolkit to unlock the potential of grids for their cause. The core Globus alliance team are: Argonne National Laboratory, University of Chicago, University of Southern California Information Sciences Institute, University of Edinburgh, Swedish Royal Institute of Technology, and the High Performance Computing Laboratory Northern Illinois University.

www.dpace.org

DSpace is a groundbreaking digital library system to capture, store, index, preserve, and redistribute the intellectual output of a university's research faculty in digital formats. Developed jointly by MIT Libraries and Hewlett-Packard (HP), DSpace is now freely available to research institutions world-wide as an open source system that can be customized and extended.

Chandler www.osafoundation.org

The Open Source Applications Foundation (OSAF) is developing a Personal Information Manager (PIM) intended for use in everyday information and communication tasks, such as composing and reading email, managing an appointment calendar and keeping a contact list. Because of the ease with which Chandler users can share information with others, Chandler might be called the first Interpersonal Information Manager. (The term PIM was first used in conjunction with the product Lotus Agenda in the 1980's. Chandler is intended to be an open source personal information manager for email, calendars, contacts, tasks, and general information management, as well as a platform for developing information management applications. It is currently under development and will run on Windows, Mac, and Linux-based PC's.

LionShare lionshare.its.psu.edu

The LionShare P2P project is an innovative effort to facilitate legitimate file-sharing among individuals and educational institutions around the world. By using Peer to Peer (P2P) technology and incorporating features such as authentication, directory servers, and owner controlled sharing of files, LionShare promises secure file-sharing capabilities for the easy exchange of image collections, video archives, large data collections, and

other types of academic information. In addition to authenticated file-sharing capabilities, the developing LionShare technology will also provide users with resources for organizing, storing, and retrieving digital files. The LionShare project began as an experimental software development project at Penn State University to assist faculty with digital file management.

www.lamsinternational.com

LAMS is a revolutionary new tool for designing, managing and delivering online collaborative learning activities. It provides teachers with a highly intuitive visual authoring environment for creating sequences of learning activities. These activities can include a range of individual tasks, small group work and whole class activities based on both content and collaboration. Whether you are a long time user of current e-learning tools, or new to the area, LAMS International and LAMS Foundation are both organisations managed by Macquarie University in Sydney Australia (www.mq.edu.au).

www.moodle.org

Moodle is a course management system (CMS) - a software package designed to help educators create quality online courses Such e-learning systems are sometimes called Learning Management Systems (LMS) or Virtual Learning Environments (VLE). One of the main advantages of Moodle over other systems is a strong grounding in social constructionist pedagogy. Moodle runs without modification on Unix, Linux, Windows, Mac OS X, Netware and any other system that supports PHP, including most webhost providers. Data is stored in a single database: MySQL and PostgreSQL are best supported, but it can also be used with Oracle, Access, Interbase, ODBC and others. Moodle is available in 40 languages, including: Arabic, Catalan, Chinese etc..

Visual Understanding Environment (VUE)vue.tccs.tufts.edu

The Visual Understanding Environment (VUE) project at Tufts' Academic Technology department provides faculty and students with flexible tools to successfully integrate digital resources into their teaching and learning. Using VUE's concept mapping interface, faculty and students design customized semantic networks of digital resources drawing from digital libraries, local files and the Web. The resulting content maps can then be viewed and exchanged online. This project is supported by the Andrew W.

Mellon Foundation.The demands on higher education require a fundamental change in direction-and technology can facilitate that change. But the present technology for teaching and learning hasn't lived up to its potential. Open source will pave a new road-changing not only the destination, but the journey, which is the real reward.

6. REFERENCES

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