# Will Open Source Software Become An Important Institutional Strategy in Higher Education?

A-HEC

## Executive Briefing Paper

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# Contents

## Highlights

- The success of open source software in the worldwide market for operating systems, web servers, and other infrastructure software is substantial and is beginning to have an impact in higher education, especially in the larger and more elite universities
- uPortal, an open source customized version of the institutional Web presence, has achieved impressive market share in higher education already and is showing signs of moving beyond the larger and elite universities
- Beyond uPortal, higher education has spawned several potentially important open source (or community source) initiatives that although well-funded and resourced, face unique challenges due to the user communities they serve and an unproven (while potentially viable) development model
- Sungard SCT has implemented an innovative, community-oriented strategy of leveraging open source for the benefit of their clients while maintaining their unique proprietary value-added components, packaging, and services
- There are reasons for higher education leaders and innovators to consider open source as a potentially significant way to leverage distributed innovation within the higher education community and as such incorporate it as part of the institutional strategy
- The current dominance of proprietary course management systems (CMS) will be challenged over the next two years by what has become a highly visible, grant-funded, and well-resourced open source initiative, Sakai, which is based on the successful uPortal, as well as a lesser known but rapidly growing organic entrant, Moodle

## Introduction

Your level of familiarity with open source software will probably vary greatly depending on your position within your institution, the financial resources of your institution, and your inclination towards the importance of technology. To many in higher education the term has popped up on the radar screen within the last year or so. However, unless you are an IT person, or directly involved in one of a handful of well-funded projects, you still may know very little about what open source is and why it could be important to higher education – not just to the IT folks, but to a significant portion of the leadership of all levels and persuasions.

The purpose of this article is to provide an 'estimate' of where we are and what to track as higher education open source initiatives progress. This summary is considered preliminary. We hope to flesh it out with further research into open source best practices.

## Commercial Viability

Open source is viable and significant in the commercial Internet and enterprise. You have probably seen the headlines in the business publications about Linux – the most noted success in open source software. The reality of open source goes much deeper. The success of Linux, an open source Unix-like operating system (OS), has been joined by other successes, including the Apache web server and MySQL database. These three products have changed the landscape of the web. If you are reading this article on the A-HEC web site, you are experiencing a web site using all three of these open source products. If you visit our 'Forums' area, you will experience a fourth, phpBB, an open source forums package that runs on Apache and MySQL. The Apache MySQL combination (usually running on top of Linux) has spawned a plethora of open source web applications in development and various stages of deployment.

So, what about the market share numbers to prove the commercial success of open source? A very comprehensive summary of quantitative data can be found in

an online paper by David A. Wheeler (see http://www.dwheeler.com/oss_fs_why.html) [1]. Some key items from this article that you should be aware of:

- Apache has over three times the market share of its nearest competitor (Microsoft) according to a poll by Netcraft of publicly available web sites – and Apache's share appears to be growing.
- The operating system competition appears to be evolving into a two horse race between Microsoft (in the lead at about 49% of web serving OSs) and Linux (clear number two at about 29% - way ahead of Sun Solaris at about 7% in a distant third).
- Various studies have touted Apache and Linux as being highly stable, very well supported and less vulnerable to security issues with lower total cost than the proprietary alternatives.

The term open source came into being less than ten-years ago, as a name to encompass variations on liberal source code licensing that had emerged through trial and error beginning with the source code licensing of the Unix operating system from AT&T/Bell Laboratories in the 1970s. To achieve higher productivity (as well as to create a reputation for one's work) it was fairly common for software developers in the 1980s to create and share various productivity tools and small portions of applications – known at the time by some developers as the emerging field of "software reuse". But, this does stand in stark contrast to the emergence of open source as a viable market challenger to proprietary software products in major markets. This new development is less than ten years old and may face significant legal and/or business model challenges ahead. However, in our view, especially given the backdrop of the historical anti-trust challenges against Microsoft, it is unlikely that the current trends will be reversed.

## What is the Major Breakthrough?

The term "open source" designates more a "process" than "free software". The open source movement is demonstrating the viability of a market alternative to the "traditional" way to develop software. The success of the open source products mentioned above is a result of a new model of software development that depends on a cooperative effort from participants around the world. What many software project managers would have deemed a nightmare in terms of organization and ability to ensure results has turned out to produce potentially better products apparently faster and more reliably than anyone could have imagined.

The book The Success of Open Source by Steven Weber [2], does an excellent job of laying out the profound issues that open source raises in terms of sociology and political economy. Our take on this is that the use of open source software constitutes a commitment to participate in a collaborative community. The community structure evolves from a licensing agreement that maximizes distribution, while also encouraging participation and collaboration in a continuous development process. It is the growth of the community that results in tremendous opportunity for the participants. The opportunity is created by achieving better products from the feedback and involvement of a large user community while reducing cost through the collaboration of the extensive developer network. This process creates products that have as their source the community, as opposed to a single vendor that one becomes dependent on. As users look to the community for support they become customers for the communities services and various members of the community emerge as providers of paid for services, such as customization, support, and even packaging. Because the community owns the intellectual property (the source code), the members can never be locked into a single vendor. In our opinion, this is truly a radical business model that will continue to challenge traditional software development.

## The State of Adoption of Open Source in Higher Education

This is not easy to assess. Open source software is difficult to track because of its liberal distribution process, and higher education constitutes a small niche of overall users. At this point in time, adoption of open source in higher education appears to be a "tale of two cities." Adoption rates of the above mentioned

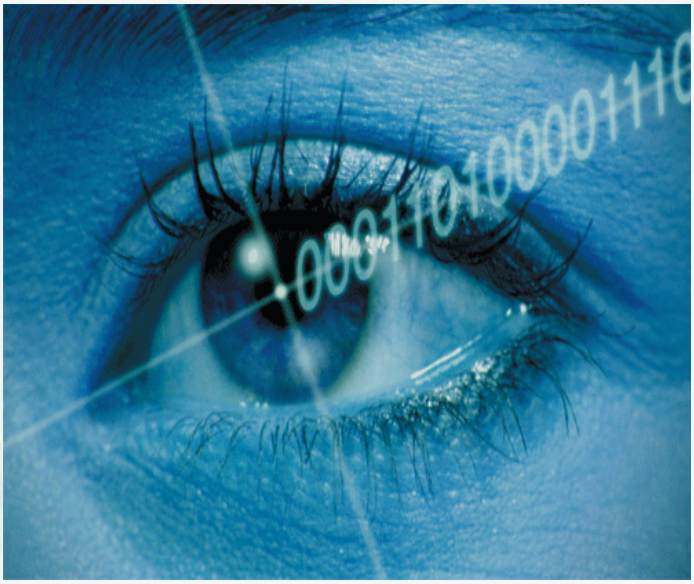
 

non-higher education products by larger universities probably parallel open source adoption rates in the larger market in both magnitude and growth. We don't know this with certainty, but the sound adoption logic used in the market at large appears to prevail in the large universities that are selecting Linux, Apache, etc. However, adoption by smaller colleges is probably muted due to lack of resources and greater dependency on less web-oriented legacy platforms.

The 2004 National Survey of Information Technology in US Higher Education by the Campus Computing Project (http://www.campuscomputing.net/) [3] indicated that most institutions surveyed felt that open source would play an increasing role. Yet, only 25% or so indicated that open source would be a viable alternative for ERP applications. Large universities clearly indicated more favorable inclinations toward open source than small colleges.

As for specific higher education focused products, there is one, uPortal, which appears to have made a significant penetration in the higher education enterprise. On its web site uPortal notes 79 institutions that have deployed uPortal and 68 in the process of implementation. Another visible open source product is Sakai, a course management system (CMS) option that uses uPortal. Although still in early testing with only a handful of deployments, Sakai has garnered significant exposure and notoriety. Based on a Mellon-grant funded collaboration between several top tier institutions that had successful versions of their own "homegrown" CMSs, Sakai was recognized by a very impressive 75% of the respondents in a quick survey conducted by A-HEC (download the results of the quick survey at http://www.a-hec.org/media/files/A-HEC_os_survey_report_050305.pdf) [4]. The Sakai web site lists 68 institutional partners. Another open source CMS initiative, Moodle, is more focused on individual users. The Moodle web site claims an impressive 3315 "registered sites".

There are several other lesser known, but potentially important higher education focused open source initiatives. These include the Open Source Portfolio Initiative (OSPI) focused on student portfolios, an open



source financial system (Kuali), and an open source legal peer-to-peer file sharing initiative (LionShare). Find links to the web sites of the initiatives we are currently tracking at http://www.a-hec.org/forums/viewforum.php?f=9 [5].

## Fit of Open Source to Higher Education

In some ways open source appears to be a great fit for higher education. In others it is a paradox. Our quick survey indicated a strong belief in a cultural bias towards open source in higher education (approximately two-thirds of the respondents believed that there is a strong cultural preference for open source software in higher education – see http://www.a-hec.org/research/surveys/osqp0505.html). Our interpretation is that higher education is an attractive "greenhouse" for growing open source projects for the following reasons:

- Higher education is a niche market that does not get adequate attention from the major software companies. There is an opportunity to create products to serve the interest of the industry that are better than those being developed by the software companies. Specialty applications like course management systems, student portfolios, and student information systems are small markets that require intimate knowledge of higher education,

making them less attractive to multi-billion dollar software companies.

- Higher education represents a potentially strong community for collaborative effort in developing these products. As a largely nonprofit industry of fairly limited competition, higher education tends to be more collaborative than most industries. In addition, few schools would see the software tools they use as a provider of competitive advantage. Third, higher education is an industry that has more stability and longer time horizons than most.

We feel that the combination of these factors makes for a fertile incubator for combining efforts across institutions to produce what could be more effective, focused products that are more stable and reliable than those produced by software vendors.

However, open source faces different challenges in higher education than in the larger market that has embraced products such as Linux, Apache, and MySQL.

- The major open source successes have been driven from the "little guy" and the "market". That is, the big successes have emerged from a set of users trying to solve a technical problem that was better solved collaboratively. Perhaps more importantly, the value was clear enough that capitalization and grant incentives were not required to bring products to fruition. In this sense the large grants behind many of the higher education open source initiatives present untested waters. This arbitrary centralization of authority could create a dynamic where the leadership is potentially more authoritative, coming from the sources or managers of the funding rather than the most capable or most dedicated developers. Clearly, as far as uPortal and Sakai are concerned there is a dominance of larger, better-resourced institutions in the mix. While this would all seem to make sense in achieving results, it is counter to the open source phenomena that has arisen and succeeded in the non-higher education world. Interestingly, Moodle looks more like the type of initiative that has succeeded previously in terms of the funding and management structure.

- Another factor that is untested lies in the user base. In the big successes so far, the users and the software developers were largely one in the same. That is, the developers of Linux, Apache, and MySQL are also largely the users of the products. CMSs, ePortfolios, and even student information systems have non-technical users. This creates a more complicated development dynamic because, in theory, the users need to be the drivers in order to create a better product. uPortal is a "framework" and is more like the prior successes in this regard. The others are more like some of the emerging and yet to succeed open source desktop office applications that have struggled against the incumbent competition.

- A third issue is in the niche nature of the higher education market where there is a lack of widely deployed standards to leverage in creating compatible open source initiatives. Because of this, there is a plethora of standards work going on in higher education, both within the open source initiatives and in separate supporting standards bodies. Linux leveraged the wide availability and support of Unix. Apache leveraged a whole set of widely used Internet standards. MySQL and other open source database products are leveraging the widely accepted SQL standard. In addition, most of these standards were created defacto (in significant use) before they were formalized as standards. Having to create and coordinate standards as you develop adds an additional risk. This appears to be the case in higher education open source

It should be noted that several of the new initiatives are referring to the development process they are using as "community source" as opposed to open source. This terminology reflects a model that reduces the risk of a project faltering in its early stages by requiring a sufficient number of institutions to contribute some funds and resources to show viability and may be bet-

ter culturally suited to higher education [6]. However, we maintain that the approach is still unproven, which makes it challenging, exciting, and interesting as an alternate model of open source development.

## Market Segments and Vendor Strategies

As the readiness of Linux became apparent, important vendors of complementary products jumped on board. These included providers of application software, hardware, and services. The major motivation behind support of Linux was that it presented a viable alternative to Microsoft, and the other major players understood that it is beneficial to have alternatives.

In higher education uPortal appears to be following the broader pattern in a healthy, albeit certainly not as dramatic fashion. For instance, Sungard SCT, the number one portal provider in higher education, has based its Luminus portal on the uPortal framework. This strategy enables SCT clients to take advantage of any applications that are compatible with uPortal (leveraging the open source development community), while simultaneously offering a more complete, easier to install, and easier to support product (with SCT's proprietary value-added components) than a "naked" uPortal. Another provider, Unicon, offers system integration, customization, and support services around uPortal. Unicon is in a unique position because its technical staff has been involved in the development of uPortal since the early days. Both of these strategies have extended the inclusion of uPortal to the "middle market" – those colleges and other institutions not resourced as well as larger or more elite universities.

Progress in the other higher education application areas is less clear. Sakai has noted a new partnership with IBM on the web site. Sakai has also announced a Hewlett Foundation grant to Foothill-DeAnza Community College District to expand support to California community colleges. Moodle may be expanding beyond individuals and departments to the enterprise. Humboldt State has adopted Moodle and posted a case study comparison against Blackboard (see http://www.a-hec.org/forums/viewtopic.php?t=43) [5].

What makes the CMS application domain interesting is the apparent love/hate relationship that has emerged between institutions and their CMSs. While it has been widely reported that over 90% of institutions have made an institution-wide commitment to a CMS, the CMS sector stood out in our recent quick survey (see http://www.a-hec.org/research/surveys/osqp0505.html) as having a higher vulnerability to open source competition than one would expect. We asked respondents to indicate vulnerability of various categories of applications to open source competition. We expected that areas such as ePortfolios, where there were few if any products would be perceived as highly vulnerable, and that was the case. We expected established product areas to be less vulnerable. Predictably, student information and financial systems were not considered significantly vulnerable. However, CMS and assessment tools (arguably a part of the CMS) were perceived as highly vulnerable.

## But What Does It Really Cost?

In our recent open source quick survey we asked respondents what they would most like to learn about open source. The answers were clustered around the basics such as what is available, what stage of deployment, case studies, and, what does it really cost to implement open source solutions (see http://www.a-hec.org/research/surveys/osqp0505.html)? The previously cited compendium by David A. Wheeler [1], has

a detailed section on Total Cost of Ownership (TCO). For the non-higher education products previously discussed, there are studies that show TCO reductions in the 20-30% range compared to Microsoft's solution. In addition, there are claims that the open source products are substantially more reliable and substantially less vulnerable to security breaches.

For the higher education applications, more research and case studies are required. This is because the analysis is complicated by the variability across institutions in terms of what resources may exist. For instance, if a software development (programming) staff exists at the institution, then the TCO is much lower than if these resources need to be hired. Further, the adoption of the previously discussed community source model requires ongoing fees for membership that, while probably lower than the annual cost for proprietary software, narrow any savings gap. Software product pricing may also be discounted in education. Stay tuned for more case studies on this issue. For now, it is probably true that if an institution has staff and other resources in place for development of a custom solution to an application (like the CMSs at the core Sakai institutions), it is probably a no-brainer economically to go the open source route. Another scenario that could be a no-brainer is the situation where the institution desires major customization, which just isn't available in the proprietary products. At this point, the lack of easy-to-implement packaging of the higher education open source initiative products means that many institutions that are interested will need to employ service firms, adding to the cost.

## Tracking Higher Education Open Source

As we have discussed open source does not mean nonprofit or non-market-driven. The growth in open source-based solutions will create new opportunities for some and diminished opportunities for others. In one sense, the more unfinished or incomplete an open source product is the more opportunity it presents for service or support providers. In the wider world, market share is king. In higher education, adoption of open source solutions may limit the market for non-compatible proprietary products. An adoption of Sakai by a major institution, this eliminating that school from a possible deployment of a proprietary CMS, is noteworthy. However, even more noteworthy is the adoption of Sakai by a mid-tier or small institution that would have a natural tendency to go with a more mature and more completely packaged proprietary product. Thus, tracking and understanding the tale of two cities in higher education is particularly important in understanding the maturity of open source. As such, the following metrics bear watching:

1. The number of institutions deploying an open source product as their primary solution.
2. The number of middle-tier or small institutions implementing open source solutions.
3. The number of solution providers or other providers of complementary technology supporting a specific open source product.
4. The extent and growth rate of the collaborative community supporting a specific open source product.

We do not have viable estimates on the above metrics at this point. One of the by-products of the SCT complementary product strategy with uPortal is that it creates a win-win between the open source community and the software product vendor. As a result of this, we would venture to guess that the combination of the uPortal adopters with the Luminus adopters might have already created a clear market share leader in higher education portals (a rough estimate is around 500 institutions). There are also viable case studies, such as San Juan College in New Mexico (see profile on the A-HEC forums http://www.a-hec.org/forums/index.php?c=3) of mid-tier institutions successfully implementing uPortal. And, although it is difficult to tell how vibrant and productive it is, we are preliminarily impressed by the extent and growth rate of the Moodle collaborative community.

## Is Open Source an "Institutional Strategy"?

It is too early to predict what the course of open source will be in higher education. More research is required. Especially in the leverage that is truly afforded by the open source alternatives (including such aspects as what defines a better user experience, not just cost) and how institutions are implementing innovation via open source. That is, are the open source solutions achieving better products than their proprietary counterparts?

If open source leadership is a strategy that goes beyond the IT department, only time and example will tell. Our research to date has uncovered some interesting and potential strategic connections:

1. **Potential Amplifier of IT Leverage.** In a forthcoming paper [7], Dr. Bill Graves of Sungard Collegis details specific ways in which IT can impact institutional performance. Notable is his argument that technology singularly has the ability to potentially reduce costs while providing new innovation – a requirement of many higher education institutions today. We will only note here that the collaborative open source approach can only enhance both the cost savings and innovation, making it a potentially ideal way to pursue these goals. The open source process combines the opportunity to save costs while achieving innovation through customization.
2. **Distributed Innovation as a Core Strategy.** Steven Weber identifies a possible motive for adopting open-sourcing as a decision supporting a strategy of distributed innovation [2]. We feel this is an attractive idea for higher education. What it means is that open source is embraced as a way to leverage the community to achieve innovation faster and at less cost. It also implies, as mentioned early in this article, that participation in open source is much more than lower cost software. It is a strategic commitment to participate in the community.
3. **Connecting Higher Education "Users".** Because the applications being addressed by open source involve staff, faculty, and students as users, a commitment to participate in the open source community, which should be driven by users, is a decision that requires leadership at many levels and from many places. This sounds complex organizationally speaking, but the reality of successful open source projects is that the contributors tend to self-select if the collaborative network is large enough. While presenting new challenges, this also presents new opportunities to connect your faculty, staff, and student leaders to others that can help change the world.
4. **YOUR Institutional 'Problem'?** Perhaps 'emphasis' is a better word here than 'problem'. We use 'problem' to make the point that successful open source initiatives have at their root a problem that needs to be solved and can be better solved through a collaborative effort. This means that your participation in the collaboration is more meaningful if you see the focus of these efforts as something that you need to solve, as opposed to something that you can wait for someone else to solve. So, for example, if you do not see something like an ePortfolio as a solution critically needed to help capture students' learning experiences more effectively than grades, the corresponding open source initiative is probably not for you. But if it is critical for you, the open source initiative can help create a focal point and rallying cry for what you believe is an important area of institutional emphasis and innovation.

Above we have detailed some of the background, state of adoption and fit with higher education, market segments and vendor strategies, and ways to track progress. If you are not already an A-HEC subscriber but would like to be kept abreast of our future research in open source, please go to http://www.a-hec.org/membership.html and indicate open source in your interest profile.

## Acknowledgements

We offer a special note of thanks to the many who contributed to the thoughts expressed in this article, especially the seventy-nine respondents to the A-HEC quick survey. Additional special thanks to Tony Holderith (Unicon), Bill Thompson (Rutgers), Robert Tidwell (Sungard Collegis), Mike Zackrison (Sungard SCT), and Bill Graves (Sungard Collegis). All helped contribute to this article through various forms of substantial and unique input.

## Notes

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## About Rob Abel

Rob Abel founded the Alliance for Higher Education Competitiveness (A-HEC) in May 2004 for the purpose of helping higher education leaders collaborate to discover, understand, and disseminate best practices. In order to fulfill this mission, A-HEC perform much needed action research to facilitate institutional collaboration. Prior to founding A-HEC Rob was the senior vice president of client services and online and academic services at Collegis, where he was responsible for the services delivered to more than 60 higher education institutions. Rob has over 25 years experience in high tech general management, business development, marketing, and product development, with degrees from Carnegie Mellon, USC, and Stanford.

## About A-HEC

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