

LENS

ON THE
FUTURE

Open-Source Learning

By Anne H. Moore



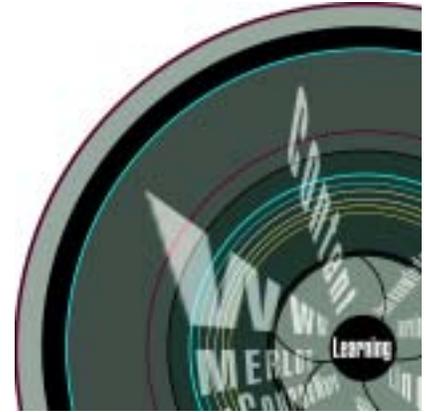
Freedom is not an abstract concept in business. . . . Open-source represents some revolutionary concepts. . . . It gives customers control over the technologies they use, instead of enabling the vendors to control their customers through restricting access to the code behind the technologies. Supplying open-source tools to the market will require new business models. But by delivering unique benefits to the market, those companies that develop the business models will be very successful competing with companies that attempt to retain control over their customers.

—Bob Young, Co-Founder and former Chairman, Red Hat

Many of the technologies available today are revolutionary and disruptive: they can serve as powerful tools to change standards for the ways in which colleges and universities accomplish their teaching, research, and outreach aims. For example, emerging technologies have the potential to enable individual faculty, students, and staff to be serious producers of many kinds of content and to construct for themselves aspects of their own learning environments and work experiences. Indeed, should people and institutions embrace the disruption that today's technologies engender, a lens focused on the future of higher education would reveal images of new instructional arrangements, new spaces for discovery and learning, and new business models for sustaining rich, technology-assisted environments for life and work. But if we use a wider-angle lens in order to add to this image of the future the ability to produce and distribute emerging technologies in an open-source environment, the disruptive discovery and learning processes could form an even more transparent feature of the changing landscape.

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At colleges and universities, visions of learning communities fostering the open development and exchange of ideas and useful services have guided the growth of institutional culture for years. Peer review is a hallmark of this system. The revolutionary open-source software movement shares this collaborative ideal. For example, the computer wizards who labor both as solitary programmers and as members of a community of peers to develop, debug, and maintain software respect the freedom of working in an open-source environment and of solving problems that particularly interest them. They also respect their freedom to exchange ideas and applications; and they value competent work and its open review. The success, nearly thirty years ago, of the development of the first-generation Internet based on the TCP/IP protocol and, more recently, of the development of the Linux operating system emerged from professionals—inside and outside of higher education—who support open-source values and processes.

Since higher education and the open-source software movement share these values, is it possible that higher education might use an open-source metaphor or model as the academy comes to terms with its changing landscape—as institutions strain to integrate technology across content areas, struggle with operational tests of systems and processes associated with integration, and scrutinize the impact on faculty roles and student learning? Perhaps the cultural predisposition for open review and exchange among peers might support the current open-source courseware and knowledgeware movement in higher education and might encourage a greater volume of work in an

open-source environment—a move that might also make good business sense.

The Current Open-Source Movement

Underpinning the current open-source courseware and knowledgeware movement in higher education and elsewhere is a belief in the advantages to be gained through the open development and exchange of ideas. For this discussion, open-source development falls into two categories: (1) open-source knowledgeware development (the tools); and (2) open-source courseware development (the content). MIT's partnership with Stanford on the Open Knowledge Initiative (<http://web.mit.edu/oki/>) is an example of a project designed to develop a learning management system, or open-source knowledgeware—Web-based tools for storing, retrieving, and disseminating educational resources and activities. In contrast, projects such as MIT's OpenCourseWare effort (<http://web.mit.edu/ocw/>), which aims to make instructional materials available free on the Web, and the MERLOT project (<http://www.merlot.org/Home.po>), which endeavors to place on the Web knowledge objects that have been evaluated for quality, represent variations on an open-source courseware-development process.

Open-source software development has traditions that date to the beginnings of the Internet nearly thirty years ago. According to Eric S. Raymond, recent technical and market forces have drawn open-source software out of its niche role in Internet development to a larger role in defining the computing infrastructure of the twenty-first cen-

ture. Raymond also suggests that the idea of open-source development is pursued and sustained by “people who proudly call themselves ‘hackers’—not as the term is now abused by journalists to mean a computer criminal, but in its true and original sense of an enthusiast, an artist, a tinkerer, a problem solver, an expert.”¹ Even among such rugged individualists as these, most abide by certain principles of good practice in development and an unwritten code of ethical development and dissemination behavior.

Similarly, many faculty who have developed course materials for the Web have done so in an open-source environment. Frequently, faculty have shared technology-enhanced materials informally with colleagues, tailoring the material for each learning situation and improving on materials in the exchange. The MERLOT project has sought, with some success, to build on faculty values that prize open exchanges and the peer review of materials. Extending these values to a Web-based teaching environment, faculty from across the nation are participating in MERLOT by creating digitized knowledge objects (modularized materials that can be used in teaching and learning), peer-reviewing them, and storing them in a searchable repository that is organized by content areas and is easily accessible for use in teaching. Like the software-development enthusiasts in the “hacker” community, most faculty abide by certain principles of good practice and an unwritten code of ethics. Whether or not projects like MERLOT are long- or short-term phenomena, it is likely that faculty will

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continue in the long term to devise their own teaching materials, with and without technology, and to seek trusted colleagues' advice in the process. Such practices are a historic tenet of academic culture.

MIT's OpenCourseWare (OCW) project underscores this tenet. Phillip Long notes that OCW is often viewed as "the educational content equivalent to the open-source software movement." Long explains that the application of open-source principles has one intent: "to allow people to read, improve, adapt or modify, fix, redistribute, and use open-source software." He adds, "The definition recognizes that improvements to complex code are made exponentially faster if more people can look at it and lend their intellectual input toward making it work better."² And so it is with OCW. In aiming for an ideal of open scholarship and free access to course materials and resources online, OCW formalizes the historic process of collegial interaction and review for a new age. The technologies employed in this open-educational content process serve at once as catalysts and tools for expanding access to information in many new forms and for encouraging broad participation in the process.

The Open Knowledge Initiative (OKI), which provides the tools that underpin OCW, is a more direct application of the same open-source principles. OKI developers are seeking to create a flexible, scalable knowledge management system that allows for innovative contributions from users in an advanced learning arena. OKI includes collaborating institutions such as Stanford, MIT, Dartmouth College,

North Carolina State University, the University of Pennsylvania, and the University of Wisconsin, Madison. These developers are taking aim at improving the technology-assisted teaching environment by providing tools that are modular and easy to use. So when faculty, staff, or students seek to access, deliver, rearrange, or reassemble information, they can do so with the flexibility and customization required to support many approaches to teaching and to learning.³

Working in either of these open-source environments (tools or content) has several benefits for higher education institutions. First, doing so results in products that supplement and compete in healthy ways with proprietary products, either in the learning management systems arena (knowledgeware) or in the publishing world (courseware). Second, working in these environments encourages the use of standards so that users, whether institutions needing knowledgeware or individual faculty needing courseware, can adapt products to particular needs. Finally, participation also creates and nurtures expertise in knowledgeware and courseware development in the academy, complementing commercial efforts and providing alternative models and materials.

If colleges and universities did view themselves more as open-source enterprises, they might pursue policies, practices, and technologies that maintain open-source values. Chris Werry proposes that higher education "should explore models that are open, participatory and democratic, that respond to a variety of social interests, include a strong public service commitment, and which embody the kind of broad

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intellectual mission that characterizes many public universities in the U.S.⁷⁴ He argues for an open-source movement of online academic resources to give faculty greater facility with and control of their materials and to expand the potential for sharing with colleagues and the public. Werry also notes that the primary obstacles in developing an open-source movement are organization, coordination, political will, and funding specifically allocated to a development process—not a lack of expertise or overall financial resources or skill. The same observations are true for developing the knowledgware or learning management systems that underpin academic content on the Web.

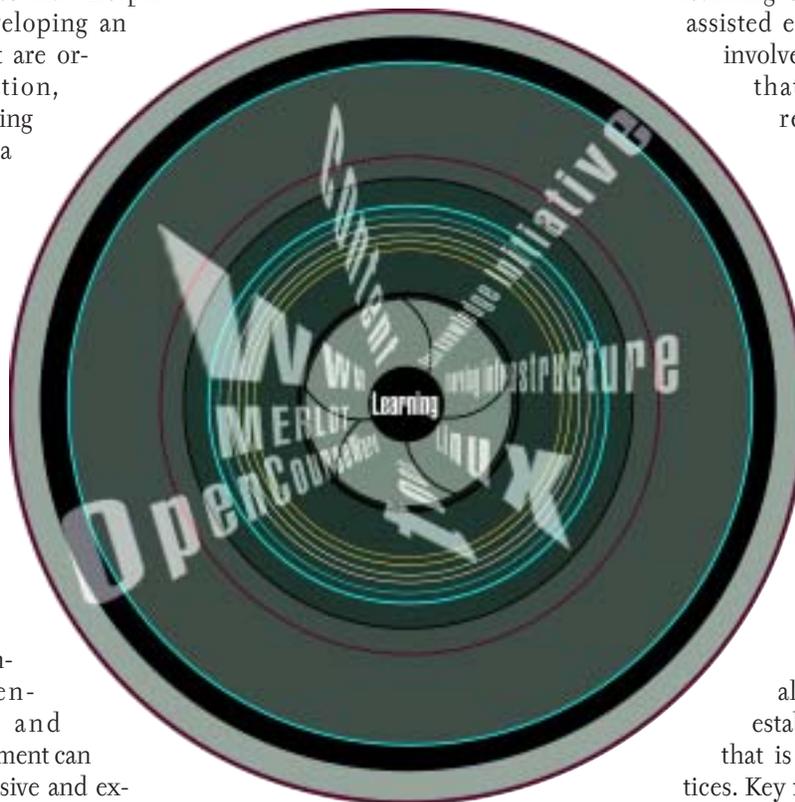
Not every college and university needs to be an open-source originator or coordinator. Indeed, managing open-source courseware and knowledgware development can be almost as labor-intensive and expensive as buying a proprietary product and adjusting it to fit a particular institutional culture. Nevertheless, where expertise, will, and appropriate resources exist, institutions might encourage efforts in open-source development. Once such a project is begun, the resulting creativity attracts other like-minded people, inside and outside of academe.

Perhaps one reason that higher educa-

tion has not moved with dispatch into the open-source courseware and knowledgware arena, MIT notwithstanding, relates to its focus on gaining additional revenues for new, expensive technology-assisted enterprises. Unfortunately, many

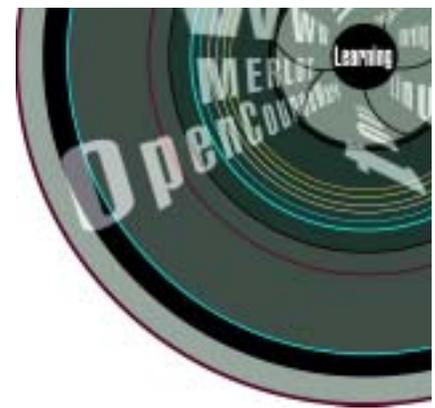
model still pushes information to consumers, without much interaction in product development by the student or much of an attempt to teach students to be producers in a new technological environment. The model fails to apprentice students in ways that benefit their own learning over time in a technology-assisted environment. It also fails to involve faculty and students in ways that make innovative use of resources that are already paid for.

In contrast, higher education should consider its experience in the open-source development of the Internet and its high prioritization of the open exchange of ideas. Colleges and universities could use this experiential foundation as metaphor or model in integrating technology into teaching and learning, in developing and disseminating original materials using new media, and in establishing a business narrative that is in keeping with new practices. Key factors will be two-way communications and interactions that involve students systematically. Students figure as an integral part of this development process, just as they do in a good open, face-to-face exchange of ideas in a physical space. Indeed, success will depend on participation by students as they simultaneously solve problems, make critical evaluations, and help accomplish the work at hand.



of the approaches to acquiring revenue have looked more traditional than innovative. Institutions have merely shifted from a nonprofit I-talk-you-listen (one-way communication) instructional model to a similar profit-making one, bolting new delivery mechanisms onto a familiar product for a market-driven price. This

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Disruptive Technologies and Open-Source Behavior

Perhaps an open-source approach to courseware and knowledgeware development might ameliorate the much debated and publicized effects (on quality, cost, and access) of the attempts by higher education to capitalize on a disruptive technology before its time has come. According to Clayton Christensen in *The Innovator's Dilemma*, technologies are either sustaining or disruptive. Sustaining technologies help institutions improve existing products, whereas disruptive technologies change the standard. Disruptive technologies offer a different set of benefits at lower costs. At first, student-apprentices and faculty-producers are skeptical, cautious, even dismissive about disruptive technologies. But as new institutions or parts of traditional institutions successfully use these technologies in emerging markets, improving quality with successive iterations, the technologies ultimately meet mainstream expectations for a superior product at reduced cost.⁵

The new technologies are disruptive technologies because they allow for the disaggregation of instruction from its support processes. Open-source development provides for the disaggregation of labor and the inclusion of new peers in the development and review process. Faculty from across many institutions can assist in the development of curriculum materials for the Web. Technical staff can continue to participate in knowledgeware development in much the same way that they participated in the development of the early Internet. Students can begin to participate more actively in peer review for online educational efforts. For example, Carol Twigg makes a good case

for more interactive approaches to student feedback using models similar to those that Amazon.com, eBay, and Zagat.com have used to elicit customer input.⁶ Indeed, since materials would be in an open-source environment, many kinds of evaluation and input could contribute to developing materials and software. But institutions would need to strategically commit the expertise, will, coordination, and funding to join an open-source movement.

In an open-source environment, where institutions might provide course materials and knowledgeware free on the Web, institutions would still be providing reliable information and requiring a fee for helping students learn how to discover, evaluate, and use information over a lifetime. Bob Heterick underscores this point in asserting that MIT understands that colleges and universities are not “giving away the store” when they put materials on the Web.⁷ Higher education institutions will continue to add value (and collect a fee) as they demonstrate the forms and functions of contemporary “immersive” exchange environments. The production of materials and the systems (technical and organizational) for delivering those materials will be different.

Not every institution needs to sponsor an open-source project. Some may be better off participating as reviewers and occasional contributors. For institutions that are prepared to initiate and coordinate an open-source development, not every project needs to take an open-source approach. Proprietary knowledgeware and courseware should be evaluated for quality and effectiveness and used alongside products and functions that have been outsourced to application service

providers. Indeed, institutions should be able to integrate proprietary tools into open-source frameworks if vendors' developers adhere to open-source standards like those promulgated by such entities as the IMS Global Learning Consortium (<http://www.imsproject.org/>).

More important, when faculty are developing materials in content areas or when technicians are custom-designing software for particular functions, they should have the benefit of other colleagues' and their students' work to help them avoid a duplication of effort and to review or assist in the development itself. Such active collaboration and review are at the center of transformational learning. It also seems likely that faculty and technologists will need to work more closely together to ensure the appropriate integration of tools and content and to ensure a process that truly benefits learning across the institution(s).

Conclusion

A few institutions seem poised to build on the successes in integrating technology through the open-source courseware and knowledgeware movement. These innovative institutions understand that the next big step involves a strategic convergence on three fronts: (1) technologies; (2) ideas and the cultural values that underpin them; and (3) resources. Yet even though past successes have been built on the continuous development of physical infrastructure, information technology infrastructure, and social infrastructure, today's accomplishments reflect a landscape in which these three domains are converging, at the same time providing glimpses of how modern disruptive technologies might change the standard. Only

by strategically involving all—students, faculty, and staff—in this blending process will higher education develop meaningful descriptions of a learning infrastructure that is seamless, linking together people, resources, and discovery for a modern age. Successful instructional technology initiatives—forays into the new learning spaces that are at the heart of an institution’s knowledge-dissemination mission—depend on such convergence in the face of disruption. They depend on an open-source environment, which will enlarge the aperture of any lens focused on the future of higher education, shedding light on highly collaborative processes designed for creating excellent tools and materials that are reliable, affordable, and accessible for Information Age activities. *e*

Notes

1. Eric S. Raymond, *The Cathedral and the Bazaar: Musings on Linux and Open-Source by an Accidental Revolutionary* (Cambridge, Mass.: O’Reilly, 1999), xii.
2. Phillip D. Long, “OpenCourseWare: Simple Idea, Profound Implications,” *Syllabus* 15, no. 6 (January 2002): 16.
3. Charles Kerns, Scott Stocker, and Evonne Schaefer, “CourseWork: An Online Problem Set and Quizzing Tool,” *Syllabus* 14, no. 11 (June 2001): 27–29.
4. Chris Werry, “The Work of Education in the Age of E-College,” *First Monday* 6, no. 5 (May 2001), <http://firstmonday.org/issues/issue6_5/werry/index.html> (accessed July 9, 2002).
5. Clayton M. Christensen, *The Innovator’s Dilemma: When New Technologies Cause Great Firms to Fail* (Boston: Harvard Business School Press, 1997).
6. Carol A. Twigg, *Quality Assurance for Whom? Providers and Consumers in Today’s Distributed Learning Environment* (Troy, N.Y.: Center for Academic Transformation, Pew Learning and Technology Program, 2001), 17–18, <<http://www.center.rpi.edu/PewSym/mono3.html>> (accessed July 9, 2002).
7. Robert C. Heterick, “Is M.I.T. Giving Away the Store?” *Learning MarketSpace*, May 1, 2001, <<http://www.center.rpi.edu/Lforum/lm/May01.html>> (accessed July 9, 2002).