What Open Source has to Offer Teachers, and it's Not Cheaper Software

A Research Proposal

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By

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Introduction

When Doug Engelbart proposed his conceptual framework for augmenting man's intellect through the co-evolution of human systems and the tools we use (Engelbart, 1962), he envisioned a process for collaboration and knowledge creation that defines modern culture and has influenced the thinking and writing of such noted social scientists as Peter Druker, and organizational learning researchers as John Seely Brown. Today's modern Internet represents a reasonable model for the underlying technical system to support a knowledge organization as proposed by Engelbart's early models, but even today we still have much to do.

One collaborative model that has been developed and refined during the Internet boom of the late 1990s and early 2000s, that embodies the philosophy, if not the practice of Engelbart's early framework is the software development process involved with Open Source Software (OS). The popular press, especially in the technical arena has written extensively on OS to lay the context for informed discussion (O'Reilly, 1999), draw parallels and contrasts between hierarchical top down world views and more collaborative, participatory views (Kaehms, 1998; Raymond, 1997), or simply to help explain the processes that allow contributors the freedom and flexibility to program the way they like, without resulting in total confusion or anarchy (Jagaleski, 1999).

What is Open Source?

According to The Open Source Initiative (OSI), a non-profit corporation formed to educate about and advocate for the benefits of OS, OS is a development method for software that harnesses

the power of distributed peer review and transparency of process. The promise of OS is better quality, higher reliability, more flexibility, lower cost, and an end to predatory vendor lock-in (Open Source Initiative, 2007).

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As a method for developing software, OS refers to collaboratively built code that is shared by developers and users as they co-create a product. Developers are geographically dispersed, often are unfamiliar to each other, do not work for the same organization, and represent varying levels of programming experience. In a typical OS project, a developer will work from existing or partial code to build a new tool or utility. The developer will post the evolving code to a newsgroup whose members will try out the program and provide feedback (Faber, 2002).

Common Open Source Projects

In strictly formal terms, an OS project is one that has adopted one of the many licensing models for distribution, as maintained by the OSI. Some of the more well known OS applications include many of the tools used to run today's modern Internet, including the Linux operating system, the Apache web server, the Domain Name Service, and the Firefox web browser, to name a few. Desktop applications include Open Office, a suite of tools similar to Microsoft Office, the Gimp, an image manipulation tool similar to Photoshop , and others. There are many content management systems (CMS) that are OS projects, including Drupal, Joomala, Plone, Typo3, Mambo, and others (List of Content Management Systems, 2007).

Open source learning management systems (OSLMS) that support online learning such as Moodle, Saki, DrupalEd, provide similar functionality as Blackboard and WebCT, used in many

colleges and universities (Robb, 2004).

In terms of adoption in an educational setting, the statistics from the Moodle.org web site tracks the growth of the number of websites using Moodle from under 200 in early 2003 to over 35,600 today (Moodle Statistics, 2007). In addition, the Moodle.org website reports over 1.5 million courses currently being offered in Moodle, with over 15 million users, representing 200 countries. Sourceforge.net, a repository for OS projects reports that there are currently 163,800 registered projects hosted, and over 1.7 million registered users of the site (Sourceforge.net, 2007). Clearly, OS as a process for creating viable software is both well understood, and well accepted.

There are abundant references to OS in today's academic literature, in terms of its potential for effective online collaborative learning environments (Luke et al., 2004), the cost effectiveness of the use of OS (Ahmed, 2005; BECA, 2005; Moyle, 2003; Tomazin, 2005), OS as a model for social constructivist learning (Taylor, & Riley, 2005). There are even studies that look directly at the technical issues involved with OSS migration projects, and organizational issues related to introducing OSS in academia from an information technology perspective (Ahmed, 2005).

von Krogh and von Hippel (2006) cite the promise of OS research in the management sciences by categorizing the existing research of over fifty studies into three axis of inquiry: motivations for contributions, governance organizations, and innovation processes, and competitive dynamics. They posit that the importance of the OS phenomenon shows important new possibilities so clearly that the world changes for some or all of us.

> *... once we truly see and begin to understand the phenomenon, what a tremendous source of new insights and possibilities for us all! Now many are excitedly exploring the*

functioning of open source software projects, while others are seeking to extend lessons learned to other areas of innovation. (von Krogh and von Hippel, 2006)

In a detailed paper on the use of the open source development model and its application to academic pedagogy, Taylor and Riley propose to expand upon the models of Open source [and Open systems] to create a pedagogical methodology for the composition classroom (Taylor, & Riley, 2005). They assert that doing so will create a classroom practice that encompasses all aspects of the open source development model.

However, when we refer back to Engelbart's original work, we find that his primary focus is the co-evolution of human systems and technical or tool systems (Engelbart, 1992). In a video interview (Kaehms, 1992), Engelbart was asked first about the technical advances made since the early days at SRI and then about the co-evolution of the human systems. "I'm not at all surprised about the technical advances, as I knew early on that things would get smaller and smaller all the time." But in terms of the human advances his response was "I thought we would have come a lot farther. It is if we are all early explorers on the banks of the Hudson River, with a huge expanse in front of us. But the question is, why has it taken so long?"

His assertion is that we are all tool makers and tool users in the context of complex organizations (networked communities) , and that optimally designed organizations realize this and plan accordingly, leveraging the capabilities provided by networked computing, in order to systematically adapt and evolve, to keep up with the rate of change (Engelbart, 1992).

Christine Peterson ties these two concepts together (OS and networked improvement communities) at a Stanford colloquium honoring Engelbart's contribution to computing, by stating:

"The open-source community for those of you who may not be familiar with it, I think is the best example of a networked improvement community that I can think of. It's really remarkably well organized considering that the organization comes from the bottom up. In other words, there is no top down organization, there are no governmental or corporate structures that make the open-source community work" (Peterson, 2000).

Social Constructionism as a Theoretical Framework

While there has been much literature that looks at the hypermedia design process in terms of cognitive learning styles (Gillani, 2000), there appears to be very few studies that attempt to look critically at the problem in an integrated fashion that tries to match the human systems to the technical systems and surrounding culture in a process of continual refinement. Gillani, for instance, notes Vygotsky's early work in social constructionism, by stating, "a salient feature of Vygotsky's notion is that human development and learning (e.g. social characteristics, communication styles, personality, cognitive ability, linguistic style, and academic background) originate and develop out of social and cultural interaction within what he calls the 'zone of proximal development.'

Furthermore, in reference to Vygotsky's work, Gillani states "a child's development cannot be understood by a study of the individual. One must also examine the external, social, and historical world in which the individual's life develops."

Brown (2000) puts this idea into the context of today's hypermedia culture by asking

Let's turn to today's youth, growing up digital. How are they different?

and notes

We had an excellent opportunity to watch these adolescents, and what we saw—the ways they think, the designs they came up with—really shook us up. For example, today's kids

are multiprocessing — they do several things simultaneously listen to music, talk on the cell phone, and use the computer, all at the same time.

Significance of Study

Clearly this body of research suggests that open source is important both in terms of the specific tool sets offered, as well as for a model for collaboration that is well defined, and continues to have an increased impact on the global economy. What seems to be missing from much of the academic research in a K12 setting, are studies that highlight lessons learned and propose guidelines that can be tailored to each individual school setting that recognize both the tools and the surrounding process associated with open source development.

Research Questions and Process

The focus of this proposal will be to engage in action research with a minimum of three to five schools in the east bay area of Northern California to assess each school's technology plan in terms of its open source policy. Target schools will include both middle schools and high schools that have either started pilot programs, or are willing to start pilot programs that utilize one of the open source CMS or LCMS systems mentioned in the literature review. Because the focus of this study is on the systematic deployment of tools (infrastructure) that facilitate collaboration, knowledge sharing and knowledge management, the specific choice of tool will be left up to the individual school. Many of the open source CMS and LCMS applications share similar features in this respect, and because they are open source, the underlying applications can easily be extended to add missing functionality. Because they are open source, other open source tools that are distributed as individual, stand alone applications, may be incorporated into the infrastructure, depending on individual needs, and these customizations will be noted in the final summary. It should be noted that possible participating schools may include both public and private schools, and this contrast may shed additional light on how

technology is deployed in various structural contexts. The size of participating schools may also provide interesting contrast, as will any social economic differences. Rather than limiting this study to a specific school profile, the results of this study will note defining characteristics of each school in the summary report.

The researcher will help each school initiate (or evolve) individual pilot projects by first introducing the concept of open source in an academic context, as a summary presentation from the body of literature that frames this proposal, followed by a six month engagement with each school in support of their own pilot projects. Each pilot project will be centered around the deployment of an open source CMS or LCMS framework that supports the management of individual classroom curriculum. At a minimum these pilots will support online access to class notes and class materials. While the teachers that agree to take part in the study may be randomly distributed across academic disciplines, the focus of the research will be to both encourage and monitor the collaboration at the department level, as well as across departments. Of particular interest will be the following: What departments are more likely to participate? How much planning and collaboration around curriculum development will occur? How much cross department collaboration will develop? Will new models for teaching begin to emerge, and if so, how? What additional open source tools will they bring into the framework, and adopt to their particular needs?

Additional tools and projects grounded in open source pedagogy will be encouraged and documented throughout the study. Because this is action research, the model aligns nicely with existing open source pedagogy of continual development and refinement within a community of practice, and may evolve in scope as the study progresses.

Specific initial research questions include:

• What is the level of open source awareness of teachers and administrative staff at the beginning of the project?

• What avenues and tools will teachers adopt to their particular curriculum and schools if given a chance?

• What challenges do teachers face in initiating projects, and how do they overcome them?

• What are the defining characteristics of teachers that will become involved in these projects, and from what academic domains?

• What reach will the pilot projects have, in terms of impacting overall school and district technology plans? (For instance, at the end of the study, will schools revisit their own plans, and incorporate open source strategy directly into the plan.)

• How much collaboration will develop in creating a framework of teachers, tools, and knowledge creation, that is sustainable, and will these efforts be school specific, or will they reach across all participating schools ?

• What effect will these efforts have on the classroom and curriculum?

• What interesting applications will come from these efforts?

• Will participating teachers have a different perspective and awareness regarding open source tools and pedagogy at the end of the project?

Methodology

Data will be collected from teachers, and administration from each participating school, including an initial survey to determine their awareness of open source at the beginning of the engagement, and to disclose any existing projects and efforts already underway that either contribute to the collection of tools and processes, or are tangential to them. The active participants will include those teachers that choose to take part after a presentation to introduce the project. At the end of the six month study, a qualitative survey will be given to both teachers and students to determine their

feelings about the effectiveness of the tools. Specifically, the survey will use a four point Likert scale to determine the frequency of use, the reliance on the application, and their overall impression of the tool. In addition, open ended questions will ask for comments on how the application might be extended or better integrated into the classroom environment.

In order to reduce bias, the study will utilize three different data collection tools to triangulate the research: surveys, recorded bi-weekly project meetings, and online discussion groups. A cross-sectional survey will be administered to all teachers at the initiation of the project in each participating school to create a baseline for the research questions above. The researcher will become an active participant on each school's open source team, will act as a facilitator, provide infrastructure support during conceptualization, and will record bi-weekly meetings on tape. The researcher will also become an active member of the online discussions. All summary data will shared with the participating teachers for review, prior to publication.

The initial survey will follow a four point Likert scale and will include the following questions (some taken and modified from a 2001 study by Hudson T. & Bell E.) While their study was an attempt to address the digital divide that existed at the time, the questions are still relevant today. Open ended questions will be included at the end of the survey to allow for deeper understanding and context to specific academic settings.

1. To what extent have you heard of open source software, and are you aware of its history and context within realm of Internet and information technology development?
2. Do you currently use any open source tools in support of your classroom? (Note that while this study centers on the use and deployment of an open source CMS or LCMS, these are only platforms that enable a complete open source pedagogy and technology strategy, so understanding the level of

awareness and use of other supporting open source tools is both important and valuable to the final report.)

3. Do you presently use any online tools to support your curriculum?

3. How many minutes per day does each student in your classroom use a computer at school?

4. How many minutes per day does each student in your classroom use a computer at home?

5. To what degree are teachers and students proficient in the following areas?

    a. Basic computer/technology use

    b. Presentation tools

    c. Video

    d. File and resource management

    e. Spreadsheet

    f Multimedia

    g. Databases

    h. Web authoring

    i. Word processing

    j. Electronic collaboration

    k. Graphics and publishing

    i. Internet use

    m. Integration of projects

6) To what degree do you think your school's technology program is matching the needs and interests of today's K12 student?

7) To what degree has the use of technology made your classroom easier to manage and curriculum easier to improve over time?

8) To what degree do you use the Internet to collaborate around your curriculum?

9) To what degree do you use the Internet to interact with parents regarding student performance?

Open Ended questions include:

10) If you could immediately change the way technology is integrated with your classroom, what three to five changes would you make?

11) What challenges exist today to keep those changes from happening?

12) What concerns do you have regarding the impact of technology on education, and how would you address them?

At the end of the study, a follow up survey will be presented to participants to ascertain the effectiveness of implementing an open source process and tool set. Participating teachers will be asked to reflect on their successes and challenges and offer strategies for further improvement. The results will be summarized and contrasted across the participating schools in a descriptive format. The findings of the project in its entirety will be presented as a written report and distributed to the project participants as requested, and made available online, or in a suitable journal.

As noted above, in addition to feedback from participating teachers, where possible feedback will be solicited from students in each classroom in a short open ended survey to determine the effectiveness of the tools and processes. This added feedback will add further to the overall understanding of the effectiveness of the study, and will be included in the report.

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