

Toward Developing an Education App Store

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Creating a friction-free marketplace for the exchange of software and content for teaching and learning would contribute to solving the problem of how to best use this technology.

Since the Web first emerged in 1994, many of us in the field of teaching have been struggling with learning how to best use this technology.

The first explorers into the new frontier were naturally computer scientists interested in teaching and learning (R.J. Vetter and C. Severance, "Web-Based Education Experiences," *Computer*, Nov. 1997, pp. 139-141), resulting in an extended period of many independent experiments. Sometimes, a small project with a few faculty members would develop enough functionality to gain a small on-campus following, rising to the level where it would be further deployed.

After reaching a critical mass, early successful efforts to develop educational technology would often be transferred to a start-up company. For example, in 1996, WebCT was formed based on work from the University of British Columbia (http://en.wikipedia.org/wiki/History_of_virtual_learning_environments). In 1999, Blackboard was based on research at Cornell University, and, in the same year, Desire2Learn came out of the University of Waterloo. Angel Learning

was launched in 2000 based on work at Indiana University. Developed at George Washington University starting in 1997, Prometheus was initially distributed through a consortium model to other universities, but was then sold to Blackboard (<http://citl.gwu.edu/pages/projectprometheus.html>), which later would acquire WebCT and Angel to consolidate market share.

VIRTUAL LEARNING ENVIRONMENTS

Starting in 2001, a series of open source projects such as CourseWork, Moodle, LON-CAPA, and OLAT were developed and remained open source. In 2004, Stanford University (CourseWork), Indiana University (OnCourse), the University of Michigan (CHEF), and MIT (Stellar), which had each developed its own virtual learning environment, formed the Sakai Project to collectively develop a single VLE they all could use. The Andrew W. Mellon Foundation provided a \$2.3 million grant to help defray the costs for the four schools to transition to the Sakai software. The William and Flora Hewlett Foundation provided additional funding to develop a part-

ners program to promote the software and recruit partners and adopters beyond the four founding schools.

The simple logic of developing a collectively produced, open source learning-management system resulted in a rapid expansion of the Sakai Partners Program, which included 120 members by the end of 2005. The University of California, Berkeley; Cambridge University; the University of Cape Town; Lancaster University, and many other schools from around the world joined the Sakai effort.

By 2010, the VLE market had reached a level of maturity and stability. Blackboard and Desire2Learn were solid commercial solutions, and Sakai and Moodle were popular open source offerings. In many ways, it felt like we had reached the "golden age" in using technology in teaching and learning, with multiple mature commercial and open source products available.

The problem with the current VLE marketplace is that significant effort has been invested in products jostling for market share. Each of the vendors watches the others closely, and when one adds a feature that gains a

competitive advantage, the others rush to add the same feature to avoid losing market share. Consequently, the products are slowly becoming clones of one another.

FINDING ALTERNATIVES

The most innovative (and fearless) teachers are simply abandoning learning-management systems and using Web 2.0 sites like WikiSpaces, Blogger, YouTube, and Delicious to teach their courses. Teaching outside the VLE is still the domain of a few hardy pioneers who make literacy in Web 2.0 technologies one of the desired learning outcomes for their courses.

Even though Web 2.0 tools are making interesting inroads into the marketplace and revealing that there's a pent-up desire for innova-

aspect was the App Store. Any reasonably competent developer can get an application into the App Store. Apple reviews applications to make sure they're of reasonable quality before putting them into the store, but in general, it lets the market decide which applications are most valuable. More than 350,000 applications are currently available in the App Store.

Interestingly, Google quickly established its own significant market share by building an Android app store following the principles established by Apple.

IMAGINING THE EDUCATION APP STORE

A successful app store needs to be an open channel between the producers of software and content and their consumers. There needs to be a venue

zabar, Instructure, Learning Objects, and others—have either shipped or are in the process of shipping products that support IMS Basic Learning Tools Interoperability. Basic LTI uses a simple OAuth signed message to transfer user identity, course information, and the user role within a course between a VLE and an externally hosted teaching and learning tool. Developers can use Basic LTI to write tools in any language and host them in any kind of environment.

We're waiting for that second critical element—marketing and communications. Some organization needs to take a bit of a risk by building an education app store and lending its name and marketing power to that endeavor.

It's important to keep in mind that Apple didn't have the first or only app store. The first few education app stores might meet with limited success. That isn't a cause for concern, but simply the market sorting itself out. It's also important to realize that there will naturally be more than one successful educational app store in the steady state.

I can see several potential paths to successful educational app stores. A current VLE vendor like Blackboard could create its own app store that's deeply integrated with its products. Publishers like Pearson Education, McGraw-Hill, and Cengage could also build educational app stores, given that it's quite natural to sell both content and software through the same store. Or perhaps the first successful educational app store will be a clever start-up that finds the right niche and overtakes the long-time market participants, bringing untold wealth to its founders. My guess is that ultimately it will be some combination of these scenarios.

It has been almost 15 years since Ron Vetter and I wrote our *Computer* column about two computer scientists experimenting with using the Web as a teaching

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tion in the teaching and learning technology marketplace, we haven't yet seen the transformative idea that "changes everything"—the App Store for education.

In many ways, the current VLE market is quite similar to the cell phone market in 2004. Phones then were simple, rugged, and reliable, and highly developed products were available from vendors including Motorola, Nokia, and RIM (BlackBerry). Each phone had whatever features its manufacturer decided to make available—remember Snake from Nokia? Every few years, your phone would wear out or break, and you would get a new one that looked a lot like the old one, with a few more capabilities. In a sense, 2004 was a golden era for the previous generation of cell phones. Both the users and the vendors were quite comfortable with the available offerings.

While the Apple iPhone was certainly innovative in terms of its base technology, its truly transformative

where the producers and consumers can find each other, much like a local farmers' market. If these two entities know when and where to show up, and the barriers to entry aren't too high, the market forms naturally.

A technology app store has two critical elements: compliance standards so that users can easily plug in the apps and use them, and marketing and communications between vendors and consumers. In the case of the App Store, the iPhone software development kit and usability guidelines form the standards to ensure that the apps work properly in the iPhone environment.

A consortium of vendors and end users has been developing the IMS Learning Tools Interoperability (LTI) standard (www.imsglobal.org/developers/BLTI), which facilitates plugging apps into learning-management systems. Over the past year, most of the mainstream vendors in the market—Blackboard, Desire2Learn, Sakai, OLAT, Moodle, ATutor, Jen-

tool. During that time, the use of technology in teaching and learning has experienced unprecedented growth and success. VLE systems moved from being developed by individual faculty members and running on servers underneath their desks to being the single most important enterprise application on most campuses. We've moved from everyone writing his or her own code to a multi-billion-dollar worldwide industry offering a wide range of mature commercial and open source products.

But even with all this progress, we've merely scratched the surface of the potential for using technology in teaching and learning. We're poised to see an explosion of innovations in areas we can't begin to imagine. When we succeed in creating a friction-free marketplace for the exchange of software and content for teaching and learning, we can bring many more creative minds to bear on solving the problem of how to best use this technology in educational settings. ■

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