

IS IT THE END OF THE ROAD FOR PROPRIETARY E-LEARNING SOLUTIONS? - A LITERARY JOURNEY TO FIND THE TRUTH

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Abstract

Proprietary e-learning software solutions have always ruled the world with their never-seen-before features, and also exceptionally high license cost. Recent statistics show that some equations have definitely changed with regard to proprietary software solutions as the industry is getting frequently challenged by the open source community & its growing user base. On the other hand, open source software solutions now have many more interesting offers for the end-client than just the free source code. This article is an attempt to find out the truth behind the recent speculation about the future of the proprietary software market, especially about the proprietary e-learning solutions. Towards this, a detailed analysis of literature regarding proprietary & open source market was conducted. Based on the literature analysis and the current market scenario, it does look like the end of the road for the proprietary e-learning software solutions in its purest form.

Keywords: *proprietary software, open source, open source solution, e-learning, source code, LMS*

1. Introduction:

In the E-learning parlance, an e-learning solution is known by the following other names – Learning Management System (LMS), Course Management System (CMS) or a Virtual Learning Environment. Even though many would say that an LMS, CMS and a VLE are different types of solutions, in truth they are sold in the academic sector for the same purpose. However, another classification for e-learning solutions is based on its availability & license requirements. Towards this, the world of computing has identified two different models – proprietary software and open source software. In other words, in terms of e-learning, educational institutions can afford to choose between a proprietary e-learning solution model and an open source e-learning solution model.

Long before the open source model became popular, the makers of proprietary solutions had taken everyone by surprise and built a strong industry. The proprietary software industry made huge gains in terms of market share and profit because of its commendable innovatory capabilities. However, with its tremendous growth the industry became rigid and dominating. At around the same time, the open source model caught someone's attention and started its slow growth. Many leaders in the proprietary E-learning industry had earlier in different ways claimed that they were not affected by their small, open (source) and scattered rivals. Today, tables have turned.

Matt Asay (2007) from CNET News compares the current state of Proprietary software industry with the fall of the Roman Empire. The reporter who is the COO of a popular company agrees with writer Edmond Gibbon's views that Rome fell not because of its weakness but due to its incredible strength. The Proprietary industry is also strong with names such as Microsoft and IBM. However, apart from a handful of these names can others in the industry stand the test of time? Taking into consideration the present sorry state of affairs in the Proprietary Industry due to a sudden renewed interest in the open source model, it makes one wonder – Is it the end of the road for Proprietary E-learning solutions?

2. About Proprietary Software

An online encyclopedia (Proprietary software, 2012) defines proprietary software as licensed software that is under exclusive legal right of the copyright holder. The copy right holder then gives its client or the licensee the right to use the software under certain conditions. Proprietary software is also known as commercial software as it is sold solely with the intention of making a profit. Proprietary software follows the 'closed' source model where the source code of the software is not released to the public. Here, the end user does not 'buy' the software, but buys the right to use it. The

source code for proprietary software is usually restricted for modification, reverse engineering and distribution.

Microsoft is a leading example, follower and proponent of this model. And IBM may be regarded as the father of the proprietary software revolution since the company started it first with its Mainframes.

Proprietary software including proprietary e-learning software is usually costly but offers excellent features, training, support and maintenance to the clients. Proprietary software can be easily installed and used since vendors always follow industry recognized project management processes. Most importantly, proprietary software offers a stable support system with different layers of support for issues as small as a bug report to as complex as a software crash.

However, proprietary software is made for profit and therefore has a very high license fee and other related costs. In the e-learning world, many institutions of higher education cannot afford to buy proprietary e-learning or Learning Management Solutions from the leaders of the industry. Also companies producing proprietary software are often under pressure to constantly release new products or product features to the end-client to satisfy contractual terms or to make a profit. As a result, most proprietary software products are released in a hurry even though they are not fully ready for use. Such proprietary products often create a lot of issues related to bugs and poor performance. As a result, end-clients have to spend considerable time in downloading and installing security patches as and when they are announced by the vendor to fix bugs (“Advantages & Disadvantages of Proprietary Software”, n.d).

Another charge against proprietary software is the tendency to ‘lock’ clients in by the vendors. According to Wikipedia (“Vendor Lock-in”, 2012), vendor lock-in is a term that is also known as customer lock-in and proprietary lock-in. The term vendor lock-in is used to indicate the state where customers become unintentionally dependent on the vendor for their products or services in such a manner that they cannot switch to another vendor without losing a substantial amount of money. Vendor lock-in is widespread in different sectors of the industry and is common even in the computing world. As a result of vendor lock-in, clients using software products or services face situations where there is lack of compatibility and interoperability between related products and services. Some of the giants from the proprietary industry notorious for vendor lock-in include the following – Microsoft, IBM, Adobe, Sony, Apple etc. In the e-learning sector, Blackboard and WebCT are the leading examples.

One of the best available solutions to avoid vendor lock-in and all the above issues related to proprietary software is to go for free and open source solutions.

3. Open Source – An Introduction

One of the major reasons for higher educational Institutes to have a slow rate of e-learning adoption currently is the spiraling cost of owning the e-learning software. Premier and higher-end institutions can afford to buy and use costly (and efficient) e-learning products such as those made available by BlackBoard and WebCT. However, not all higher educational institutions can follow suit. At this point it must be noted that proprietary e-learning solutions are not the only option available for quality e-learning. According to Depow (2003), an alternative for institutions desirous of using online learning is to go for open source e-learning products.

DiBona, Ockman, and Stone (1999) in their book give out the history of open source software. It all started in the year 1984, when Richard Stallman from the MIT Lab started the GNU project with the sole objective of not making anyone pay for the software. It was Stallman's vision that source code of the software should always be open to all otherwise according to him only a few and powerful would dominate the computer world. Through the concept of open source solution Stallman wanted computer knowledge to be shared and distributed.

However, to make sure that open source code is ethically used and benefited by all, Stallman initiated the GNU General Public License (GNU GPL). According to GPL, any individual or company can modify the open source code, provided they do not stop others from further modifying it either by charging them or licensing them.

According to an encyclopedia ("Comparison of open source and closed source", 2012), Free and open source software also known as FOSS freely allows its source code for viewing and modification by the general public. Going for free and open source e-learning solution helps in bringing down the overall cost of the e-learning project. For foundations and projects sponsoring the FOSS, the revenue model is based on the support services. Under the FOSS model, the software can be re-distributed for free provided credit is given to the original manufacturer. Leading proponents of the free and open source software model include the following – Red Hat, Mozilla Foundation, Oracle etc.

3.1 The FOSS that changed the E-Learning World

The most popular free and open source course management system is from Moodle, and is known as Moodle. The term Moodle (“About Moodle”, n.d) actually stands for – Modular Object Oriented Dynamic Learning Environment. The reason why Moodle became popular and synonymous with an open source LMS is that it was perhaps the first e-learning software solution that was available free. Today, many higher educational institutions across the world use Moodle as a tool for creating dynamic learning environments for the teachers and students.

Moodle is an open-source product under the GNU General Public License. While using Moodle as a user, an Institution or an individual has the freedom to customize the software according to their needs and at the same time the software is protected under the Copyright Protection Act. Moodle as a project was started by Martin Dougiamas in the 1990’s who still leads the initiative. The first tested version of Moodle (version 1.0) was released in the year 2002.

According to the developer (“About Moodle”, n.d), Moodle was developed because he was not satisfied with the way proprietary e-learning solutions worked, especially WebCT and Blackboard, and that Moodle is committed to be intuitive, open, and free. Moodle was originally developed with schools and smaller institutions in mind where people often like to try some free alternative to costly proprietary solutions that could help their teaching and learning skills to be transferred to the online world. Moodle has become so widespread that it is currently used in higher educational institutions such as Universities & Colleges, and even in high schools, primary schools, companies, organizations (non-profit), by home-schooling parents and also by independent instructors.

Apart from the fact that Moodle was the first free open source LMS, it has the following other features as well:

- The product is highly scalable and can be deployed in an Institution with thousands of students
- It can be used as a fully online tool or as a blended learning tool
- It can create rich collaborative communities of learning using features like forums, databases and wikis
- It deliver standard SCORM packages to students and assesses their performances
- The software can run on any computer that runs PHP and supports SQL type database
- It can run on Windows OS, Linux and Mac OS.

Moodle has approximately twenty different types of activities such as forums, wikis, assignments, quizzes, glossaries, polls, databases, scorm, blogs, messaging, participant lists, grading, reporting etc (“About Moodle”, n.d). The wonder of Moodle is that, not only higher educational institutions get the opportunity to use these activities for free they also get to customize them according to their own needs. To implement Moodle, all an Institution has to do is to install the solution on a web server which can be on a personal computer or on one hosted by a web hosting company.

Today, Moodle is not the only free open source E-Learning option available to academic institutions. Some other good open source E-learning solutions include – Docebo (SCORM Compliant), eFront, Dokeos, Claroline (SCORM compliant), ATutor (SCORM Compliant), ILIAS, OLAT (Award winner), Sakai (from Sakai Foundation), LRN (developed by MIT), openelms, Bazaar, Plone, Canvas and Ganesha (Depow, 2003; Sampson, 2009; Keeman, 2009).

3.2 Why Open Source?

As time passes, an institution using any type of e-learning solution feels the need to expand its existing tools. A noticeable advantage of using open source e-learning solution is its ability for expansion. Open source solutions give an Institution host of opportunities to try and add new modules and tools to their existing e-learning solution –absolutely free. It is heartening to know that the open source community through the support of developers is constantly developing its own worldwide accessible and entirely free app store.

On the other hand, proprietary solutions often sell their products and solutions in packages. To get an additional feature an Institution may have to pay more. With proprietary solution it gets increasingly difficult to perform or get necessary permission to perform even a minor customization on the software to match the Institution’s need (Curran, 2011).

A survey conducted by online magazine Computer Economics (“Key Advantage of Open Source”, 2005) showed that clients do not like to be dependent on the software vendors for every activity related to the software solution. For example, most decision makers such as Institutions are forced to accept frequent product upgrades when they do not need them in the first place. While releasing new software upgrades most vendors phase out technical support to the older versions. On the other hand, with Open source software no one is forced to accept upgrades and there is enough support from the open source community to resolve any issue relating to an older version.

According to the survey, visitors to the Computer Electronics website gave the following factors for supporting Open source software (not necessarily in order) –

- Low total cost of ownership,
- Less dependence on software vendors,
- Easy customization option
- High security.

However, the results showed that respondents voted more for ‘less dependence on software vendors’ as the major factor for choosing open source software than ‘low total cost of ownership’ as shown in the graph below.

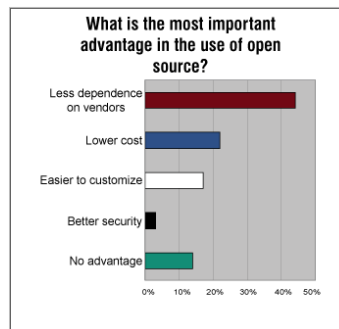


Figure: 1 Advantages of using Open Source. (Courtesy: Computer Economics)

Another study conducted by Computer Economics (“Open Source Business Apps”, 2008) showed that organizations that implemented open source solutions enjoyed stronger & positive return on investment (ROI). The study was conducted among 200 IT companies and only 5% showed a negative ROI after the usage of open source solution.

Keeman (2009) in his blog says that open source projects are good because they promote constant development of the software solution by anyone with some basic programming knowledge.

4. Open Source Solution or Proprietary Solution – A Realistic Comparison

Purchase decisions for an E-learning solution are getting increasingly complex these days due to the multitude of options available in the market. This statement holds good for proprietary solutions as

well as open source solutions. An Institution may have the following options with regard to using an e-learning solution –

- Buy a proprietary solution and then customize it
- Use an open source solution and then customize it
- Build an LMS using own resources

To choose between an open source e-learning solution and a proprietary e-learning solution, it is important to understand some aspects of a learning management solution. Learning Management Solutions can be based on the FOSS model or based on the Proprietary Software model. Joomla, the open source content management initiative (“Learning Management System”, n.d) gives out few points for Learning Management System Comparison in its website.

Free LMS	Not Free LMS
License cost and support from open source community is free	LMS distributed on paid basis. The price of the LMS will include – license cost, customization cost, support cost, annual maintenance cost etc.
Open Source code & free customization	Restricted source code with paid customization (minor customizations may be free and included in the license cost)

Table: 1 - Fee Type

Based on number of users	May include the entire user base of an Institution or may classify student user base, staff user base etc., for deriving the total cost of ownership
Based on Concurrent users	May limit the license based on number of concurrent (simultaneous) users in the LMS.
Based on duration of usage	Most e-learning solutions have annual license subscriptions. Some even have monthly.
Based on number of courses	There might be some limitation with regard to the number of courses an Institution can create.

Table: 2 - Paid LMS is further classified based on Licensing Model

However, from a layman's concept the simplest differentiator between an open source solution and a proprietary solution is the cost involved - Open source is free and proprietary is not free.

Not necessarily.

Many feel that using open source software would mean subtracting the license cost of the product from the project budget and thereby saving a lot. It is at this point one should ask why then the respondents from the Computer Economics website survey ("Key Advantage of Open Source", 2005) didn't choose 'low total cost of ownership' as the leading factor over other factors for choosing open source solutions as open source software is supposed to be totally free.

According to Sampson (2009) what many may not know is that there is always a cost of installation and support with using open source software. This cost has skyrocketed in many cases where E-learning decisions were taken in a jiffy. The cost of installation and support is not always directly financial in nature, but may largely relate to time. According to the Computer Economics website ("Key Advantage of Open Source", 2005) which conducted the survey, apart from the license cost which may be free in case of open source solution, administration cost, customization cost, support cost and time cost are quite large.

An open source e-learning solution is more suitable for those institutions or individuals that do not require any major customizations, provided that they have their own IT team to do the minor customizations. While going for an open source e-learning solution chances are that an Institution may have its own dedicated small-sized IT team to handle all issues. However, can an Academic sector-based IT team handle all issues related to an e-learning solution? Chances are it may not.

This is because the responsibilities of an 'academic' IT team do not stop with installation and configuration of the open source e-learning solution. As the system scales up, most institutions would face the problem of not having enough skilled IT resources to support the project. As the usage rate of an open source solution increases, any IT team would require a support system & team to direct its work. In academic institutions, not many will have the time to look after the affairs of the IT team. An institution which is not prepared for this type of issue might end up wasting a lot of precious time & money managing day to day support issues of the open source e-learning solution.

Ted Curran (2011) says that while choosing between an open source solution and a proprietary solution it is important to evaluate options about cloud hosting and support. Ted cites the example of his University which has an e-learning solution from Blackboard. Sometime ago, the University

purchased the Blackboard solution which is a proprietary one and ran the solution on the University's server, managed by the University's IT team. Very soon many important reliability issues forced the University to go for a Managed Hosting plan with Blackboard. According to this plan, Blackboard will run the servers for the University, pay for the IT team that supports the solution and also pay for the support staff to answer technical queries. This way, the University not only pays for the proprietary solution but also shells out money to keep it running 24/7.

However, does this mean the University where Ted Curran is working is making a big mistake by choosing a proprietary solution? May be not. This is because even though the University is paying a big sum for running the e-learning solution it is getting assured and efficient day to day service, which it may not get, had it gone for an open source solution.

Guatam (2010) in his blog adds that when an institution customizes an open source solution to match its requirements, it may become very difficult to add future upgrades of the solution without the help of a skilled programming team. Without adequate and skilled support for day to day issues, the user base of the open source e-learning solution including the students & teachers often gets frustrated from the whole e-learning initiative. A poorly motivated and highly disinterested user base for an e-learning project can prove to be the biggest cost center for such Institutions.

Also, another factor that goes against FOSS is that educational institutions running such solutions are always under the fear of a probable software crash resulting in total shut down of the e-learning solution. This is why it is said nothing good comes absolutely free in this world. An academic institution should therefore never give the 'totally free' tag as the reason for choosing an open source e-learning solution. According to Curran (2011) it is true that selecting a proprietary solution or going for a hosted option over FOSS may be costly, it sure is an insurance policy towards continued and reliable 24/7 support for the e-learning initiative.

5. Facts & Figures

Having seen the good and bad of the proprietary and open source solutions, it is now necessary to know which model will rule the academic market in the next few decades. To come to a decision, one cannot depend on assumptions and perceptions but only on facts & findings.

In its October 2011 survey report Netcraft found that approximately 64.67% of all the leading web servers across any domain are using Apache (open source), whereas only 15% are using Microsoft servers (proprietary). Even though, Microsoft's proprietary web browser Internet Explorer has a

strong market presence, according to a Wikipedia research (“Usage Share”, 2012), Firefox and Chrome are gaining popularity gradually as shown in the chart below.

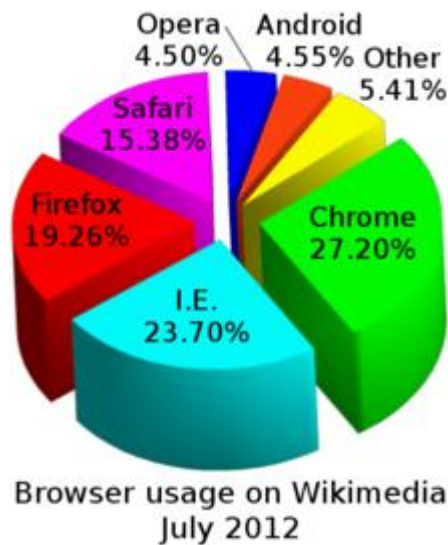


Figure: 2 – Browser Usage on Wikipedia (Courtesy: Wikipedia)

Arthur (2011) in an article in The Guardian reports that in less than eighteen months, Google’s Android (open source) OS has grown at an amazing pace in the Smartphone market in the UK. During its fast growth Android has outpaced proprietary mobile OS solutions such as – Nokia’s Symbian, RIM’s Blackberry and Apple’s OS. The data for the article was taken by Arthur from a Kantar ComTech WorldPanel report.

According to a survey conducted by W3Tech (“Web Technology Survey”, n.d), the current leaders in the content management systems market are – WordPress and Joomla. WordPress has a content management system market share of 54.3%, whereas Joomla has a share of 9%. WordPress and Joomla both are open source solutions.

Zack Rosen (n.d) in his blog page has highlighted some figures and a graph to show his readers who is the leader in the LMS market among the following – Moodle, Sakai, Blackboard & WebCT. The graph taken by Rosen (n.d) from Sakai partner’s page clearly shows that Moodle is the winner, and the fact that open source has won over proprietary e-learning solutions.

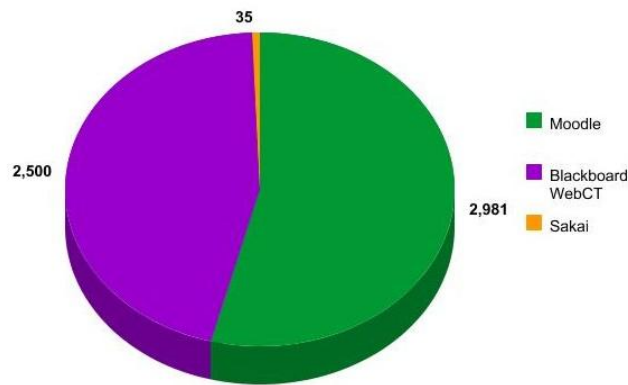


Figure: 3 – Comparison between Moodle, Blackboard & WebCT and Sakai

(Courtesy: Rossen (n.d) & Sakai)

The above statistics and survey results show that free and open source solutions are outpacing proprietary solutions and they do deliver a stable, secure and quality driven product at a lesser cost.

6. So is it Open Source all the way?

Both open source e-learning solutions and proprietary e-learning solutions have their own merits and demerits. However, in many ways from the above data it can be seen that the open source solutions today have a wide edge over the proprietary solutions. This edge however is not enough for the open source market.

According to Crosslin (2011), some of the factors that ideally should determine the openness of an online solution include the following:

- Open Source Code
- Freedom for Courses – An open e-learning solution should have an option to easily migrate the course content from one system to another. Another easier option would be to create content on sites like WordPress and then later export it easily.
- Free Accessibility to courses from anywhere and not just within the Learning Management Solution
- Open to any system for easy integration
- High Scalability

An open source e-learning solution is truly open only when there is free hosting for the system. Open source solutions with free hosting and cloud services offers many advantages to an Institution, such as - support for open education standards, flexibility & choice for the Institution apart from eliminating the dreaded vendor lock-in (Kolowich, 2011).

Therefore, the following factors have to be considered before going for the final decision related to choosing an e-learning solution for an Academic Institution: Ease of customization, time, cost, scalability and support & maintenance (Vayuvegula, 2012).

7. Discussion

Years ago, while ruling the e-learning market like the erstwhile strong Roman Empire, Proprietary software industry had rubbished the existence of threats from the open source market. Today, things have changed. In the year 2010, Microsoft the leading proprietary software company changed its stand and one of its top executive was reported saying that the Company regrets its earlier anti-open source position (“Comparison of open source and closed source, 2012”).

In the E-learning market too, many companies have now changed their anti-open source position to become pro-open source. For example, E-learning market leader Blackboard announced in 2012 that it has bought two companies that earlier became popular for providing support services to its open source rival, Moodle. In March 2012, Blackboard has announced that it has successfully acquired Moodlerooms and Australia’s Moodle support company, NetSpot. Apart from this, the Company has announced the formation of an Open Services Support Group for Institutions that use open source e-learning solutions. Similarly, Blackboard also has launched its own cloud based free Learning Management Solution known as CourseSites (Kolowich, 2011).

It should be again remembered here that Blackboard is the company which had ruled the e-learning market for a very long time with its proprietary and highly priced LMS product.

According to Kolowich (2011), another heavyweight pro-open source solution announcement came from the leading education giant, Pearson. The Company has announced the launch of its open source learning management solution named OpenClass (still in beta). OpenClass offers free customer support and cloud based hosting, which will be an attractive option for many higher educational institutions. Pearson is already the seller of educational textbooks and online courseware along with its proprietary e-learning solution eCollege (now known as Learning Studio) which was aimed at higher-end profit making Institutions. Open Class on the other hand is only aimed at traditional higher educational institutions. After going through the current e-learning trend towards open source software solutions, Kolowich (2011) rightly asks whether this is the end of the proprietary LMS revolution which has significantly milked higher educational institutions during the last few decades. And it sure looks like it.

8. Conclusion

Today, vendors of proprietary e-learning software solutions need to do more than just hang on to the belief that open source products are not a threat because they are less secure and they do not offer timely support. What most prospects and even buyers of proprietary e-learning software fear and worry most is how to get out of the clutches of the vendors when they want to stop using the product. According to the analysis made by the Computer Economics survey (“Key Advantage of Open Source”, 2005), if vendors of proprietary software provide easy options for prospective buyers to abandon their solutions, chances are the buyers won’t feel the need to abandon it. If proprietary software of the future gets hybrid by having an additional advantage of interoperability with other e-learning products including those from the open source community, it can definitely appeal to IT decision makers, and slow down its doom.

However, it does not mean that open source solution in its pure form can dethrone the proprietary e-learning industry completely. A lot more improvements in service for open source solutions are expected by the end client and the end users. There are many options to try. An option as mentioned elsewhere in this article is about going for a managed hosting plan with an open source e-learning solution. This will make sure that a trained team will run the online learning solution trouble-free and the Institution does not pay anything towards the license fee. An example of this according to Curran (2011) would be MoodleRooms. And MoodleRooms today is with Blackboard. And Blackboard was once the leading proprietary e-learning software solution company. This and all the above factors show that more and more proprietary e-learning companies are now forced to accept the Open Source Software model for their survival.

The LMS of the new generation should be the one that is built to be open to any system so that it can be easily integrated without much support or other technical issues.

In this article, an attempt was made by conducting a literary journey to know whether it is sunset time for the proprietary industry or not. Based on the facts and figures collected from different sources, it does look like the end of the road for the pure proprietary e-learning solution.

References

1. *About Moodle.* (n.d). Retrieved August 17, 2012, from Moodle website, <http://docs.moodle.org/>
2. Advantages & Disadvantages of Proprietary Software. (n.d). Retrieved August 17, 2012, from: http://www.kedah.edu.my/sahc/a_portal/portal_tekvok/ict/nota_com_sys/Microsoft%20Word%20-%20les_57.pdf
3. Andres. (2011, November 1). Open source is winning where it counts, so where to next? [Weblog post]. Retrieved from <http://www.technollama.co.uk/open-source-is-winning-where-it-counts-so-where-to-next>
4. Arthur, C. (2011, October 31). *How Android swallowed the UK Smartphone market in 18 months.* The Guardian. Retrieved from <http://www.guardian.co.uk/technology/2011/oct/31/android-uk-smartphone-growth>
5. Asay, M. (2007, September 23). *Proprietary software and the fall of Rome.* CNET News. Retrieved from: http://news.cnet.com/8301-13505_3-9783201-16.html
6. *Comparison of open source and closed source.* (2012). In Wikipedia the free encyclopedia. Retrieved from http://en.wikipedia.org/wiki/Comparison_of_open_source_and_closed_source
7. Crosslin, M. (2011, November 7). The Battle For Openness In The LMS Market. Edugeek Journal. Retrieved from <http://www.edugeekjournal.com/2011/11/07/the-battle-for-openness-in-the-lms-market/>
8. Curran, T. (2011, November 8). Open Source or Proprietary LMS? Your Answer, My Friend, Is Floating In the Cloud. [Weblog Post]. Retrieved from <http://www.tedcurran.net/2011/11/open-source-or-proprietary-lms-your-answer-my-friend-is-floating-in-the-cloud/>
9. Depow, J. (2003). Open Source Software: Two learning management systems. *The International Review of Research in Open and Distance Learning*, Vol 4, No 2. Retrieved August 14 2012 from <http://www.irrodl.org/index.php/irrodl/article/view/135/215>
10. DiBona, C., Ockman, S., & Stone, M. (Eds.). (1999). *Open Sources: Voices of the Open Source Revolution.* California, CA: O'Reilly Media.
11. Gautam, A. (2010, April 29). The Real Cost of a Free (Open Source) LMS. [Weblog post]. Retrieved from <http://www.upsidelearning.com/blog/index.php/2010/04/29/the-real-cost-of-a-free-open-source-lms/>

12. Keeman. (2009, March 2). Open-Source LMS: Beyond Moodle [Weblog post]. Retrieved from <http://keemanxp.com/blog/2009/open-source-lms-beyond-moodle.html>
13. *Key Advantage of Open Source is Not Cost Savings*. (May 2005). Retrieved August 12, 2012, from Computer Economics website, <http://www.computereconomics.com/article.cfm?id=1043>
14. Kolowich, S. (2011, October 13). Freeing the LMS. *Inside Higher Ed*. Retrieved from http://www.insidehighered.com/news/2011/10/13/pearson_announces_free_learning_management_system
15. Kolowich, S. (2012, March 27). Blackboard's Open-Source Pivot. *Inside Higher Ed*. Retrieved from <http://www.insidehighered.com/news/2012/03/27/blackboard-buys-moodlerooms-creates-open-source-division>
16. *Learning Management System Comparison*. (n.d). Retrieved August 12, 2012, from Joomla LMS website, <http://www.joomlalms.com/compare/>
17. Netcraft. (2011). *October 2011 Web Server Survey*. Retrieved from: <http://news.netcraft.com/archives/2011/10/06/october-2011-web-server-survey.html>
18. *Open Source Business Apps Enjoy Strong ROI*. (September 2008). Retrieved August 12, 2012, from Computer Economics website, <http://www.computereconomics.com/article.cfm?id=1399>
19. Proprietary software. (2012). In *Wikipedia the free encyclopedia*. Retrieved from http://en.wikipedia.org/wiki/Proprietary_software
20. Rosen, Z. (n.d). Higher-ed LMS market penetration: Moodle vs. Blackboard+WebCT vs. Sakai. [Weblog Post]. Retrieved from <http://zacker.org/higher-ed-lms-market-penetration-moodle-vs-blackboard-vs-sakai>
21. Sampson, B. (2009, April 8). Open Source LMS – 10 Alternatives to Moodle. [Weblog post]. Retrieved from: <http://barrysampson.com/2009/04/open-source-lms-10-alternatives-to-moodle/>
22. Usage Share of Web Browsers. (2012). In *Wikipedia the free encyclopedia*. Retrieved from http://en.wikipedia.org/wiki/Usage_share_of_web_browsers
23. Vayuvegula, A. (2012, March 19). Things You Need to Know Before Selecting an LMS. [Weblog Post]. Retrieved from <http://blog.commlabindia.com/elearning/selecting-an-lms>
24. Vendor Lock-In. (2012). In *Wikipedia the free encyclopedia*. Retrieved from http://en.wikipedia.org/wiki/Vendor_lock-in

25. Web Technology Surveys. (n.d). *Usage of content management systems for websites*. Retrieved from http://w3techs.com/technologies/overview/content_management/all
26. Wright, C.R. (n.d). *Selecting a LMS and Switching From a Proprietary to Open Source LMS*. Retrieved from: <http://www.scribd.com/doc/46126912/Selecting-a-LMS-and-Switching-From-a-Proprietary-to-Open-Source-LMS-Clayton-R-Wright>