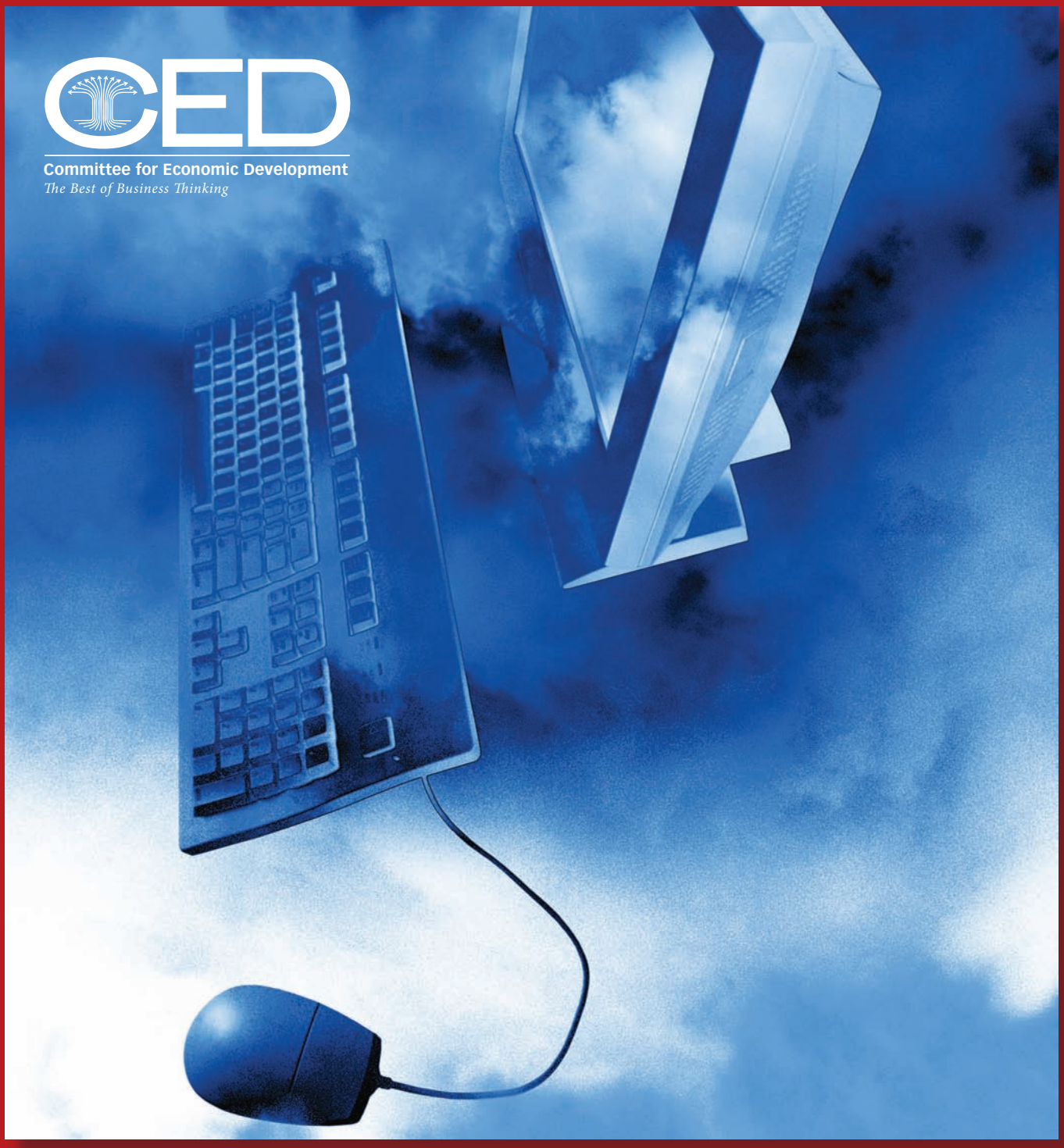
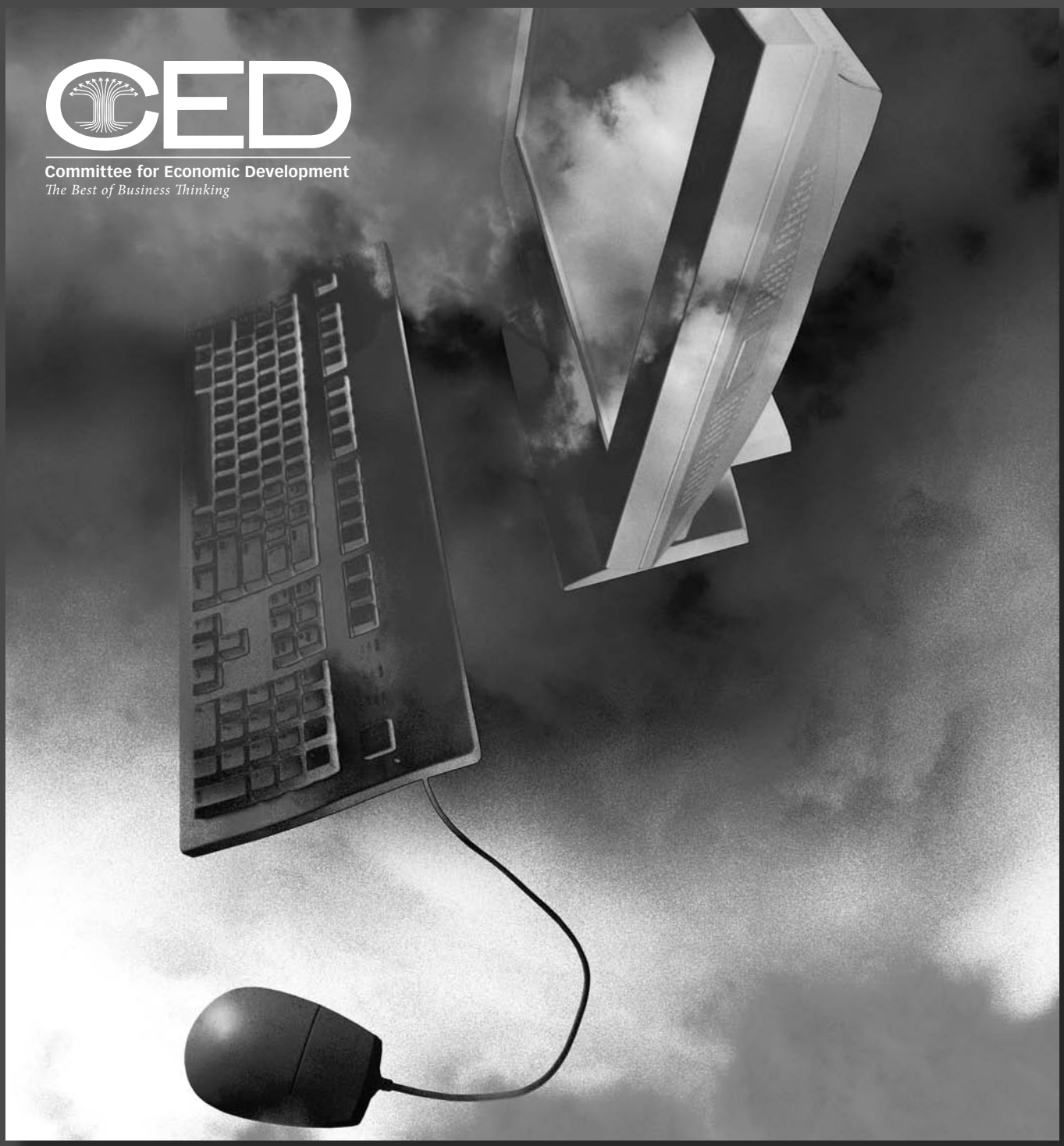



# Harnessing Openness to Improve Research, Teaching and Learning in Higher Education

A Report by
the Digital Connections Council
of the Committee for Economic Development

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# Harnessing Openness to Improve Research, Teaching and Learning in Higher Education

## Preface by the CED Policy and Impact Committee

CED's Digital Connections Council (DCC), a group of information technology experts from CED trustee-affiliated companies, was established to advise CED on the policy issues associated with cutting-edge technologies. This report, concerning "openness" in higher education, is the fourth of its products. CED appreciates greatly the efforts of the members of the Council, and in particular, the work of DCC Chair Paul Horn, Senior Vice President, Research (retired), IBM Corporation, and Distinguished Scientist in Residence, Stern School of Business, Courant Institute of Mathematical Sciences and the Graduate School of Arts and Science, New York University, for his leadership in bringing this report to completion. Special thanks are also due to Elliot Maxwell, CED's project director and consultant, to Charles Johnson and Stuart Kottle, CED Research Associates, for assistance with research, editing, and publication, and to Janet Hansen and Elliot Schwartz, CED's Vice Presidents for Education Studies and Economic Studies, respectively.

This report is the work of the Digital Connections Council. We welcome this report and recommend it to readers as an excellent analysis of how the institutions and processes of higher education can benefit from the application of greater openness through digital technologies.

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# Executive Summary

The rise of the Internet and the digitization of information are affecting every corner of our lives. In a series of reports we have examined how these two changes are increasing the "openness" of information, processes and institutions.

The degree of openness of information, for example, can differ dramatically. To the extent that people have access to information, without restrictions, that information is more open than information to which people have access only if they are subscribers, or have security clearances, or have to go to a particular location to get it. But accessibility, quite similar to the concept of transparency, is only one aspect of openness. The other is responsiveness. Can one change the information, repurpose, remix, and redistribute it?

Information (or a process or an institution) is more open when there are fewer restrictions on access, use, and responsiveness.

The Internet, in particular, has vastly expanded openness. It is changing the nature of information, processes and institutions by making them more accessible to people next door and around the world. It also makes information more responsive—capable of being enhanced, or degraded, through the digital contributions of anyone interested enough to make the effort, be they experts, devoted amateurs, people with an ax to grind, or the merely curious.

In this report we examine higher education through the lens of openness. Our goal is to understand the potential impact of greater openness on colleges and universities. Like other service industries such as finance or entertainment, higher education is rooted in information—its creation, analysis, and transmission—and the development of the skills required to utilize it for the benefit of individuals and society.

But finance and entertainment have been transformed by greater openness while higher education appears, at least in terms of openness, to have changed much less. We aim, in this report to identify some of the potential gains from making higher education more open. We also make a series of concrete recommendations for policy makers and for institutions of higher education that should help harness the benefits of greater openness.

Higher education is a complex arena with many different institutions serving many different audiences. Colleges and universities are, in part, the products of their own societies and reflections of hundreds of years of practice in teaching and learning, research, and service to the community. Reasonably slow to adapt, particularly in their core methods of teaching and learning, colleges and universities have been faced in the last decade with significant trends: the rapid increase in globalization, the arrival of students who were "born digital" and who may never have experienced an educational institution without the Internet, and a transformation of the Internet itself from a curiosity to a means for gaining access to information and now to being a fundamental element of a more "participatory" culture that encourages everyone to make their own contribution. The research function of the university, which aims to produce and disseminate new knowledge, has become so intertwined with the Internet that it is almost difficult to recall what research was like before the World Wide Web. Colleges and universities are also beginning to use the Internet to strengthen ties with their various stakeholders and communities as well as to improve their internal management.

## Openness and Teaching and Learning

For hundreds of years, personal interactions between teachers and students and printed texts have been at the heart of teaching in colleges and universities. But changes in the openness of the educational materials being used and in the vehicles for the delivery of these

materials have the potential to fundamentally reshape teaching and learning.

Unlike traditional printed educational materials, digital materials have the valuable characteristics of allowing teachers and students to know what parts of the materials have been reviewed and providing immediate feedback on what the learner has done with the material. One can easily determine how successful the student has been in achieving the learning outcomes that the materials are designed to produce. The potential gains from using digital materials for both learners and teachers—as well as for the authors of educational materials and for the learning-sciences community in general—have often proven elusive. But the development of more open digital materials known as "open educational resources" (OER), combined with our growing experience with digital materials, suggest the possibility of far greater gains in the future.

The most familiar examples of OER are the MIT OpenCourseWare (OCW) materials that were adapted from existing MIT courses and posted on the Web, available free to anyone anywhere who had an Internet connection. MIT's OpenCourseWare initiative was part of the first generation of OER—putting old but highly regarded educational wine into new digital bottles. Like other information available via what has become known as Web 1.0—they were accessible but static. But newer OER reflect Web 2.0 and its participatory nature. As a result, they are far more open. They are created by a far broader range of authors—faculty, students, literally anyone interested—from around the globe. Not only can anyone create an OER, they can come in all shapes and sizes—a course, lecture, game, simulation. They are freely available to all, and anyone can modify an OER in order to customize it for a particular purpose, language, setting, technological platform, culture, or skill level.

With the extraordinary connectivity provided by the Internet, we can, using OER, provide free digital educational materials to millions of people in institutions of higher education and to the many millions more unable to attend such institutions. Everyone has the opportunity to participate in a global effort to improve and extend these materials, to customize, even personalize, them. We can incorporate new knowledge into digital learning materials more quickly and make those materials immediately and broadly available. We have the potential to collaboratively create materials that are student centered and that reflect our growing understanding of the importance of group effort in learning.

Web 2.0 has redefined the relationship between experts and amateurs in, for example, the creation of encyclopedias such as Wikipedia. It has altered the mechanics and economics of the production and distribution of videos as in YouTube. It is altering the way people interact via social networks such as Facebook. In the world where OER offers the possibility of new relationships between teachers and learners, will the old paradigm of a teacher as the "sage on the stage" remain dominant? We think not.

We do not expect OER to simply replace more closed, proprietary educational materials which themselves are increasingly becoming digital. And there are many issues that must be addressed if OER is to live up to its potential. OER has been supply driven, with creators posting whatever interests them regardless of how or even whether it is used; to be successful OER must meet the needs of users. We need to know how OER is actually being used, how effective it is, particularly in comparison with existing materials, and what impact it has on learners. We need to rethink our copyright rules to allow increased non-commercial educational uses of copyrighted materials beyond the traditional classroom in order to facilitate the further development of OER. Just as new approaches to sustainability are being developed to support open-source software and open-access scientific journals, we will need to see if there are ways to sustain the development and distribution of free high-quality, academically rigorous, and pedagogically sound OER that take full advantage of its digital nature.

We make a special effort to understand the potential implications of greater openness for community colleges. These institutions face extraordinary challenges. They serve almost half the undergraduate students enrolled in higher education in the United States. Their student bodies are far more diverse than those of four-year institutions, with vastly different aspirations and backgrounds and levels of academic preparation. Yet community colleges are given fewer resources to accomplish more different missions than four-year institutions; they have, until recently, received far less

attention and recognition than they merit given their critical place in the entire scheme of higher education.

How might greater openness benefit community colleges? Access to information is one of the central aspects of openness. But there is far too little data collected and analyzed on the progression of students from high school through college and then into the workforce to allow valid judgments about what works and what doesn't. This is not surprising given that community colleges are often funded based on enrollments, not on their results. Funding mechanisms that reward achievement of specific educational outcomes would provide more appropriate incentives and stimulate efforts to find the most effective ways of achieving these outcomes.

Putting more information about course selection and degree paths online so that students—many of whom work full time and support families—can better understand the requirements they need to fulfill, and how they are progressing should be helpful. Providing more support through online counseling and tutoring, including by their peers, would increase openness and be of particular benefit for those who need the most help.

OER could certainly benefit resource-starved community colleges. Using OER and online education would allow them to offer a wider range of courses and meet the needs of students who want more specialized instruction. Online simulations and immersive environments (potentially as OER) could provide educational experiences that would otherwise require expensive laboratory facilities. OER could also help reduce textbook costs that now rival the cost of tuition at some community colleges.

Community colleges serve today as the focal point in higher education for workforce training. Greater openness would encourage closer relationships between community colleges, students seeking training or retraining, and local employers. Businesses should make clear their expectations in terms of skills and knowledge and alert community colleges to emerging workplace needs; community colleges should develop educational aims and learning outcomes as part of short- and longer-term educational programs that will meet the needs of potential employers and students. Better integration of educational policy and basic skills training with workforce preparation and economic development policy would help students, employers, and the country as a whole, particularly as we struggle through today's trying economic times.

National policy should support increased broadband connectivity for community college computing centers and supplement community college training facilities with new open "fabrication labs" to provide students—and members of local communities such as laid-off workers—with exposure to powerful, and increasingly software-controlled, tools.

## Openness in Research

Research has been revolutionized by the digitization of information and the continued extension of the Internet. New models of networked research, such as that embodied in the Human Genome Project, are characterized by vastly increased collaboration, often on a global scale, and by the rapid public disclosure of research results rather than holding them for publication in scholarly journals or by academic presses. This more open model of research is consistent with the research mission of the university to create and disseminate knowledge—and appears to lead to both broader and deeper research while increasing the pace of innovation.

Collaboration is not new to colleges and universities—it is in their DNA. But the scale of today's global collaboration and its pervasiveness were unthinkable until relatively recently. Universities have long had to learn how to recognize the scholarly achievement of research collaborators. Now they (and governmental grant makers) face the challenge of finding ways of evaluating and rewarding more open research, the results of which are publicly disclosed without being subject to a peer-review publishing process (but which are subject to the immediate scrutiny of the global scholarly community). It seems likely that new forms of recognition for tenure, grants, etc. will be required for today's digital age. At the same time, new Web-based, open-access journals, peer reviewed and freely available to all without subscription, are emerging as threats to the business models of even the most prestigious proprietary journals and academic presses.

Another manifestation of greater openness in research is the rise of digital repositories. There is ample

precedent in the sciences for researchers to voluntarily deposit their research results in an electronic archive that is accessible by all, but it is only recently that major research universities have begun to adopt policies requiring researchers to place copies of their research in institutional digital repositories. MIT's faculty, for example, recently voted unanimously for such a policy to make a statement that they stand for the free flow of ideas. These repositories further the research mission and allow scholars everywhere to learn about and build upon previous work. But work needs to be done to ensure that they are interoperable and user friendly.

Congress has greatly advanced openness in research by passing legislation that dramatically increases access to research funded by the National Institutes of Health (NIH). A condition of NIH support now is that results must be deposited into Pub Med Central upon acceptance for publication and be made publicly available within 12 months of publication. This policy is being vigorously opposed by publishers who claim that their intellectual property (IP) interests are being infringed by the open access requirements. Not only do we believe that the NIH policy is consistent with copyright law and good public policy —to increase the pace of innovation and avoid making the taxpayer pay twice for taxpayer-funded research—but we believe that the public-access mandate should be expanded. Recently introduced legislation would extend public access to research funded by the 11 federal agencies that each provides more than $100 million in support. We also support increasing access to data collected by the government such as for regulatory purposes. The National Science Foundation has already moved in this direction by establishing a policy that any scientific and engineering data funded by NSF must be made broadly available and useable.

Yet another example of the conflicts between IP rules and greater openness is being played out in a battle over the digitization of the world's books—one of the most exciting opportunities for increased openness since the invention of printing. The Google Book Project, the Internet Archive, and the Open Content Alliance, among others, have been engaged with major libraries, including university libraries, in important and praiseworthy efforts to digitize books and to make them globally accessible. Google has been sued in a class action by publishers and authors who allege that copying and digitizing the books and displaying even small portions of them without the specific permission of the copyright owners are copyright violations. A proposed settlement has been crafted and is being reviewed by the court overseeing the case, as questions have arisen about the impact of the proposed settlement on broader access to "orphan works" (those whose copyright holders are unreachable), on the online marketplace for digital works, and on the privacy of readers. We are not in a position to make a judgment about the proposed settlement but we think the goal of public policy should be to obtain the greatest possible access to copyrighted works, and in particular "orphan works," and to stimulate competition, consistent with the need to provide incentives necessary for creativity. We would encourage university libraries to join in these important efforts at digitization and to expand their attempts to preserve surprisingly fragile digital materials.

The intellectual property arguments that have been invoked to oppose public-access mandates for government-funded research and the digitization and partial display of the world's books suggest to us the need to recalibrate our intellectual property rules for the digital age. Intellectual property rules should serve not only those who first create a work (and subsequent rights holders) but should also recognize the needs of users who often are follow-on creators. When the application of existing intellectual property rules appear to regularly have perverse effects—electronic books having text-to-speech capabilities turned off to the detriment of the visually impaired, or university presses, created to increase the accessibility of scholarly materials, invoking copyright protections to have their material removed from the globally accessible Web—it is time to step back and revisit not only the specific applications of the rules but the rules themselves. Given the complexity of these issues, universities should be forceful proponents for greater openness in legislative debates about IP, and should be educating their faculties about their intellectual property rights.

The drive for greater openness also raises questions about the technology transfer activities that have spread throughout higher education since the passage of the Bayh-Dole Act that aimed to encourage patenting and commercialization of federally funded university research. The research mission of the university is to create, preserve, and disseminate new knowledge. Technology transfer offices, on the other hand, have

been created to spur the commercialization of university research and to generate funds for the support of university activities.

Very few technology transfer activities generate significant funds. Their practices regarding technology transfer can be inconsistent with the research mission particularly if their drive to maximize revenue results in licensing practices that unnecessarily restrict access to university research. Universities should examine the practices of their technology transfer offices to ensure that there is an appropriate balance between generating funds and the broadest possible dissemination of new knowledge.

In a related area, universities must be vigilant to protect the openness (and quality and integrity) of university research from commercial limitations; a striking example of such threats are licensing restrictions imposed by providers of genetically modified seeds that have prevented land grant universities from conducting research comparing the effectiveness of genetically modified seeds with other seeds. We believe colleges and universities should carefully review the terms of commercially supported research to guard against inappropriate restrictions and maintain sufficient reporting requirements to identify possible sources of conflicts of interest by university researchers.

The growing use of e-portfolios by students should facilitate greater openness in teaching and research. Students can use them to deposit their digital work, both finished and in process. This allows improved faculty review and assessment and provides a mechanism for students to demonstrate their accomplishments to other schools and potential employers. These e-portfolios might be maintained past graduation, serving as a repository for a student's work throughout his or her lifetime and as a life-long link to one's alma mater.

## Openness and Relations with Various Stakeholder Communities

Colleges and universities are adopting the open tools of social networks to strengthen relationships with applicants, incoming students, parents, alumni and other stakeholders—although nowhere as quickly as their students have adopted them. But these tools can also be used invidiously for monitoring the past and present activities of those who participate in these networks. We believe that institutions of higher education should initiate conversations with members of their communities about the privacy implications of online disclosures as well as how the institutions themselves are making use of them.

Increased access to the Internet has created an opportunity for colleges and universities to rethink and expand their role in continuing education—often considered tangential to their mission to teach undergraduates. The Internet also allows colleges and universities to share the extraordinarily rich array of intellectual activities taking place on campus with local communities as well as those a world away. Given this potential we would encourage institutions of higher education to change the "default setting" from "Why should we make this activity available on the Web?" to "Is there any reason why we should not make this activity available electronically to all?" In the same spirit we are encouraged by new efforts to open students to the global community in which they will work and live via study-abroad opportunities and Internet-facilitated links with institutions beyond U.S. borders.

## Openness and University Administration

A new form of software development, community-sourced software, has produced some innovative products useful for university administration such as the SAKAI course-management system and the KUALI financial systems. Such open-source systems may be particularly helpful in areas where proprietary software is not efficiently and effectively meeting the particular needs of institutions of higher education. Universities should seriously consider using open-source systems such as these and establishing information and communication technology procurement requirements that favor greater openness and interoperability.

The rise of the Internet should also lead colleges and universities to reconsider the enormous amounts being budgeted for improvements and expansions of their physical facilities. In a world of constantly expanding bandwidth and connectivity, will "place"—the particular geographic location of a college or university —remain as critical? Should investments in bricks and mortar continue to dominate capital budgets? We think there may be a potentially persuasive case for shifting investment over the next decade to less

capital-intensive information and communications technology tools that enable greater openness.

We discussed the tensions between openness and IP rules in the context of research but they are being felt in another area by college and university administrators. The Higher Education Opportunity Act requires colleges and universities to take steps to diminish unauthorized use of copyrighted materials by students using institutional networks and to participate in alternative mechanisms for legally obtaining downloadable music, movies and videos. The potential price is a loss of federal aid.

We believe that institutions of higher education have an obligation to educate their students about their IP rights and responsibilities, including their responsibility not to misappropriate the intellectual property of others. But these institutions that rely so much on openness and trust in their teaching and research missions are ill suited to serve as enforcement agents for private parties in commercial disputes under threat of severe federal penalties.

## Openness and Certification, Accreditation and Transparency

There is also important work to be done to provide real meaning for degrees and certificates. We may know how many credit hours are required to obtain a degree or certificate, but we know little about the educational objectives and outcomes that underlie these supposed demonstrations of student competencies. In the absence of such information it is impossible for employers, for example, to make meaningful cross-institutional and cross-border comparisons.

We need better information to allow individuals to compare the educational objectives and outcomes of different institutions and to measure the value added that an institution provides. The absence of such information inhibits genuine competition amongst institutions of higher education. At present, potential applicants are asked to make decisions comparing educational institutions around the world using ratings based on inputs such as the test scores of their matriculates, student-faculty ratios, and the financial resources of the institution. Wouldn't we be better served by competition based on publicly available educational objectives and the learning outcomes that the institutions achieve, and the value that they add to what their students bring to them?

We currently trail European efforts to make transparent, comparable, and compatible the meaning of degrees and certificates and to describe the educational aims and outcomes that underlie them, but we are seeing some progress. We continue to suffer, however, from the legacy of battles over the federal role in accreditation and the very purpose of the accreditation process itself. We believe that in a world of great student mobility, increasing distance education that transcends state borders, and the critical role of higher education in our national competitiveness, that the federal government must play a role in facilitating the portability of degrees and certificates and ensuring their compatibility, comparability, and transparency. Increased federal support for research on assessment and measurement of educational outcomes would help. So too would a change by accrediting agencies from a focus almost entirely on institutions (their members and clients) and inputs to one that pays greater attention to impacts on students. Few accrediting agencies now make public information about the institutions they accredit beyond the formal accreditation actions that they have taken; greater focus on student outcomes would lead to greater transparency and facilitate more informed choices by potential students.

## The Role of Proprietary Institutions

We have focused our research on the impact of openness on not-for-profit public and private two-and four-year institutions. This is not because for-profit institutions are unimportant or unworthy of attention—the for-profit sector of higher education has been growing rapidly and includes many highly successful institutions. It is a function of limited time and resources.

But even in our cursory look at this sector we can identify certain practices that support our conclusion that greater openness can help improve higher education. We think that the most successful for-profit institutions have learned the importance of defined learning outcomes and appropriate assessment, and the need to produce decision-relevant data. Many have been leaders in experimenting with new technologies in support of their missions; they must prepare their students to meet and exceed the needs and expectations of potential employers, so they have to strive

continuously to understand existing and emerging workforce needs. For-profit institutions often provide more support and teacher training to their faculty than do their not-for-profit equivalents and have been earlier to recognize and support the positive impacts of student group-learning activities.

## Recommendations

This report makes several recommendations that would help institutions of higher education move in the direction of greater openness. The following highlights some of the key initiatives.

**Governments should:**

- Establish standards for the nationwide collection and reporting of data tracking student progress from high school to post-secondary institutions and then on to the workplace, focusing on educational outcomes and factors that favor or impede student success. Such data should be broadly accessible and useable and subject to rules to protect privacy and security.
- Fund research on the comparative effectiveness of digital educational materials, including OER, and conventional materials as well as on best practices for online and blended on-line and face-to-face education. Additional research aimed at assessing the accomplishment of learning outcomes would help support improved teaching and learning.
- Review and recalibrate intellectual property rules recognizing the increasing importance for innovation of users as follow-on innovators. Extend permissible uses of proprietary materials under the educational exceptions for non-commercial educational use beyond traditional classrooms.
- Retain existing requirements for public access to NIH-supported research (public availability within 12 months of publication) and extend the public-access policy to cover non-classified research funded by the 11 federal agencies that each annually provide over $100 million of research support.
- Remove obstacles to federal involvement in efforts with states, colleges and universities, and accrediting bodies to establish minimum quality standards for, and foster self improvement by, institutions of higher education. Support efforts to establish clearer learning outcomes at the program and departmental level at institutions of higher education.
- Establish as federal policy the goal of increasing compatibility, comparability, and portability of degrees and certificates and transparency regarding the educational outcomes at, and the value-added by, institutions of higher education.
- Support the establishment of "fabrication laboratories" in conjunction with community colleges, businesses, labor unions and local governments in areas of high unemployment.
- Improve access to "orphan works"—those still under copyright but whose rights holders cannot be reached—by legislatively limiting liability for their good-faith use.

**Colleges and universities should:**

- Reevaluate faculty recognition policies regarding tenure, advancement, and the granting of awards to acknowledge (and not discriminate against) new practices regarding the dissemination of research results such as via immediate release, publication in open-access publications, and creation of open educational resources.
- Establish open-source digital repositories and require faculty to provide the institution with a non-exclusive license to the products of their research. Deposit electronic copies of the research into the repository and identify them using standardized metadata to facilitate search and use. Ensure faculty the right to withhold research from general availability while providing metadata to disclose the existence of the research and contact information.
- Reexamine and readjust technology transfer policies and programs, particularly exclusive licensing arrangements, in light of the research mission to create and disseminate new knowledge, while recognizing the need to generate revenues to support the institution.
- Establish e-portfolios into which students can deposit their work while attending the institution which can be used for assessment and shared

with prospective employers and others. Consider making such e-portfolios available for students to continue to use after they leave the institution.

- Be a voice for greater openness in access to information and for a re-examination of intellectual property rules for a new digital era.

# Chapter 1: INTRODUCTION

Colleges and universities play a central role in the creation, analysis, and dissemination of knowledge. They help develop and inculcate the habits of mind and the skills necessary for a life of learning. They prepare us in many different ways—large and small, direct and indirect—to engage in productive and rewarding activities.

The rise of the Internet and the increasing digitization of information are creating myriad opportunities for institutions of higher education to refashion how teaching and learning take place (including the nature of the materials used), how they create and disseminate knowledge, and how they interact with their various constituencies. Because institutions of higher education generate cutting-edge research on information and communications technologies (ICT), they might be expected to be at the forefront in finding ways to employ technology to fulfill their missions.

It is true that there have been changes in higher education that have come about because of the availability of the Internet and the development of ICT. But these changes, particularly regarding the teaching and learning mission, appear to be less pervasive than in other service sector industries, such as finance or entertainment.

This paper examines some recent developments in higher education and attempts to identify steps that institutions of higher education might take to obtain the benefits of greater "openness." But what do we mean by openness and why does it matter?

## Openness

Openness, as we have developed the concept in a series of papers, is not binary.[1] Information products or processes are not likely to be either fully "open" or fully "closed" but rather fall somewhere in-between these end points of the continuum of openness. Information that is not shared by its creator, for example, would be considered closed. Information posted on the World Wide Web, available to all, would be considered open. Most products and processes fall somewhere in-between, and can be placed on the continuum based on their relative "accessibility" and "responsiveness." If information is available without conditions, such as a requirement to pay or to be part of a certain group, it is more accessible and therefore more "open" than information available only via subscription or because one belongs to a certain professional society. If the information can be modified, repurposed, and redistributed without restrictive conditions, it is more "responsive" and thus more "open" than information available only in a "read-only" format.

The concept of openness can be applied to institutions as well as to information and processes. To the extent that an institution of higher education makes its teaching materials available without restrictions, it is more "open" than one that does not. To the extent that an institution provides broad access to the fruits of the research it supports, it is more open than one whose research results are available only to journal subscribers.

The openness we are discussing should not be equated with the use of information technology or the Internet. It is true that openness can be enhanced by utilizing ICT to facilitate the creation, modification, reproduction and distribution of digital information. But greater openness does not depend on technology. Greater openness can be reflected in an attitude that sees and welcomes the potential for valuable contributions from both expected and unexpected sources—experts as well as amateurs, students as well as teachers—to improve information, processes and institutions.

When teachers treat students as neophytes who are simply recipients of the teacher's knowledge we recognize that the teacher is displaying less openness. When researchers recognize students as fellow investigators we see their greater openness.

Why should we care about the degree of openness? Over the course of our work we have found that greater openness fosters quicker and broader innovation, primarily because of the potential for many more people to contribute, as opposed to having to rely on the work of a lone "genius" or the capabilities of a very small group. Individual creators certainly play an important role. Their value should not be underestimated. But openness taps the potential of a much larger number of potential creators, who might see the problem in a different way or be aware of alternative solutions and who are able to contribute drawing upon their own experience and expertise.

In our report on open innovation we quoted an aphorism of the open-source software community: "With enough eyeballs, all bugs are shallow," to illustrate how openness works in practice.[2] In seeking to continuously improve open-source software such as LINUX, the open-source community distributes the source code as broadly as possible. Even the intellectual property licenses used by the open-source community are designed to increase (and preserve) the accessibility of the code for everyone.

The rationale is that the more people who view the source code, the more likely it is that someone, somewhere, will have the expertise, experience, and inclination to detect and fix the inevitable errors (or "bugs"). Broad distribution makes it more likely that the unknown programmer for whom the bug is "shallow" will encounter the source code and suggest improvements. Making the source code accessible, rather than controlling it and excluding others from access to it as is done with proprietary software, is necessary because the programmer for whom the bug is shallow cannot always be identified in advance.

Although we support increased openness in many situations, we recognize that openness is not an unalloyed good. Greater openness is not always the best way to achieve a particular purpose.

As a result of greater openness, we are awash in a tsunami of information—simply because we can be. Because of the resulting information overload we continually have to struggle to find the right information from the appropriate trustworthy source.

Too much openness can frustrate the best of intentions. Broad distribution of source code allows open-source software to be improved based upon the suggestions of a large number of programmers. But many of the suggestions are not good, or are not ready for prime time. If the LINUX software you rely upon changed every time someone proposed a change, you would quickly stop using it. So even in what we call open software there are limits on openness, in this case limits on the responsiveness of the software to proposals to improve it. But the limits reflect the strategy of improving the software by involving a broad community while achieving the stability and quality control that users demand.

It is often difficult to determine the optimum degree of openness for a particular purpose. This is certainly true in the varied contexts of higher education, where there are a number of factors that tend to limit openness—privacy, security, data integrity, intellectual property rights, etc—that must be considered.

## Higher Education

Higher education in the United States is a complex, constantly changing service industry. It includes highly selective private four-year undergraduate and graduate institutions that are often at the forefront of research and provide learning opportunities on a campus for a relatively small group of high-achieving students. It includes flagship public universities that owe their origins to an enlightened public policy begun during the Civil War that recognized colleges and universities as crucial to the growth and maturation of an expanding nation. There are hundreds of large and small public and not-for-profit private institutions that are generally less well endowed, less selective, and more focused on undergraduate teaching than on research. There are also roughly 1,200 public two-year community colleges that now serve almost half of all undergraduate students attending institutions of higher education in the United States.[3]

The last decade also has seen the rapid growth of another set of educational institutions: private for-profit institutions, which were originally focused on vocational training but whose educational goals have, in some cases, moved much closer to those of traditional two and four-year colleges and universities.

Although these institutions differ considerably, we have concluded, based on the work we are describing

in this report, that greater openness is the direction toward which institutions of higher education should be moving. We believe that they can benefit from greater openness in their core missions of teaching and learning and research. Institutions of higher education, like other institutions, have administrative and other needs that may be met more efficiently through greater openness. Colleges and universities serve a variety of constituencies, including faculty members, students, administrators and staff, alumni, funders, applicants, and the local communities in which they are located. Greater openness can enable institutions to connect with and serve these constituencies more effectively.

Given the potential advantages of greater openness it is helpful to understand what higher education is now doing to become more open; why higher education has been relatively slow to respond to the technological and social upheaval brought about by the Internet; and to identify how institutions of higher education can become more open when appropriate. We have tried, where possible, to make specific recommendations for policymakers and for institutions of higher education that should help harness the benefits of greater openness.

## Trends Affecting Higher Education

### *From Web 1.0 to Web 2.0*

In the early days of the commercial Internet, following the development of the World Wide Web and the first commercial web browser (Mosaic), experts forecast that the Web would become a new "Library of Alexandria." Everyone's information needs would be satisfied through vastly greater access to digitized data. This was Web 1.0, the Web as a vehicle for access to information.

Only 14 years after Mosaic's creation, however, we have learned that the Internet does much more than increase access to information. In its Web 2.0 incarnation, it has helped create a "culture of participation" by allowing everyone, young and old, to become researchers, collaborators, teachers, students, authors, publishers, video producers, performers, activists, team members, observers, global celebrities with their "15 minutes of fame," as well as spammers, gamblers, hackers, and fraudsters.

The emergence of Web 2.0 has facilitated the creation and sharing of information and the emergence of the "crowd" as a potential source of wisdom. Information sharing is surely not unprecedented. But our intellectual property system favors control and exclusion to encourage innovation.

The traditional intellectual property (IP) regime is based on encouraging an individual or small group to create by allowing them to profit from their creation; to enable them to profit they are given the right to control their creation and to exclude others from access to it without some form of compensation.

A system of innovation based on sharing is the mirror image. It sees value being created by sharing rather than by withholding and excluding. Creative work increases in value as more people contribute to its improvement. While the traditional IP system looks primarily to the initial creator, the alternative looks to the far greater number of users/follow-on innovators and reminds us that every first creator is a follow-on innovator for an earlier first creator. Or to paraphrase Newton, each creator, even the individual genius, stands on the shoulders of giants.

The power of sharing and the unprecedented scale of participation in co-creation that it allows can be seen in the growing role of open-source software, the development of new institutions like Wikipedia and YouTube, in the millions of cacophonous voices in the blogosphere, and in new social networks such as Facebook and MySpace.

Few institutions have been unaffected in some measure by this culture of participation. It seems apparent that institutions of higher education will need to prepare students to participate effectively and responsibly in these changing institutions, but this preparation is not likely to be the same as that which served the Industrial Age. Colleges and universities will have to adjust to one of the effects of this culture in which everyone can be a creator—that of the blurring of lines between producers and consumers. In the context of higher education, this foreshadows a change in the relationship between teachers and students from one where the teacher imparts knowledge and the student receives it, to one where both teacher and student are empowered to contribute to the learning process, even though the teacher is expected to have more to share

and to serve as a model practitioner of a discipline or skill.

### *Born Digital*

Students too are changing. Eighteen-year-olds entering colleges and universities in 2009 were "born digital." They have spent their entire formal educational experience in a world where they were increasingly linked to, and by, the Internet. They do not see themselves as passive recipients of information. Many multi-task while on social networks and share music, articles, political views, and videos. They collaborate to fundraise for a cause or join groups to plan events more efficiently. They blog, use and create podcasts, visit virtual communities, play electronic games, track friends with Twitter and post homemade videos on YouTube. According to surveys, 35 percent of them belong to social networks and 57 percent can be considered "media creators."[4]

Many have never used a print encyclopedia, preferring searchable online information sources such as Wikipedia. Those 'born digital' may well feel constrained when they come to a college or university with less connectivity than they experienced in high school or at home. In an increasingly digital environment, they are often taught by "digital immigrants" with far less sophistication about digital technologies than they themselves possess.

### *The Rise of Networked Research*

Models for research are also changing. The Internet is providing a network for collaboration among researchers enabling what has been called "invisible colleges" of researchers separated by geography but united by interest. As a study of 700 scientific articles published in *Nature* found, only six of those published in the modern era were by single authors, a complete reversal of earlier patterns.[5] The Internet also is providing the means for researchers to disclose their findings quickly and broadly so that others can build upon them, rather than withholding them until they can be published in a scholarly journal.

The development of networked research can be seen most readily in the sciences. As Paul David has described it, "open science represents a break from the previously dominant ethos…to a new set of norms, incentives, and organizational structures that reinforce scientific researchers' commitment to the rapid dissemination of new knowledge."[6] Open science is marked, as is Web 2.0 and open-source software, with a much more welcoming attitude toward participation by non-experts. Amateurs by the thousands now contribute to scientific activities as diverse as classifying galaxies based on spaced-based images to manipulating scanning microscopes from a distance to study molecular structures.

### *The Growth of Connectivity and the Rise of the Mobile Internet*

Over a billion people are now connected to the Internet.[7] As Clay Shirky points out, the very fact of their connection changes the potential impact of greater openness.[8] More people have access. More can participate. The amount and variety of the contributions they can make increases with the number of those connected.

Not all connections are the same. While the number of people with access to broadband connection has been steadily rising, the percentage of those with broadband connections in the developing world remains dramatically lower than those having broadband connections in the industrialized world.[9]

The real increase in connectivity is now being driven by the growth in wireless connections accessed via mobile devices such as mobile phones (smart or not), laptop computers (or netbooks), personal digital assistants and other emerging tools. These wireless devices are becoming ever more capable, and now outnumber desktop computers and landline connected devices on a global basis.[10]

The explosion of new devices and new capabilities, and the wide range of bandwidths being used, are affecting how information services—including higher education—are provisioned and used. Institutions of higher education will have to adjust, not only by modifying materials to take fuller advantage of digital capabilities but also by using different technologies with different capabilities and characteristics to serve populations in different cultural settings.

### *Underserved Markets for Higher Education*

The rise in Internet connectivity has created enormous opportunities for higher education to reach huge

underserved markets both in the United States and around the world. These markets include both those who seek formal educational experiences and a degree or certificate attesting to some form of mastery, as well as informal/self-directed learners who now have access to Web-based educational materials. Reaching these underserved markets is critical because long-term and sustainable economic development depends on well-educated populations.

Nearly half of all people in the world are under the age of 25. Some 1.2 billion people alive today are between the ages of 10 and 19, with 87 percent living in developing countries where less than 10 percent of the population has access to higher education.[11]

There are 30 million students today who are qualified to attend college but cannot, due to a lack of places or financial resources.[12] As the head of the University of London has written, we would have to create a major university every week to meet the needs of these young people who are so critical to the promises of their own societies.[13] Not only is this not taking place but many countries have been cutting back their spending on higher education, a movement likely to be accelerated by today's global economic slowdown.

If colleges and universities in developing countries can't meet the need, can institutions in the industrialized countries? Even if these institutions had spaces—which they do not—they could meet only the tiniest fraction of the demand because traditional forms of higher education do not scale well.[14] Moreover, in the long run it would be counterproductive—and a blow to economic development worldwide—to encourage a mass educational migration. Even today, a high percentage of students from the developing world who leave their countries to study do not return, remaining away to live and work.

Unlike the developing world, the largest population cohorts in advanced economies are not young. It is projected that by 2050, over one in every five persons in the United States will be 65 or older, and one-third of the population in developed regions of the world will be 60 or over.[15] The Lisbon Declaration of the European Commission points out that this aging population provides a growing market for life-long learning opportunities as tens of millions of people will have access to more resources and more free time to continue learning, developing new skills, and taking part in new activities.[16]

In the United States, between the young and the old is another underserved community, adult learners 25 and older. This cohort is growing while the percentage of the population representing men and women 15-24 is declining.[17] Although the United States spends the largest percentage of Gross Domestic Product on higher education of any country in the world, there are still 32 million adults here who have never attended college. Where the United States once led the world in the percentage of population with post-secondary degrees, its rank has now slipped badly. We are facing the depressing prospect that today's younger generation in the United States will be less well educated than their parents.

### *Globalization*

The Internet has quickened the pace of globalization. Institutions of higher education could reasonably be expected to provide students with a greater experience and understanding of the rest of the world.[18] But rather than being the most "worldly" of our institutions, many colleges and universities in the United States have been slow to respond to globalization. A recent study by the Center for International Initiatives at the American Council on Education showed that less than 40 percent of institutions of higher education made specific reference to international or global education in their mission statements, and that the percentage of colleges that require a course with an international or global focus as part of a general education curriculum actually fell from 41 percent in 2001 to 37 percent in 2006.[19]

Statistics on foreign enrollments in U.S. institutions of higher education and U.S. students studying abroad during the seven years post 9/11/2001 suggest that U.S. institutions of higher education (and the governmental institutions that provide visas and support to foreign students) are not rising to the challenge of globalization.[20] A potentially quite constrained view of the world is suggested by these enrollment figures: while the number of foreign students coming to the United States has rebounded after a significant post 9/11 drop, the number of students from Islamic countries remains disconcertingly lower than before, and the number of U.S. students studying abroad in

Islamic countries is lower than the number of U.S. students who go to Costa Rica to study.[21] (Surely if we wished to increase our understanding of, and improve our relations with, the Islamic world, we would see it to be in the national interest to alter these numbers.)

### *The Global Movement Toward Openness*

The Internet has fostered a burgeoning movement toward greater openness in many domains. A key aspect of this has been the movement to define knowledge as a public good that should be broadly available—a central credo of the "Access to Knowledge" movement. In support of this, the European Commission has added "knowledge" to the list of items that should move freely across borders in the European internal market.[22]

At the same time, "open" has become an almost commonplace adjective: open source for software, open standards for information technology, open systems and open architecture as elements of design, open access for cable and telecommunications systems, open spectrum for radio frequency management, even open innovation. This move toward increased openness forms a backdrop for a discussion of openness and higher education today.

# CHAPTER 2. HIGHER EDUCATION AND ITS ADOPTION OF OPENNESS

No one would likely argue with the proposition that the financial services sector has been continuously revolutionized by the introduction of new technologies to deal with financial information, from the invention of the telegraph to today's electronic-banking networks. The music, video, and movie industries are being transformed as information once encoded on vinyl, 8-track tapes, CDs, or DVDs becomes detached from a physical medium and takes on the special characteristics of intangible digital data, capable of being copied and freely distributed to 6 or 60 million of one's closest friends via peer-to-peer networks.

Information is also at the core of higher education. Institutions of higher education create knowledge and disseminate it. They pass it on generation to generation, and put it in a social context. They help students structure, organize, navigate, and produce it. How has higher education been affected by the forces that are transforming these other sectors?

There surely have been changes but they seem to come more slowly, particularly with regard to teaching and learning. Perhaps it is because the millennia-old model of bringing teachers and students together at a particular location has been so successful. Perhaps it is because the leaders of institutions of higher education are usually not technologically sophisticated, and younger, more tech-savvy faculty who want recognition and rewards believe that they must follow traditional paths. Perhaps it is because the thrust of competition in higher education is not as piercing as in finance or entertainment. Perhaps it is simply inertia.

Whatever the reasons, the slower pace of change is not because technological innovation has been absent from higher education. The use of electronic communications for teaching and learning is not new. The Open University in Great Britain (OU), for example, has provided a working model of higher education at a distance using broadcast technologies since 1969.[23] But the course materials were specially created. Audiences were limited. The model of teaching and learning was relatively traditional.

More recently, the increasing use of digital media and the emergence of a new form of educational materials known as "open educational resources" are raising the possibility of substantially changing the materials used in teaching and learning, the ways that they are created and utilized, and even the process of teaching and learning itself. The creation and use of open educational resources reinforces the view of learning as a collaborative social activity and illustrates the potential for making new and customizable educational materials available wherever the Internet extends.

## Open Educational Resources: A Force for Greater Openness in Higher Education

What are open educational resources (OER)? The Organization for Economic Cooperation and Development's (OECD) definition captures the essence: "digitized materials offered freely and openly for educators, students, and self learners to use and reuse for teaching, learning and research, including content, software tools to develop, use, and redistribute content, and implementation resources such as open licenses."[24]

The term OER covers a wide range of materials from whole courses to modules as small as a simple exercise, from videos of lectures to an entire lecture course, from a textbook to a single reading assignment. OER can include encyclopedias, games, images, and video and be available on line or via broadcast, physical media etc. They are digital with all the inherent malleability of digital materials, free, and subject to use, modification, and redistribution by anyone for any purpose.

*MIT and the OpenCourseWare Initiative*

MIT helped pave the way for the growth of OER through its OpenCourseWare (OCW) Initiative. Growing out of the work of MIT's Council on Education Technology, championed by MIT's President

Charles Vest, and funded by the Hewlett and Mellon Foundations, MIT began to post course materials drawn from 32 of its courses on the Web in 2002.

What MIT was making available to anyone with Internet access was material based directly upon existing MIT courses, including lecture notes, syllabi, tutorials, and problem sets. The posting of these materials, based largely on a traditional single instructor course model, reflected, but did not go beyond, the Web 1.0 model of increasing access to information. Accessibility was increased, responsiveness was not.

Vest and other OCW supporters saw OCW as a natural e-learning response to MIT's educational, research, and public-service missions—and as an exciting way to increase interaction among faculty, students, and alumni. But there were important and difficult issues involved that needed to be resolved to achieve even this limited degree of openness. Initial estimates of the costs of getting materials ready for posting were daunting. It was not clear how to translate the course materials, fashioned for physical classrooms and laboratories, into attractive and useful Web-based materials. What would be the copyright status of MIT-generated materials that were posted on the Web? What should be done regarding course materials for which MIT was not the rights holder? Would the posting of such materials on the Web be a "fair use" of copyrighted materials which would be a defense against charges of copyright infringement (at least in the United States)? If so, how much material could be posted and still be protected? Would Web posting fall under other educational exceptions to charges of copyright violation? (Faculty have traditionally used copyrighted materials in their classroom teaching without seeking permission; posting materials on the Web as OCW would, however, involve a far broader and more visible distribution and would take place outside of traditional classrooms.)

MIT's leadership strongly supported OCW. But some faculty resisted having their course materials being made available because they would be subject to criticism or appropriation by others. Even though MIT specifically disavowed providing MIT course credit or allowing access to MIT faculty for those using OCW, some MIT alumni feared that their MIT degrees would be cheapened if everyone had access to the same course materials they had used. MIT's exclusivity, doubtless one of the attractive attributes of MIT and its elite competitors, might be threatened. (One OCW supporter was alleged to have said that what OCW really proved was how valuable it was to actually attend MIT.[25])

Out of this first trickle of open courseware has grown a flood. Materials from eighteen hundred (virtually all) MIT courses are now available online.[26] The materials have been translated into multiple languages, making them available to billions of people in their native tongues. In 2005, MIT and other educational institutions formed the OpenCourseWare Consortium. The Consortium now consists of over 200 institutions that have at least 10 courses online and that share common goals to:

- Extend the reach and impact of OpenCourseWare by encouraging the adoption and adaptation of open educational materials around the world;
- Foster the development of additional OpenCourseWare projects; and
- Ensure the long-term sustainability of OpenCourseWare projects by identifying ways to improve effectiveness and reduce costs.

MIT now plans to publish 200 new and updated courses each year.[27] Faculty and alumni at MIT have largely embraced the effort. Most MIT faculty and students make use of OCW and believe it has improved their teaching and learning. MIT faculty have noted that posting their materials online has improved their professional reputations and enhanced MIT's prestige internationally. They welcome suggestions from fellow experts on how to improve the materials they have posted and their new found ability to see more deeply into the courses taught by others. Rather than discouraging them, many successful applicants to MIT point to MIT's role in OCW as among the reasons they matriculated there.[28]

As MIT President Vest foresaw, posting syllabi and course material created a positive feedback loop that has improved MIT offerings. Even the contemplation of posting provides a strong incentive for improving the quality of material that might be posted, although poor materials do not become better simply because they're posted online.

### *MERLOT*

Based on work begun in 1997, the California State University system founded the MERLOT cooperative to provide "a user-centered, searchable collection of peer-reviewed and selected online learning materials, catalogued by registered members and a set of faculty development support services."[29] MERLOT's vision was to be a "premiere online community where faculty, staff, and students from around the world share their learning materials and pedagogy."[30] Now comprised of 16 higher-education systems and 7 leading institutions of higher education that support it, MERLOT's strategic goal is "to improve the effectiveness of teaching and learning by increasing the quantity and quality of peer-reviewed online learning materials that can be easily incorporated into faculty designed courses."[31] Materials can be submitted to MERLOT by any faculty member at the 23 participating institutions.

As with OCW, MERLOT's materials are course and faculty oriented. But MERLOT's mission statement expresses a greater interest in making available the pedagogical aims and techniques underlying the materials. MERLOT explicitly seeks to improve the ability of faculty to teach and use online materials effectively with students who are performing at different levels.

Peer review of contributed materials is an important part of the MERLOT system. Fifteen different discipline-based groups have been organized to provide such reviews. Materials that have been reviewed are identified accordingly.

MERLOT has a broad institutional membership. The membership brings together a wide community of potential contributors and users. MERLOT's extended membership also increases its sustainability since MERLOT is financed by membership fees.

### *Connexions*

Connexions, originally based at Rice University, describes itself as "an environment for collaboratively developing, freely sharing, and rapidly publishing scholarly content on the Web…organized in small modules that are easily connected into larger collections or courses…free to use and reuse."[32] This emphasis on the creation of linkable educational objects rather than courses allows Connexions to minimize the commitment of time and effort required of authors (thereby broadening the potential universe of contributors) and to facilitate rapid adaptation of the educational objects.

Connexions has two goals: "To convey the interconnected nature of knowledge across disciplines, courses and curricula; to move away from a solitary authoring, publishing, and learning process…"[33] Unlike MIT's OCW, which began by providing Web access to versions of traditional course materials, Connexions explicitly seeks to create new materials and tools that will change the way students, teachers, and authors interact.

Also unlike OCW, Connexions' materials are "born digital." They reflect the collaborative and participatory nature of Web 2.0 and are structured in accord with light-weight XML data standards that Connexions has adopted to increase interoperability and adaptability and to prevent materials from being locked into proprietary formats. Connexions is also developing and sharing XML authoring tools to facilitate the production of compatible materials.

Connexions provides an outlet for anyone interested in producing OER. In a striking example, a private piano teacher not affiliated with any college or university posted a 270-page treatise on musical theory on Connexions. Her work has been downloaded more than 7.5 million times.

Rather than using the MIT brand or the peer-review mechanisms utilized by MERLOT, Connexions has taken a different path to help users identify OER that meets their needs. Connexions has invited various scholarly organizations to review and evaluate materials in their own area of expertise, providing what Connexions calls a "LENS." Potential users can choose the LENS of an organization they trust to obtain evaluations of the available OER.

Connexions provides the use of its materials for non-commercial purposes. This limits users who wish to link these materials with materials licensed under different conditions—such as MIT's OCW. The non-commercial limitation may also eliminate certain commercial activities, such as those that have been important for the growth of open-source software, that might provide sustainability for Connexions or other OER activities.

While potentially closing off one source of funding, Connexions has discovered another in an unexpected place. A newly reinvigorated Rice University Press is publishing and selling Connexions materials in hard copy at a price that is a fraction of the cost of conventional college and university texts.[34] Some of its revenue goes to support Connexions. Connexions is also exploring the creation of a network of distributed OER repositories that would reduce the burden on any one institution for hosting, maintaining, upgrading, and distributing OER.

*Open University of Great Britain*

The Open University of Great Britain (OU), an early champion of increasing access to higher education using electronic means, now serves over 200,000 learners using 70 centers.[35] It has, not surprisingly given its heritage, embraced openness for students, materials, and methods.

Because of its open-access policy, OU imposes no entrance requirements for students. Research has shown that many OU learners, who might not have qualified for entrance to more traditional institutions of higher education in the United Kingdom, perform as well as those who had qualifying credentials.[36] Crucial to OU's success is its emphasis on providing support for its learners through tutors and other means; OU is, in fact, rated among the top 10 U.K. institutions of higher education in providing student support.[37]

OU has begun making some of its online courses freely available through its "OpenLearn." OpenLearn now has over 5400 hours of study materials in its "LearningSpace" and 8100 hours of content in "LabSpace;" users can download and remix these materials in whatever ways they choose.

LabSpace is the locus of much of OU's OER related work. It is experimenting with different methods and tools to support OER and has become a virtual laboratory for collaborative educational activities and a locus for studying user experiences with OER.

*Carnegie Mellon University's Open Learning Initiative*

One of the most intriguing efforts to create high-quality materials, including OER, that fully utilize the potential of digital materials to improve teaching and learning is taking place at the Open Learning Initiative (OLI) at Carnegie Mellon University (CMU).[38] Teams of subject matter experts, cognitive scientists, instructional designers, human-computer interface researchers, and other specialists at OLI are collaborating to build OER that have well-defined educational aims, are academically sound, use appropriate pedagogical techniques and digital technologies, and perhaps most important, take full advantage of the capabilities of digital materials to build in continuing assessment, feedback, and support.

Authors of digital materials can embed assessment within the materials, enabling both teachers and users to have richer and more immediate feedback on user performance. The feedback loops can facilitate performance improvements by users as well as teachers, as well as the customization and improvement of the digital materials themselves. They can also provide rich data to the learning-sciences community. Combining 24/7 access with support from human and/or cognitive tutors and embedded assessment and feedback loops, OLI is creating digital materials including OER with the capability to offer academically rigorous, pedagogically sound, individually tailored educational experiences.[39]

This potential for individualized materials may be particularly important for remediation. Many students entering colleges and universities are given standardized tests to determine whether they require remedial work. If so, they are enrolled in non-credit-granting developmental courses rather than courses for college credit. Individualized materials may allow teachers and students to pinpoint specific and more limited remedial needs. They can then begin to address them, focusing on particular skills requiring improvement. This targeted, rifle-shot version of individualized remediation stands in sharp contrast to today's shotgun approach of requiring the completion of developmental experiences—which many students find difficult to navigate and many never complete—before being able to participate in college credit courses.

Building OER as OLI does is neither quick nor inexpensive. There are now 5000 courses available from the OpenCourseware Consortium while OLI has produced only a small number of fully developed courses. But the work at OLI provides a clearer view of OER's long-term potential and the utility of digital media in general, particularly for improved assessment and feedback.

## The State Of OER Today

OER is flourishing. The number of institutions supporting OER development continues to grow. Courses ranging from Utah State's "Lambing and Sheep Management" to MIT's "Relativistic Quantum Field Theory" can be accessed from around the globe. The number of freely available open educational objects is also growing, not only the Web 1.0-like versions of existing courses pioneered by MIT's OCW, but Web 2.0-like courses, curricula, and smaller, modular educational objects available for reuse, remixing, repurposing and redistribution.

There are an increasing number of vehicles being used to make these and other educational materials easier to find and use. YouTube, for example, has created a starting page for higher education, YouTube EDU, with thousands of objects including videos of lectures from the University of California at Berkeley and high-production-value videos of courses that Yale University posted based on their perceived educational effectiveness and their potential global utility for colleges and universities. Educational materials from many different colleges and universities can be found at iTunes University, the university, as Apple describes it, that never sleeps.[40]

With many varied OER initiatives over the last decade, we are learning a good deal about OER. We know that even first-generation OER—existing course materials adapted and posted on the Internet—have had a substantial effect; the use of these materials in colleges and universities around the world is testimony to the value of increased access. The posting of course materials on the Internet—particularly those validated by the academic reputations of institutions such as MIT—allow colleges and universities that cannot economically offer a particular course to do so, extending their reach and allowing them, as Chris Anderson's long-tail theory suggests, to provide niche educational services to small groups that they could not efficiently serve otherwise.[41]

The millions of downloads of OCW by individuals indicate the value that they place on increased access. As Michael Shrage has written, the Internet has created "a paradise for autodidacts."[42] OER is a major attraction in this paradise. (Nearly half of those who access MIT's OCW are self-directed learners.) Individuals using OER can control the pace of their own learning, a particularly valuable attribute given how many potential students must work full time or have other responsibilities that make it difficult to participate in more traditional educational settings.

We have also begun to see the realization of the potential of the next generation of OER. These second-generation OER are, on our continuum of openness, much more open than the first. While both the first and second generations of OER are accessible, the second generation is more responsive, permitting remixing, repurposing, and redistribution. They can be customized, allowing them to be tailored to many different settings and many different skill levels. They can be configured in many different ways for many different platforms, ultimately taking shapes as diverse as printed pages or immersive computer simulations for lab exercises.

Because this next generation of OER doesn't necessarily take the form of courses, the burden of creation can be reduced, encouraging more contributors and potentially leading to the creation of more materials. Because OER are available globally, the sources of potential improvement and new creation are also global, allowing OER to benefit from the world's best knowledge and resources.

Because they are more open, these OER can be more easily revised, increasing the likelihood that they will reflect the state of the art on any given subject, making them particularly attractive for studying fast-changing subjects. This same openness should help reduce the time between the creation of knowledge and its incorporation into teaching materials, and similarly reduce the time lag between the production of teaching materials and their widespread availability.

OER are even now lowering the cost of educational materials.[43] Beyond the free materials on the Web, Connexions' university press initiative is making printed versions of OER available at very low prices. Other groups are acquiring the rights—or receiving the rights from sympathetic authors—to existing texts, so they can be distributed as OER via electronic means at no cost or at lower prices than charged by traditional educational publishers.

Today "individual educators spend heroic amounts of time on planning and preparation, but with enormous

duplication of effort and no economies of scale."[44] OER may help reduce those redundant efforts by making high-quality teaching and learning materials available worldwide for individual teachers to draw upon, increasing the societal return on the creative investment by OER authors.

But we are still very early in the development of OER. In this respect, today's OER is reminiscent of the early days of electronic commerce. As with first generation of e-commerce, the early gains of OER have been important but limited. What passed for e-commerce in its early days were most often existing business processes that were ported to the Web with the Web serving basically as a new distribution channel. It was only when businesses reconsidered and reconstructed what they were actually doing to take advantage of the capabilities of the new technologies that e-commerce became transformational.

It was relatively simple, for example, for a book store to post its inventory on the Web. It was quite a different matter to recognize that a book store could have, unlike a traditional store, a virtually unlimited inventory, and could efficiently serve tiny niche markets that could not be served economically in the physical world. It was a revelation that one could provide sufficient value, as Amazon has done, to entice customers to voluntarily contribute their time and energy to submit reader recommendations that draw in new users while allowing the harvesting of their purchase data to make the site more valuable.

Even given its potential advantages OER is not likely to completely displace traditional materials. Nor are online institutions likely to replace traditional, geographically based colleges and universities. If OER evolves as has electronic commerce, it will coexist with traditional materials, just as totally online educational institutions will coexist with more traditional ones as well as with blended ones using both face-to-face and online education — just as online stores compete with physical ones as well as those that have evolved to use both bricks and clicks.

Perhaps newer, more-entrepreneurial entrants in the world of higher education, like the proposed University of the People, will more quickly and fully embrace greater openness. New or less successful players may be more inclined to discover currently underserved needs and to think creatively about how technology will allow them to be met. As Clayton Christensen points out in the *Innovator's Dilemma*, it may be difficult for more established incumbents to embrace new products enabled by new technologies because they may be perceived as "inferior" to what their customers are used to or want; successful incumbents theoretically may have the status and resources to take more risks but may be reluctant to cannibalize their own products and to embrace new capabilities and change.[45] Whoever leads the way, increasing openness should provide significant opportunities.

## Teaching and Learning Using Open Educational Resources

Open educational resources can most easily be understood as part of a larger movement toward "opening" up education—a movement thoughtfully described in a recent book of the same name edited by Toru Iiyoshi and M.S. Vijay Kumar.[46] Supporters of open education see new technologies as providing an opportunity to fundamentally rethink how we teach and learn using new capabilities and materials. As John Seely Brown put it, "We need to think about how technology, content and knowledge about learning can be creatively combined to enhance education and ignite students' passions, imaginations and desires to participate in constant learning (and sense making) of the world around us. And we need to collect shared, distributed practicums in which experiences are vetted, clustered, commented on, and tried out in a new context."[47]

The "h2o" project at Harvard Law School described the task, in a slightly different but complementary way, as seeking to answer the question of "how to help teachers, unobtrusively but effectively, inspire and lead their students through the use of networked technologies, fostering online intellectual communities with innovative tools that fundamentally differ from existing educational systems."[48]

The very nature of OER suggests changes in teaching and learning. Just as Web 2.0 blurs the lines between producers and consumers, OER blurs the lines between teachers and students. OER's invitation to collaborate and participate is consistent with what we are learning from educational research—that "collaboration and social interaction enhance students' learning experiences as well as the quality and degree of

learning."[49] OER can be student centered as it provides the opportunity to support multiple forms of learning with materials that can be customized and personalized. The potential for effective assessment, feedback, and continuous improvement in digital materials offers the means to determine where the student begins an educational experience and where he or she finishes.

By encouraging student-centered participatory learning, OER offer the opportunity to move away from teacher-controlled, discipline-based transmission of facts and knowledge. Because learners are given greater control and are asked to take more responsibility, they can become more independent. To the extent that they modify the OER, they are engaging in the same kind of learning experience that scholars engage in when building upon earlier work. When OER are created by multiple participants, they can foster the growth of communities to solve problems.

That, at least, is the theory. But does it work? There is, as of today, little hard evidence. If open education is to build support, it must be able to show "concrete evidence of gains in the productivity and efficiency of teaching and learning interactions that are due to open education."[50] As Diane Harley has written, "we all recognize that it is one thing to make high-quality content and tools widely available and another to identify the best strategies for integrating them into a critical mass of meaningful teaching and learning context."[51]

Evaluation of OER is now immature. Too little is known about whether and how well individual educational objects meet the needs of learners and teachers. We know that OER are accessible through billions of connections and have been downloaded millions of times. But we know too little about who the users are, how they locate and choose what they download, what they do with the materials, and what the impact is from what they use. We don't know what works, what doesn't work, and why.

Most evidence is anecdotal. Some early experiments at the Open Learning Initiative at Carnegie Mellon University, for example, suggest the potential to change higher education significantly. Researchers compared the impact of traditional lecture courses judged to be excellent with newly created computer-mediated educational materials that use embedded assessments, feedback loops, and cognitive tutors.[52] The experiments showed that while good lectures and good computer-mediated learning may be equally *effective*, 24/7 electronic access is more *efficient* due to the flexibility it offers. The research showed that 24/7 electronic access to computer-mediated materials allowed students to match the learning outcomes of those in traditional courses while taking only half the time to complete the courses. If the use of digital materials enables us to dramatically shorten the time needed to master a subject and match the learning outcomes of using traditional materials (while reducing the associated costs) it would be very significant.

*Washington Post* columnist Steven Pearlstein has noted the increased productivity experienced by teachers employing high-quality computer-mediated materials.[53] They can spend less time grading assignments—that's done automatically—and more time preparing for their classes; they can see the difficulties that students encounter with the material as well as individual performance issues and spend more effort addressing these problems.

Unfortunately methods of learning what works educationally—in the physical world as well as in cyberspace—and the methods of sharing that learning are not generally effective. Information about teaching and learning in higher education is often tacit, hard to capture and formalize, and difficult to disseminate and implement. Most faculty members are expert in their own disciplines, but not expert in what makes for effective teaching. Many institutions of higher education do not place a sufficiently high priority on helping faculty to improve their teaching.

We need to learn more about how to build in and take advantage of the capabilities of digital materials, OER or not, just as we need to systematically evaluate the comparative effectiveness of digital materials versus traditional learning materials and processes.

***Recommendations***

Governments should:

- Fund research on the comparative effectiveness of digital educational materials, including OER, and conventional materials.

# CHAPTER 3. ISSUES SURROUNDING OPEN EDUCATIONAL RESOURCES

We have reviewed the history of OER to show its evolution and potential benefits. But there are issues that need to be successfully addressed if OER is to have a significant impact on improving educational outcomes.

## Issue: How should OER be defined?

Although many definitions of OER exist, the salient characteristics are that OER are digital, free, available anytime and anywhere, and can be modified, repurposed and redistributed without restriction. Under this definition, free samples of otherwise restricted materials would not be considered OER. Providing access to a limited group would not transform otherwise restricted materials into OER.

These characteristics put OER at the openness end of the openness continuum. But should individuals and institutions that favor greater openness support materials that fall short of this definition?

This question may not be important to everyone. But the intensity of the arguments that took place, and continue to take place, over the definition of "open-source software" or "free" or "libre" software suggest that supporters of openness should avoid acrimonious debates about how to define OER. They should recognize that there are many different ways by which we can move in the direction of greater openness, some more far reaching than others.

There may be instances, for example, where materials designed to be OER have been carefully crafted and evaluated and are then fixed, rendered unmodifiable, for some period of time or for a particular geography in order to ensure the quality of the materials. We might not want to discourage the use of such materials just because they do not satisfy all the characteristics of OER. Similarly there might be materials that otherwise have the characteristics of OER for which a very low fee is charged. If that fee were critical to sustaining the efforts to create more open materials there is a reasonable argument for supporting it. In other circumstances, there might be good reasons for allowing some restrictions on access—such as limiting the number of people having access—if such limits are necessary to persuade rights holders to make a larger amount of existing closed materials more broadly available.

## Issue: The Perils of a Supply-Side Focus

Much of the attention regarding OER has focused on the supply side—on the materials and on those who create, host, and distribute them. It is easy to understand this supply-side focus; when OER didn't exist, those who supported the concept were focused on how to create it.

Eventually this supply-side strategy of "build it and they will come" needs to be replaced by a strategy based on a more sophisticated understanding of users. OER that is not demand driven is unlikely to have a substantial impact or to be sustainable over time.

At present, we have relatively little understanding of what potential OER users want and need, and how they use, or would like to use, OER. We know far too little about how potential users search for OER, how they come to a particular site, how they choose among OER, how they are modifying OER, or how they are affected by their use of OER. Unless these basic questions can be answered, there is a relatively high likelihood that a substantial amount of OER that is produced will be used little, if at all.[54]

One of the difficulties in addressing these questions is that the demand side is so varied. Learners, formal or informal, vary in capabilities, resources, experiences, and aspirations. Different geographical settings may require different educational platforms, different forms of display, different technical capabilities, and different cultural orientations.

## Issue: Locating and Evaluating OER

A recent UNESCO report confirms that there are important gaps in promotion, awareness, and capacity building for both users and creators of OER in those areas of the world that can benefit most.[55] It is important to determine the most effective ways to help potential users learn about OER and make informed decisions regarding OER use.

One starting point might be the click-stream data that is available to each OER repository—the record of the path a user follows through a site hosting the OER. This can be mined in a manner that protects the privacy interests of users while still providing useful data about both users and their behaviors. A pooling of data from many sites, with appropriate privacy protections, should produce richer insights than would be available from any one site.

How do potential users of OER evaluate and choose from the increasing amount of available OER?

One of the difficulties that potential users face in evaluating OER results from the malleability of OER—one of its most attractive characteristics. Although one version of a particular educational object may have been subject to rigorous testing and evaluation, because it is open it can be modified by anyone. While we might be confident in Release 1.0, should we be equally confident about Release 1.1, the modified and re-contributed version? Not only is there the challenge of keeping track of changes in the various versions, but, in theory, one would need to test and evaluate each new version. Just as in open-source software, not all changes in the OER are for the better. Will changes in OER require continuous re-evaluation? If so the challenge could be overwhelming.

A second difficulty in evaluating OER, and one that keeps getting larger, is the sheer volume of OER. One can't imagine reviewing and evaluating even single versions of each individual resource.

The question of quality will remain as long as users have choices in OER. Not all educational materials are born equal. Not all changes are improvements. OER advocates need to focus on ways to improve the means of evaluating OER quality, given that, unlike proprietary materials, there is no one to point to who is in charge of "quality control."

Some possible solutions are being tried to address the issue of how to evaluate OER. One is "crowd sourcing," providing some form of user-based reputational rating system for OER. Another, suggested by Connexions, is to allow third parties to evaluate OER with potential users being able to choose an OER based on an evaluation by an intermediary they trust.[56] But this solution, or the peer-review system utilized by MERLOT, may not scale up to handle the volume of OER, particularly if different versions are in different languages or reflect different cultural sensitivities. (As OER is inherently global, what works in one area may be inappropriate or ineffective in another.)

Over time, "branding" may come to play a more important role in a user's choice of OER. Just as the "MIT brand" provided instant global legitimacy for MIT's OCW, some OER may be branded by institutions, consortia, third-party experts, etc. But it takes time and effort to develop a brand that is seen to be a reliable indicator of quality. Will there be sufficient incentives for individuals and organizations to justify the effort if OER is free?

There is no complete substitute for rigorous evaluation of the effectiveness of an OER. An added complication is the fact that, in some cases, such as in healthcare education which can lead to a governmentally recognized credential, governmental review and approval is likely to be required.

## Issue: The OER Landscape and the Need for Coordination

There are an increasing number of suppliers of OER, but many of them do not know of, or engage with, each other. The OER community and the open education community as a whole are highly decentralized. There are powerful innovative advantages of decentralized systems that "let a thousand flowers bloom." But there may well be circumstances in which a more systematic structure to support coordination and collaboration would be helpful.

An improved understanding of the supply-side landscape would facilitate sharing of information and should reduce unnecessary and duplicative efforts. Identifying curricular gaps or determining the priorities of audiences to be addressed or materials to be developed might be easier with improved coordination.

Some coordination in what would amount to joint marketing and some sharing of data would be useful to raise awareness and ease discovery. If standards are required to facilitate interoperability and ease of use, some coordinating mechanism may be necessary.

This doesn't mean that different individuals and groups should not follow different paths—such differences are the basis for innovation in any open, decentralized system, and there is more than enough work to do. But collaborative and coordinated efforts directed at shared goals can, under the right conditions, be more effective than disjointed and disconnected ones.

## Issue: Incentives for Participation in OER Creation and Development

If the growth of OER is to be encouraged, it will be important to understand the incentives (or disincentives) for the various players. These include faculty, students, and others who might create OER, and institutions that can encourage (or discourage) OER creation and use.

Many creators of OER, as in the open-source software world, are sustained by their sense of contributing to a community or cause that is important to them. Some academic contributors may believe that creating OER will enhance their reputations within their fields, leading to more successful academic careers. If the goal is to increase the number of faculty OER creators, positive incentives for faculty are likely to be needed to overcome the academic community's tendency to reward research as opposed to activities related to teaching. Faculty who expect to obtain substantial financial rewards from the publication of their own proprietary materials are particularly unlikely to create OER without strong incentives to participate.

Institutions can provide incentives for creating and using OER by acknowledging the value of such activities when engaging in traditional forms of academic recognition—via grants, reduced teaching loads or released time, promotion and advancement etc. If such incentives could persuade faculty members just to share their own existing teaching materials as OER, the amount and breadth of OER would quickly and effectively be expanded.

MIT's OCW program addressed a disincentive for faculty to make their materials available by providing extensive support for turning existing materials into Web-ready ones, reducing the time commitment required by faculty to a handful of hours. The move toward smaller, more modular OER also reduces the burden on creators, which might encourage contributions by those unwilling or unable to make major commitments of time and effort.

The difficulty of broadening the involvement of today's faculty members is compounded because many faculty members are "digital immigrants." If an institution is committed to greater openness through the creation and use of OER, it might provide training for faculty who see themselves as lacking the skills to be able to do so. Such support, including training, is clearly applicable to online education in general.

Students, as digital natives, are potentially important contributors to the growth of OER. Student participation in creating, polishing, or refreshing OER, or in creating associated materials such as exercises, can be increased, as shown at Utah State, by providing course credits or making the OER part of the student's portfolio.[57] Using students to maintain OER may be particularly important as the attraction for faculty of "just" maintaining OER is likely to be low, just as the task of maintaining open-source software rarely draws in the "alpha geeks."

Obviously institutions will not provide incentives to support OER unless they believe that OER is of value to them. Some examples of institutional benefits already exist. MIT research shows that its own OpenCourseware initiative has led students to choose to enroll there, and has improved teaching by the MIT faculty.[58] Both MIT as an institution and MIT faculty members have achieved significant reputational gains.

On the other hand, the costs of supporting OER, at least in the form of creating and posting materials on the Web *a la* MIT, are substantial and pose a challenge in the present economic situation. Costs are declining due to the creation and sharing of tools by early OER supporters and learning-curve effects; it is estimated that the production and posting of such materials might cost $10,000 to $15,000 a course. With video, costs could double to as much as $30,000.[59] The costs of producing materials using teams of experts such as at CMU, or requiring high-quality production values, such as at Yale, are likely to run much higher.

It may be harder for institutions with fewer resources than MIT to justify these costs in the present tough economic times.

*Recommendations*

Schools and universities should:

- Consider posting selected course materials on the Web and opening them for reuse, remixing, repurposing, and redistribution.
- Encourage the production and use of high-quality, academically rigorous and pedagogically sound OER by faculty by acknowledging the value of these activities through the traditional means of academic recognition including funding, research support, advancement, released time, etc.
- Provide support, including training, to faculty members interested in producing OER or teaching online.
- Encourage student involvement in the creation, maintenance, and upgrading of OER through academic credit where appropriate.

## Issue: Government Support for OER

Is there a role for governments in fostering OER? There might be if governments conclude that OER can assist in lowering the costs and improving the quality of educational materials and extending higher education to those currently underserved. A useful first step would be for governments to increase support for research on the effectiveness of various forms of educational materials and practices including the comparative effectiveness of digital materials such as OER and of more traditional materials. Governments could also increase access to governmentally generated information, information provided to the government, and the results of governmentally funded research, to improve OER without intellectual property restrictions.

A more direct means would be for governments to fund the creation of educational materials that would be made available as OER; President Obama has, in fact, proposed a limited amount of funding for educational materials that could be made freely available. Governments at all levels around the world today spend considerable amounts, directly or indirectly, on proprietary materials for education. Some of these funds could be re-targeted to support the creation, maintenance, and distribution of OER. This obviously raises difficult issues about the appropriate role of governments and private parties essentially competing in the market for educational materials although, as in open source software, commercial vendors could make use of OER in their own products or could build commercial activities upon OER.

Direct support might be particularly appropriate in fields where there are not already an abundance of materials and where the lack of materials might hamper specific governmental initiatives. Present examples might include subjects such as installing solar energy equipment, maintaining wind turbines, or providing health IT services where the lack of sufficiently trained personnel would frustrate the achievement of already funded governmental objectives.

Governments could also authorize the use of OER in the curricula of accredited institutions, as the state of Florida has recently done.[60] Governments could use their procurement activities to encourage the development and availability of OER or to increase the openness of proprietary materials. Governments could also increase incentives for those who might create OER by recognizing creation of OER when making decisions about the recipients of governmental grants and awards.

*Recommendations*

Governments should:

- Allow open educational materials to be accredited for use in college and university curricula and ensure that institutional accreditation activities do not unreasonably discriminate against the use of OER.
- Support the creation of OER in areas that lack an abundance of materials and where the lack of materials hampers specific governmental initiatives.
- Encourage the World Bank to support the creation, evaluation and distribution of open educational materials in support of World Bank initiatives.
- Encourage the creation of high quality OER by taking into account such activities when recognizing achievements such as when providing grants etc.

- Utilize their procurement powers to encourage the development of OER and to increase the openness of proprietary materials.

## Issue: Intellectual Property Rights and OER Development

One of the most significant barriers to OER development on the practical level is the need to obtain permission from the holders of the relevant intellectual property rights to make existing materials freely, or more broadly, available. The cost and effort required to get such permission, to "clear the rights," have bogged down many OER initiatives. Clearing the necessary rights from rights holders (who are sometimes hard to identify and locate and who may be reluctant to agree to provide greater access) constitutes a significant cost in OER development.

There are ample reasons for the existence of intellectual property rights and we do not support their elimination. Our earlier reports, in fact, describe the incentives they provide for innovation. No one should try, and no one should be able, to build a robust OER movement by ignoring rightful intellectual property claims. But if OER growth depends in some substantial measure on using, or customizing, existing material, some less-expensive and less time-consuming mechanism for rights clearance must be devised. (Obviously, if more creators conceive their works as shareable at the time of creation, if more materials are "born open," this problem becomes far less constraining.)

One way to cut through the clearance barrier is to purchase the necessary rights. The Maxfield Foundation, for example, has done this for a popular statistics text which is now being made available by Connexions.[61] Although effective on a small scale, this path is likely to be too expensive to pursue in the long run, given the breadth of materials that would be useful for successful OER development.

Alternatively, and less costly, institutions of higher education may be able to encourage rights holders to reduce the barriers to using existing proprietary materials in OER. Advocacy by leading research universities for more flexibility on the part of rights holders might be particularly persuasive given that it is the faculty of these institutions who often create and review—and cause libraries and students to buy—materials used by students and teachers at colleges and universities. It might be possible to persuade those who hold the rights to donate rights (or to charge a lower license fee or impose less-restrictive terms) for materials targeted at less-affluent markets, much as some software companies have dramatically lowered licensing fees in China.

Rights holders might have a stronger incentive to contribute if they anticipate reputational gains from their donations or if they conclude that making proprietary materials more freely available can, perhaps counter-intuitively, lead to greater sales. Music studios have traditionally provided free copies of music to radio stations with the expectation that the station's airplay served as cost-effective advertising. There is an increasing amount of evidence that making proprietary materials freely available on the Web has, in many cases, increased, or at least not decreased, actual physical sales.[62] Rights holders may also be willing to take steps to increase accessibility if they believe that their real long-term choice is between doing so (and accepting lower margins and profits) or being displaced entirely in the higher education ecosystem by free or less expensive high-quality materials.

More importantly, we believe that a recognition of the value of sharing as demonstrated by OER and elsewhere should lead to a recalibration of today's legal balance between the rights of creators and the rights of users who may serve as follow-on innovators. We reached a similar conclusion in our study of open-source software, *Open Standards, Open Source, and Open Innovation*. We continue to believe that it would be timely to review the relationship between the rights of creators, designed to provide incentives for innovation, and the rights of users whose follow-on innovation can be accelerated by a quicker and broader diffusion of knowledge.

Over the last 15 years, the law has shifted the balance in favor of rights holders, often but not always the creator. The development of the Internet and the digitization of information, however, have shifted the technical balance toward the user via increased access and control. Given that shift, it is not surprising that some rights holders have pushed vigorously for even greater legal protections of their works and for stricter government enforcement of those rights. But greater legal protection for the first creator comes at a cost.

Expanding the rights of first innovators leaves less room for follow-on innovation by users, leading to its underproduction.

The complexity of the issues and the difficulty of finding the right balance can be seen in a recent case involving Amazon's electronic book reader, the Kindle—which is being tested by a number of colleges and universities as a vehicle for accessing e-textbooks. The Kindle was built with the capacity to convert text into speech. Some rights holders of books available on the Kindle successfully objected to the use of this feature arguing that it would constitute a violation of copyright law without additional payments to them and their explicit permission. Whatever the legal merits, it illustrates the impact of copyright law on the development and diffusion of a valuable technological capacity and the tension between rights holders and users (such as the blind and the visually impaired) who were deprived of a new means to access previously unavailable works.[*]

***Recommendations***

Governments should:

- Review, reconsider, and redraw intellectual property rules, recognizing the increasing importance for innovation of users who contribute follow-on innovation.

Colleges and universities should:

- Work with rights holders to provide more open materials and to donate their intellectual property rights for the purposes of the production of open educational materials to be used for non-commercial educational purposes.

## Issue: "Fair Use" and Educational Exceptions

The United States, unlike many other countries, has a robust "fair use" regime which has the effect of allowing the use of portions of copyrighted materials without the use being considered copyright infringement. Unfortunately for creators and users of OER, what legally constitutes fair use can only be determined in a specific context.

The United States has other exceptions from copyright liability for use of copyrighted materials for non-commercial educational purposes, but these were created primarily to deal with the use of copyrighted material in traditional classrooms. Other countries, such as India, have systems that provide exceptions from copyright liability more favorable for educational uses than those in the United States—but the lack of global consistency may inhibit the growth of OER.

A number of efforts are being made to address the issues around fair use and educational exceptions. Legislation has been introduced to ease access to and use of so-called orphan works—those works which are under copyright but out of print and where the rights holder cannot be located to ask for permission to use his or her work.[63] MIT has worked with the publisher Elsevier to establish a more straightforward and operationally simple definition of fair use so as to ease rights clearance for MIT's OCW; Elsevier now provides blanket clearance for up to three tables and 100 words per article for thousands of Elsevier's articles.[64] (OER advocates worry that such an agreement may set an unnecessarily restrictive ceiling on educational fair use.)

[*] This is especially ironic given the development in the World Intellectual Property Organization of a proposed treaty which would provide exceptions to copyright enforcement for the world's 45 million blind and visually impaired. The fact that the particular provision of the copyright act which was invoked by the rights holders might be read to call into question the right of a parent to read *Good Night Moon* to a child at bedtime only increases the complexity of the story. In another example of the potential extraordinary reach of the copyright laws, the use of ringtones by cell phone users in public has been alleged to violate copyright while the cell phone service providers who were paid for the downloading of the ringtones are alleged to be guilty of contributory copyright infringement.

Based on what we have seen in higher education, and in particular in the development of OER, we believe that copyright law should give increased weight to the rights of non-commercial educational users. Copyright law should not treat non-commercial educational uses in the same way as commercial uses. Nor should any exceptions from copyright for non-commercial educational uses be restricted to traditional classrooms when the Internet has created a global classroom.

*Recommendations*

Governments should:

- Extend permissible uses of copyrighted materials under the educational exceptions for non-commercial educational use beyond traditional classrooms.
- Review the broader question of exceptions for non-commercial educational purposes in light of developments regarding open educational resources.

## Issue: Intellectual Property Licenses for OER

Given the present state of intellectual property law, how should OER itself be licensed? One of the most important recent developments in the realm of intellectual property law has been the emergence of Creative Commons (CC).[65] In a very short time this organization has constructed an open and user-friendly copyright regime for creative works. CC licenses allow creators new flexibility in exercising a wide range of protections and permissions for their works—including opening up their work completely or doing so but requiring attribution for the original creator. Creative Commons also has created a consistent and machine-readable mechanism to identify the copyright status of educational objects online and is supporting the development of an electronic system for rights clearing.

The use of Creative Commons licenses has grown dramatically. Hundreds of millions of documents, including CED and DCC reports, now bear Creative Commons licenses.

But the flexibility of the various Creative Commons licenses has its own costs. They do not always map exactly to the intellectual property licenses employed by some OER supporters, causing interoperability problems that limit mixing and matching from or between, for instance, MIT's OCW and Connexions. Their "attribution" provisions may pose difficulties in dealing with large databases. Their "no derivatives" alternative may be so restrictive as to be impractical. Their "share alike" model poses difficulties for commercial publishers and their "non-commercial use" label may be difficult to define in different contexts.

Creative Commons has been working diligently on these problems.[66] It recognizes the need for the standardization of licenses and the importance of building an appropriately open regime for databases. It has been able to negotiate solutions to some interoperability issues, although this is a long and tedious process. CC has established ccLearn to promote open access to educational resources, find ways to expand the use of creative commons licensing in education, and conduct empirical studies of the effectiveness of open access for educational purposes.

*Recommendations*

Colleges and universities should:

- Encourage the use of Creative Commons licenses by their faculty.

## Issue: Standards and Interoperability

Just as the lack of standardized intellectual property licenses for OER has impeded the free exchange of OER, the lack of standardization among other aspects of OER has increased the difficulty of identifying, locating, and utilizing it.

The rationale for, and the creation of, the JAVA software programming language may suggest at least a hypothetical path of action to overcome the lack of standardization. JAVA was created to allow programmers to write computer code once that would run properly on any platform—write once, run everywhere—eliminating the need to recode for various platforms. For OER, this analogy suggests three goals.

One would seek to create OER that would, like JAVA, run properly on desktops, laptops, new mobile devices etc.—create once, run on everything. Another goal would be to create OER that could be effectively displayed in many media, including print—create once, display everywhere. A final goal would be to have

standards that facilitate linkages among repositories of OER so that OER created once could be automatically available at all the OER repositories—create once, appear everywhere.

Some level of standardization would also promote easier discovery and use of OER. If search processes and metadata describing educational objects were standardized, search should be easier. OER use would also be facilitated if a potential user didn't have to learn new instructions or procedures for each educational object encountered.

Standardization has the advantage of reducing transaction costs but, like openness, standardization is not without difficulties.

Getting standardization right is not easy. As any respectable two-handed economist would say, adoption of a standard too early freezes innovation in the standardized area, while adoption too late inhibits broad scale adoption of the standard. Standardization may result in higher costs for the creation of standardized materials, which would tend to reduce OER production, but that potential decrease must be weighed against the increased accessibility that standardization could bring.

## Issue: Learning about Co-Creation

OER materials are, because of their re-mixable nature, much more likely to be products of co-creation than traditional proprietary materials. But we need to know more about how co-creation works over distance and time and in different environments, cultures, and contexts to produce materials appropriate for different audiences operating in different technological environments. Given the growing recognition of the importance of collaboration in today's world it is surprising that collaboration itself is not the subject of more extensive study. (There is a well-developed body of business literature on how to successfully build and operate teams.)

It would be useful to extract best practices for co-creation from various OER production experiences. We do know that successful collaboration requires clear understandings among the parties, participation by relevant parties in planning and implementation, recognition of mutual benefits, and a shared sense of ownership. Operational clarity—clear assignments of responsibility, clear and measurable deliverables, and clear delivery dates—is also needed. We are fortunate to have, in the actual production of OER, a laboratory to further develop principles and best practices for co-creation and the growth of communities of practice. LabSpace at the Open University is engaged in such studies; it would be a great loss if the OER community as a whole fails to take advantage of the opportunity.[67]

*Recommendation*

Governments should:

- Fund research on barriers to collaboration and best practices regarding collaboration.

## Issue: Sustainability

The OER movement owes its existence, in large part, to the dedication of those who have voluntarily created and contributed materials, the enlightened support of a small number of educational institutions, and the vision of several private foundations. Whether the OER movement is sustainable over the long term without substantial direct support remains a critical issue.

We will watch with great interest the efforts to find business models that could sustain the creation, distribution, and maintenance of OER. The task of supporting "free" goods has been confronted in other areas. New business models have emerged to support freely available open-access electronic journals, some of which have already become profitable. A variety of business models have grown up around open-source software, a product that is also freely available to all.[68] A new book by Chris Anderson even argues that the future of business is "free" and describes fifty business models for "free" goods.[69]

The open-source software movement is supported by some of the largest corporations in the world. IBM, for example, spends an estimated $100 million dollars a year to develop open-source LINUX software and makes software available to the LINUX community.[70] IBM does this for multiple reasons including its strategic positioning *vis-à-vis* other firms in the ICT marketplace. Is there an analog for such corporate support for OER? Are there similar situations where providers of proprietary materials, now opposing OER, might be encouraged to support it?

Is it possible to obtain support for OER development from firms that might build commercial activities around OER? In the open-source software world Red Hat, a for-profit firm that provides support for LINUX development, makes money by providing consulting services and products that enhance and extend the use of LINUX, which is available for free. Could similar support for OER be generated from similar commercial activities?

Possible sources of sustainable support for OER include:

- Fees for providing customized learning materials to corporate clients.
- Fees for training and support for institutional users of OER.
- Revenues from the sale of print-on-demand paper copies of OER such as by Rice University Press.
- Subscriptions.
- Direct government support of OER as a public good, perhaps, as one observer called for, via a Third Morrill Act, named after the 1862 legislation that laid the foundation for the land grant college system.
- Direct support of OER by colleges and universities that use OER to broaden their own course offerings.

## Issue: E-Spaces and E-Portfolios

Digital natives are increasingly using digital media to fulfill educational assignments and to exercise their own creativity. Colleges and universities can and should help students master these tools. But these tools present new challenges.

Traditionally it was the province of those in arts education to create spaces where students could demonstrate their accomplishments in painting, sculpture, video, or film production. Students of creative writing or dance majors might require performance places for whenever they were able to enlist friends to give life to a play or a piece of choreography. But most student work generated paper-and-ink products. There was little need to find new spaces in which to create or new vehicles for display.

Students from all disciplines are now finding new ways of mixing and matching different digitized modes of creating, processing and displaying information in multiple forms. Colleges and universities will need to create new digital spaces in which students can learn to exercise their digital skills; these places, if accessible, could make student work available globally.

Similarly, colleges and universities in the past have been able to preserve student work simply by adding space in the library. But what is to be done with students' new digital creations?

The use of e-portfolios, repositories into which a student would place digital work, in draft version or final or both, has been growing recently. E-portfolios allow faculty to more easily follow and assess the development of a student's work and let students keep a more systematic record of what they have been doing, both for credit and on their own. A student could provide e-portfolio access to graduate and professional schools or to prospective employers. His or her e-portfolio could even be kept available for new deposits after leaving the institution, a personal electronic archive whose very existence would strengthen the link between the student and *alma mater*.

There are obviously many operational questions regarding e-portfolios that need to be addressed. Who has control, who has access, how much storage is available, and for how long, what can be stored, who would bear the cost, how could security and privacy be protected, etc.? We have all tried to find a way to preserve work that is important to us; new technologies now allow us to create a more capable digital equivalent to the trunk in the attic.

### *Recommendations*

Colleges and universities should:

- Establish e-portfolios into which students can deposit their work while attending the institution and utilize them for improving assessments of learning outcomes and for demonstrating accomplishments to potential employers etc.
- Consider making such e-portfolios available for students to use after they leave the institution.
- Develop digital display areas for student and faculty work.

## Issue: The Open Syllabus

In a world in which whole courses, including videos of lectures, are being put online, it is hard to imagine that course syllabi are not continuously available electronically at all institutions of higher education. That openness should be the default condition for syllabi should be self evident in this environment, although individual faculty members should be allowed to opt out for their own courses.

*Recommendation*

Colleges and universities should:

- Make course syllabi available electronically 24/7 allowing faculty members to opt out of the requirement with regard to their own courses.

# CHAPTER 4. COMMUNITY COLLEGES

Roughly half the undergraduate students in higher education in the United States attend community colleges.[71] Their enrollments are increasing three times as fast as those at four-year colleges; four-year colleges receive three times the federal expenditures per student. Community colleges receive neither a commensurate share of the public resources invested in higher education nor appropriate recognition for the key role they play in the U.S. higher education system. They are, as President Obama stated, "an undervalued asset in our country."[72]

## The Challenges

If the United States is to dramatically raise the percentage of those who successfully complete at least a year of post-secondary education and to have, as President Obama has proposed, the highest proportion of college graduates in the world by 2020, we will have to rely on community colleges. If we are to double the percentage of low-income, 16- to 26-year olds receiving some form of post-secondary educational credential by 2020 (the object of a major program recently initiated by the Gates Foundation), or increase to 60 percent the percentage of students receiving high-quality degrees by 2025 (the goal of the Lumina Foundation), community colleges will have to play a central role.[73] If we are to improve the skills of the reportedly 60 percent of high-school graduates requiring remediation before they can do college-level work, we will need to make major improvements not only in high schools but in community colleges as well. If we are to educate our workforce to bolster U.S. competitiveness in a global economy, if we are to retrain workers seeking to reenter the workforce, if we are to accommodate qualified students priced out of higher-cost institutions, we must give community colleges the resources, recognition and support they need to improve.

Community colleges serve a much broader student population than do four-year colleges and universities. With a history of open access, they provide a point of entry to higher education for students who often are the first in their families to attend college and who may well lack the familial or societal support structures that help others navigate the often slippery path to, and through, college. They enroll students who lack the academic qualifications or the preparation to begin their higher education at four-year institutions and provide some remediation for a majority of their students. Students who are qualified and who would otherwise attend four-year colleges are increasingly applying to community colleges while students who now attend four-year colleges are "reverse transferring" to community colleges, because of the enormous differential in costs; tuitions in community colleges are roughly one-half of those of four-year public institutions and one-tenth of the cost of private colleges and universities.[74]

Students of all ages enroll in community colleges to gain basic skills and obtain certificates that will improve their job prospects in good times—even more so when times are hard. Older students, sometimes newly unemployed, seek to improve their work skills or to be retrained for work in a new field. At the same time community colleges are providing opportunities for continuing education and life-long learning to older Americans; 84 percent of community colleges have programs for students over 50 years old.

Community college students differ in other ways from those in four-year institutions. More are older. More are economically disadvantaged. More are minorities. More have families to support. Roughly twice the percentage of community-college students work full time and can only attend on a part-time basis.[75]

Community colleges today are attempting to accomplish their multiple missions as applications for admission and financial aid are rising and direct state support is falling. Over much of the last decade federal aid to community colleges also declined.

The following sections do not constitute a comprehensive examination of community colleges. They provide a brief look at public community colleges through the "lens" of openness.

We believe that greater openness can help community colleges succeed. Even small gains from increased openness could have outsized impacts because of the large percentage of students in higher education that they now serve.

## The Inevitability of an Increase in Online Education

We do not equate online education with openness. But we see no practical way by which community colleges can accomplish their various missions without a substantial increase in online education, which is more accessible and more responsive—and thus more open—than traditional offerings. Some states are already planning for this; Minnesota, for example, is preparing to increase the percentage of credits earned online in the state system from approximately nine percent to over 25 percent by the year 2015.[76]

There is increasing evidence that this move to increase the use of online education can lead to improved educational outcomes. A recent meta analysis of existing comparative studies published by the U.S. Department of Education indicated that online education produced better results than traditional education; the report found blended systems, hybrids involving both face to face and online education, did even better.[77]

There are many different permutations in which the two can be combined. The right mix depends on the particular educational goals. But as we noted, good online education is not the result of simply digitizing existing materials—putting old wine in new digital containers. Materials should take advantage of the characteristics of the new media. Nor is online education necessarily far cheaper than face to face education. It is possible to reach more students and to reduce the cost per student but to achieve the real potential of online education, separately or in conjunction with traditional education, requires considerable planning and investment.

### *Openness and Support*

The importance of support for students at community colleges is even greater than at other institutions of higher education. Many entering students are unprepared academically; many lack the skills and habits necessary to be successful. Many are unfamiliar with the responsibilities that they will have in various classes, and do not fully understand the various courses of study open to them. They may feel little connection with the faculty or their student peers because they work full time.[78] The demands of employment, often combined with significant family responsibilities, make scheduling and attending classes or meeting with counselors a challenge. Even getting to campus became prohibitively expensive for some students during the recent spike in gas prices.[79]

A Lumina Foundation study found that an overwhelming majority of students at risk did not understand what they needed to do and did not get help—one of the contributing causes of the disappointingly low retention and graduation rates.[80] Helping students to better understand what they need to do—to gain admittance, qualify for financial aid, fulfill developmental requirements, succeed in class, complete a course of study required for a credential, satisfy transfer requirements—is critical. We cannot rely on face-to-face meetings between individual students and counselors to accomplish this given the existing high ratio of students to counselors—in some cases 1000 students per counselor.

Making necessary information comprehensible and accessible online 24/7 seems to be a logical and practical partial response to the problem. While this challenge could be left to each state or to each community college, there would seem to be a strong argument for providing federal funding for the centralized production of appropriate educational materials—potentially OER—that could be customized locally for use in community colleges and high schools. One obvious area is that of financial aid where federal grants and loans are particularly important and where even the best educated students and families can become confused.

Providing effective counseling is a problem for almost all educational institutions; no one counselor can know everything necessary to advise each student. In the Web 2.0 world, when an individual's knowledge is limited, we can tap into the wisdom of the crowd. Peer-to-peer online counseling might provide an opportunity

for students to share sometimes painfully gained insights about choosing courses and navigating the path to a credential or degree, and might help students without strong family or social support systems to feel more a part of their educational community.

High-quality online navigational materials and online peer-to-peer counseling should complement rather than replace professional counseling. But the availability of online resources, including the ability to access records and fill out forms online and be notified automatically as to requirements that must be fulfilled, should let counselors, at the institution or in outside support groups, target limited resources on higher-value interventions.[81]

Beyond counseling, access to high-quality online educational support materials 24/7 should help. Technology also facilitates online tutoring, a key component of educational efforts in the military and other distance education efforts. Such tutoring, available at times convenient for time-challenged students, is likely to make a positive contribution to student success. Sharing notes online is yet another way the Internet enables an application with both positive and negative potential.[82]

Another more open mechanism might improve the utility of an individual's educational records, now not routinely available to the student. In the healthcare arena there is a burgeoning interest in electronic personal health records (PHRs) that individuals can use to save vital information, record events or conditions, or store medical advice. An analogous personal educational record (PER), with appropriate security and privacy protections, might allow a student to keep track of requirements and progress as he or she attempts to continue on the path to a credential or degree.

The need for support for faculty is often overlooked. Many faculty members would benefit from help in preparing materials that take full advantage of the capabilities of different media. Foothills-De Anza Community College and affiliated community colleges, for example, have built a series of tools called Etude for putting courses online and work closely with faculty so that their online work achieves their academic and pedagogical goals.[83] The 50-member Etude consortium also supports research on improving online education.

*Recommendations*

Governments should:

- Fund the creation and distribution of online materials, such as materials aimed at potential applicants for federal financial assistance.

Colleges and universities should:

- Increase the use of online means of providing counseling and tutoring including student peer-to-peer efforts.
- Provide online access to records and automatic notifications to students about requirements that need to be fulfilled (from unfiled forms to faculty approvals, etc.).
- Consider utilizing personal educational records as components of expanded student support.
- Increase training and support for faculty in the area of online education.

## Openness and Data Availability

Increasing access to information about students and their progress—or lack of it—is a natural goal for proponents of increased openness. But in the realm of higher education there is relatively little information to be accessed. As the Lumina Foundation found "in most states it is difficult or impossible to calculate accurate graduation rates, track students from K-12 education into higher education or from higher education into the workforce, determine the relationship between spending and results or say anything at all about what students are learning in post-secondary education."[84] This lack of information on student progress and learning outcomes makes it impossible to judge the effectiveness of any particular educational activities or of the institutions themselves.

To some extent the lack of this information should not be surprising. There were few incentives to gather it because many community colleges were funded based on their enrollments rather than on achieving successful student outcomes. Using this funding mechanism encouraged community colleges to maintain or increase the number of enrolled students—to keep the stream of students coming in the front door to fill the seats vacated by those who leave, whether through the front door at graduation or out the back by dropping

out. If enrollments were steady or increasing there were few incentives to establish learning objectives and measure progress toward meeting them or to determine the effectiveness of various modes of teaching.

This lack of data is now receiving increased attention. The Gates Foundation is working with the National Student Clearinghouse to improve nationwide data. More recently, the Secretary of Education has directed $250 million to the states to assist them in improving their data collection.[85]

*Recommendations*

Governments should:

- Establish standards for the nationwide collection and reporting of data tracking student progress from high school to post-secondary institutions and then on to the workplace. Such data should be broadly accessible and useable and subject to rules to protect privacy and security.
- Assist in funding state efforts to improve their data collection and reporting of student results.
- Building on this expanded data gathering, support research on the comparative effectiveness of various forms of educational practices in both the short and long term—online, face to face, and blended—to identify key elements for success and best practices. Research should focus on learning outcomes and improving the ability to assess success in achieving such outcomes.
- Encourage reform so that financial support of community colleges is related to successful educational outcomes rather than on enrollments.

## A More Open Way to View Grades 9-16

Another way that the lens of openness can help is to encourage a broader view of higher education. Too often we analyze high schools, community colleges, and four-year institutions as if they are totally separate. Viewing each category as an educational "silo" or focusing only on the "articulation agenda" that governs the passages between them does not reveal the increasing permeability of the boundaries between them and the variety of institutional relationships that are emerging to respond to the wide range of student talents, aspirations, and accomplishments.

Some high schools, for example, are going beyond Advanced Placement courses and encouraging students—not only high-achieving ones but also those interested in a particular vocation—to attend appropriate classes on the campuses of nearby colleges. Some two-year schools are seeking to offer bachelor's degrees; some four-year institutions plan to offer degrees in applied sciences. Two- and four-year institutions that are collocated are reducing the barriers for students to move between them, and are inviting the collocation of high schools to join them so that student transitions are easier.

*Recommendations*

Governments should:

- Support data collection that facilitates a more integrated view of high schools, colleges and universities, and work force entry.

## Openness and Extending Institutional Resources

Community colleges have limited resources, including limited course offerings. OER and distance education provide a vehicle for such institutions to increase the number and range of courses and other educational activities that they can provide. These opportunities would allow them to offer both mainstream courses as well as more specialized ones—"long-tail" courses that serve much smaller numbers of students.

The ability to use digital resources is likely to be especially important for courses requiring lab or clinical work because many community colleges lack up-to-date facilities and/or have difficulty in hiring well-qualified clinical personnel. Digital materials, OER or not, and in particular those involving simulations or immersive experiences, should be able to provide at least partial substitutes for expensive laboratory facilities and the guidance of professional practitioners.

*Recommendations*

Governments should:

- Support the creation of high-quality online experiences aimed at providing substitutes for hands-on laboratory activities.

Colleges and universities should:

- Consider extending, and filling gaps in, course offerings through expanded use of OER and online educational opportunities, particularly when appropriate laboratory or clinical experiences are not available.

## Openness and Strengthening Community Colleges' Relationships with Businesses

Recognizing that strong relationships with local businesses that employ their students, host apprenticeships and internships, and provide tuition support for their employees are important to their success reflects openness on the part of the most successful community colleges. Businesses can help colleges identify workforce needs, both existing and emerging, that college courses might target. Maryland's Howard Community College, for example, began programs to certify Korean and Arabic speakers based on discussions with a major local employer, the U.S. National Security Agency, which saw a personnel shortage emerging. Businesses should define the skills they require while the community college focuses on developing the appropriate learning objectives and providing learning experiences that produce those skills.

Efforts such as those of California's Career Ladder's Project are showing how community colleges can improve the way they work with local businesses.[86] At the national level, the Advanced Technological Education (ATE) Program of the National Science Foundation has funded 350 centers to help build partnerships between community colleges and employers to train technicians for high-tech fields.[87] The ATE also supports applied research and the development of curricula and curricular materials.

The American Reinvestment and Recovery Act of 2009 recognized the importance of strengthening relationships between community colleges and businesses.[88] The Act provides funds to local councils, established under the Workforce Investment Act, to contract with local community colleges for training in high-demand jobs; in the past the councils issued training vouchers to individuals so that retraining had to be arranged one student at a time.

A recent report by the President's Council of Economic Advisors noted the importance of aligning basic skills and occupational training.[89] At present these two crucial activities are planned and funded separately within the government. A more integrated approach with stronger links between these activities would be helpful.

The Administration's proposed 2010 budget and other policy proposals include changes that should increase the role that community colleges can play in assisting workers. There are, for example, proposals to allow Pell Grants to be used to pay for shorter term occupational training and to support the elimination of rules that today cause workers to lose unemployment benefits if they are enrolled in college as opposed to looking for work full time. There are also plans to review the Workforce Investment Act and the Perkins Vocational and Technical Education Act to help workers obtain the training they want and need.

*Recommendations*

Governments should:

- Plan and fund support for basic skills and occupational training in a more coordinated manner.
- Strengthen links between community colleges and local Workforce Investment Boards to facilitate the development of more effective retraining programs, and encourage stronger ties between community colleges and local businesses.
- Allow the use of Pell Grants for short term occupational training under conditions established by the Departments of Education and Labor.
- Support changes in unemployment assistance programs that would allow participation in educational programs without a loss of benefits.

## Open Textbooks

Tuition rates at community colleges have traditionally been kept low to preserve open access. The cost of textbooks, however, has risen at twice the rate of inflation since 1980 and, in some programs, now rivals the cost of tuition.[90] In this area, freely accessible OER may provide the most tangible benefit of greater openness.

As noted earlier, Connexions is offering free electronic versions of textbooks as well as printed versions at

prices well below those of comparable proprietary texts. The Open Learning Initiative at Carnegie Mellon as well as a number of other programs are working with community colleges to create freely accessible open materials. Authors are donating rights, and foundations are funding the acquisition of rights, all with the aim of providing high-quality, freely accessible materials that can be modified, customized, and redistributed.

One development effort focused on community colleges is led by Foothill-De Anza Community College and the Community College Consortium for Open Educational Resources.[91] The Consortium plans to support the creation of OER targeted at the ten most popular textbooks used in community colleges and to expand coverage over time. The consortium will make the books available for free online and sell hardcover versions for much less than commercial publishers.

There are other efforts in the same direction. Flatworldknowledge aims to take existing books by leading experts and make them available free online or in various other formats—soft covers, audio books, chapters—and freely modifiable by instructors and students.[92] The Community College Open Textbook Project, funded by The Hewlett Foundation and managed by the Community College Consortium for Open Educational Resources, is examining "different ways to make free, open textbooks a sustainable resource for faculty and students" and "working to create a vetting procedure to review textbooks and recommend" high-quality texts.[93]

As was noted earlier, governments should consider supporting the creation of high-quality freely accessible OER for training critical job skills where there are not already available an abundance of well-tried and tested materials. NSF's ATE program already supports development of curricula and curricular materials for high-tech jobs. The Departments of Education and Labor and the NSF could fund open curricular materials that could easily be incorporated in new or existing products without the need to obtain clearance for IP rights.[94] Commercial publishers could incorporate these materials or build upon them to provide competing products. (It is estimated that 20-25 courses represent almost 75 percent of the credits taken; any freely available improvements in materials for these courses could have a huge impact.)

The Student Public Interest Research Group has pointed out that the market for college texts has some unusual characteristics which affect the accessibility of educational materials.[95] Faculty choose the texts to be used but are often not informed by the publisher's sales representatives of the prices of the texts—a problem remedied by recent legislation. (The Higher Education Opportunity Act (PL 110-315) now requires sales representatives to disclose the prices of textbooks to faculty members they approach.[96]) The students, the actual purchasers, often learn the price only when they register for a course and buy the materials—but they have no choice in the texts to be used. Although websites such as BookBoom.com seek to provide students with greater choices on textbook purchases and others are offering textbooks to rent, publishers have narrowed the secondary market for textbooks through efforts to "license" books like software, rather than "selling" them. These licenses place conditions not only on the sale of these books but also on their use.

In the long run, the rise of e-books and e-texts may drive down textbook costs. They are cheaper to produce and distribute, easier to update, and can shorten the time between the discovery of new knowledge and its dissemination and incorporation into teaching materials. A number of colleges are now experimenting with e-texts and e-readers such as Amazon's Kindle, and a number of commercial publishers have joined together in CourseSmart to produce e-texts.

One potential sticking point is whether publishers take advantage of the new medium or whether they will try to maintain their present business models and profit margins in the emerging e-text marketplace. If they do, repeating the path music companies initially took to meet the challenges of digital music distribution, they may well frustrate the development of this fast-growing market. Similarly if publishers and electronic book sellers don't provide interoperability, if they fail to take advantage of the capabilities of the new medium, if they use software-like licensing to exercise controls over electronic texts that are dramatically different from the way physical texts have traditionally been treated in the "analog" world, then they inhibit the market's growth and, contrary to their commercial interests, simulate demand for more open materials.

A recent decision by Amazon illustrates the tensions between the rules of the digital and analog worlds.

Amazon remotely deleted electronic copies of George Orwell's "1984" from the Kindles of those who had "purchased" them from Amazon. The deletions also eliminated any notes, commentary or bookmarks the purchasers had made which led to heated discussions about "analog expectations" and their role in a digital world. (In the "analog world" a book seller might have to break into one's home to take back a book someone purchased.) Amazon apologized, issued electronic refunds, and pledged not to take such actions in the future, but this event reinforces our view that we are in need of a more thoughtful discussion and legislative action to find the appropriate balance between the rights of producers and users of electronic books.

*Recommendations*

Governments should:

- Consider expanding the National Science Foundations' Advanced Technological Education Programs to cover new "green jobs", or initiating cooperative programs between the Departments of Education and Labor to support the development of open curricula and training materials aimed at critical job shortages where there is not an abundance of well-tested training materials.
- Review the existing legal regime to determine what "analog expectations" about books should apply in the world of electronic texts to strike an appropriate balance between the rights of users and those of authors, publishers, and electronic book sellers.

## Broadband Connectivity and Fab Labs

Access to digital technology by students varies considerably. The American Reinvestment and Recovery Act included funds to increase broadband connectivity for underserved communities as well as for community college computing centers which provide physical facilities where students can work online and have access to technical support.

A different kind of "open" facility is now emerging which could serve community college students as well as members of their surrounding communities. Based on work by Neil Gershenfeld at MIT, groups have been establishing fabrication laboratories (fab labs), "small scale workshops with an array of computer controlled tools" that can be used to make "almost everything."[97] These "open labs" provide access to tools such as laser cutters, computer-controlled lathes, and rapid prototyping machines, which allow "individuals to create smart devices for themselves" as well as new products that might be offered commercially.[98] Other variants of this concept, such as Tech Shop, or O'Reilly's Maker's Faire, also are directed toward education by doing.[99]

Providing funding to create such fab labs at community colleges would supplement the colleges' existing efforts to help students learn workplace skills. Such labs could also be part of economic development agendas involving local governments, businesses and unions, particularly in locations where large numbers of workers trained in using these tools have lost their jobs.

*Recommendations*

Governments should:

- Continue to support broadband deployment to community colleges and public computing centers.
- Support the establishment of fab labs in conjunction with community colleges, in cooperation with local governments, businesses and labor unions in areas of high unemployment.

# CHAPTER 5. OPENNESS IN HIGHER EDUCATION: CHANGES IN RESEARCH

The second major mission of institutions of higher education is the creation, dissemination, and preservation of knowledge.

Not all colleges and universities support a substantial research function; the top 100 research institutions conduct the vast majority of research and are the obvious focus of this section. But the impacts of greater openness on the creation, disclosure, dissemination and preservation of knowledge of research results are likely to be felt broadly in higher education.

There is a revolution taking place in many areas of research.[100] This revolution is marked by two important trends facilitated by the Internet and the digitization of information: greater collaboration among researchers and the prompt disclosure of research findings rather than withholding them until they can be published in a scholarly journal or by an academic press.

Both of these trends were visible in the highly competitive effort to decode the human genome. On one side was Celera, a private company headed by a brilliant scientist who sought to decode the genome and profit from licensing Celera's findings; in this, Celera was following a common path taken by those who seek to profit from their creative work. On the other side was the Human Genome Project which sought to increase the pace of discovery by encouraging worldwide collaboration and the immediate disclosure of research findings so that the broadest possible group of scientists could more quickly start to build upon new discoveries. This sharing, while not unprecedented, was quite different from the process Celera envisioned. In the final analysis, both sides, using very different practices, deserve credit for an enormous intellectual achievement.

But it is the Human Genome Project's more open model that increasingly is being adopted. Many of the most significant biomedical research projects being conducted today have adopted it. Traditionally secretive research and development arms of large pharmaceutical companies have embraced this model, at least for pre-competitive research. The former head of Celera has even chosen to make the results of some of his most recent research more quickly and freely available to anyone with an Internet connection.[101]

This trend toward rapid disclosure of results is more evident in the sciences. This is not surprising as there were many early precedents in fields like high-energy physics for disclosing research results quickly via "pre prints" and electronic repositories. (This "pre-print culture" may have eased the adoption of open courseware at MIT.) These trends are not as visible in the arts and humanities and the social sciences, but they are gaining traction.

## Resistance to Greater Openness

Substantial questions have been raised about the value of rapid, pre-publication disclosure of research findings. Perhaps the most important one is whether research results not vetted through pre-publication peer review will be less reliable than those that have been scrutinized as part of the process required for publication in traditional proprietary journals or by academic presses.

Peer review has played a central role in the scholarly publication process but the actual process of conducting peer review has been sharply criticized. Critics have accused it of institutionalizing "the tyranny of the old" or as a façade for academic cronyism. And the spate of recent retractions on the part of reputable peer-reviewed scholarly journals has raised questions as to its efficacy and value in practice.[102] Proponents of early disclosure note that it creates the opportunity for immediate post-disclosure review by a far-wider circle of peers than is true for traditional peer review. (Although the evidence is limited, an experiment by the journal *Nature* found little interest on the part of

authors in post-publication review and few volunteers to serve as post-publication reviewers.)[103]

But peer review remains, for many, an important tool. Even strong advocates of greater openness, such as the founders of the open-access Public Library of Science (PLoS), utilize it.

Another significant question for those who advocate for a more open system of rapid disclosure of research results is how it will affect the recognition of scholarly merit. Recognition at leading research institutions via promotion, tenure, and funding is generally not based primarily on teaching accomplishments but rather on publication, whether in prestigious journals or in well-received books—the venerable "publish-or-perish" syndrome. Younger faculty seeking advancement may be concerned that if they immediately disclose their findings, they will not be able to have their research considered for publication by leading journals because their previous disclosure renders the findings already "published." They may hold back disclosure due to worries that other scholars may misappropriate their work or exploit it unfairly. Institutions are facing or will soon face the challenge of determining what they will use in place of the judgments of prestigious publishers and their peer reviewers that help define scholarly achievement today. As growth in research collaborations continues, institutions will also need to improve their abilities to determine the relative contributions of scholarly collaborators for purposes of recognition.

These are not trivial concerns, particularly for younger faculty attempting to build their reputations and advance in their fields. But they are concerns that universities can and should address.

Universities have already found ways to determine the relative scholarly contributions among collaborators; this issue has existed since academics began to work together. Universities (and other funders including government research agencies) can evaluate the work of faculty who disclose their research results in advance of publication by directly querying relevant experts rather than outsourcing this process to a publisher and the two or three anonymous reviewers the publisher selects. Citation studies use citations of a scholar's research in the research of others as an indicator of how a scholar's peers appraise and build upon his or her work. New Internet-based activities are aimed at encouraging peer evaluations and determining scholarly impact. These issues are also being addressed by some academic and professional societies that have established processes to investigate and recognize new means for evaluating academic achievement in the digital age.

Even given these issues we believe that universities committed to the creation and dissemination of knowledge should be encouraging greater openness in order to increase the pace of innovation as well as to stimulate new broader and deeper research.

A recent study has cleverly demonstrated this additional result of greater openness by building upon a natural experiment involving genetically modified mice.[104] The study, "Of Mice and Academics," compares research conducted utilizing mice that were available to all researchers without restrictions on the nature of the research or the use of the findings, with research conducted using mice that required licensing and imposed strict conditions on the work of the licensee. (Differences in the "openness" of the mice and the mice research created the conditions for this comparison but lasted for only several years. The differences were eliminated when the principal funder of research in this area, the U.S. government, required that all of the modified mice be available for research without restrictive conditions.)

The study found that greater openness contributed to the generation of a larger number of related studies. This is not surprising because the lack of restrictions allowed more researchers who were interested in performing follow-up research to do so.[105] An unexpected finding was that the larger number of studies included some by researchers who came from outside the initial area of study. These researchers, newcomers to the field, could view the research questions from a new perspective. This "horizontal" broadening of research to include researchers from outside the initial field of inquiry has been found by firms such as Innocentive to lead to more effective research.[106]

The research demonstrated another unexpected outcome. The use of "open mice" also generated more research along the path to commercialization than research on mice subject to licensing requirements. While advocates for today's intellectual property

regime justify it as encouraging creativity and facilitating the commercialization of innovation, in this case, at least, greater openness appears to have led to more refined and commercially oriented research, even as it broadened research into new fields.

Given the positive impacts of greater openness on the research mission, colleges and universities should make efforts to ensure, at the very least, that their reward systems do not inhibit their faculty members from conducting their research in more open ways. Faculty should not be discouraged from prompt disclosure of research results if they believe it appropriate.

## Openness and Open-Access Journals

Researchers now have many new outlets for their work beyond simple Internet posting. There are over 3,000 open-access (OA) journals freely available and accessible to all. Research on the impact of OA journals is consistent with the findings on the value of openness described in "Of Mice and Academics." Based on the admittedly early record of OA journals, several different researchers have found higher rates of citation for articles in OA journals than for similar articles in proprietary journals, presumably due to the fact that they are freely and readily available to far more people interested in the journal's subject than is true for subscription-based publications.[107]

Several new developments suggest more growth in OA journals in the future. The University of California, in an effort to increase access to research, has recently recommended that its faculty publish in open-access journals.[108] Other institutions are following a similar path. (It should be noted that these are recommendations, not policies that require a faculty member to choose an OA publication.)[*]

Several colleges and universities, including the University of Tennessee have gone a step further and have begun to provide funds so that their faculty can pay for publication in open-access journals that rely on an "author-pays" system for financial support.[109] They want to ensure that faculty have a choice as to whether they choose an OA or a proprietary journal and are not forced to choose a proprietary journal because they could not afford OA journal fees.

The rapid rise in OA journals has up-ended the traditional academic publishing model. Proprietary publishers have responded in a variety of ways. About 30 proprietary journals have become open-access journals. Some proprietary journals have voluntarily reduced the period of exclusivity during which only subscribers can have access to the published research; the *Nature* publishing group has adopted a six-month restricted window.[110] Other proprietary journals have made their back issues freely available. The Mellon Foundation is now supporting a project involving a group of proprietary journals in the humanities and social sciences examining various proposals to increase access.[111] The second largest proprietary scientific and technical publisher has become the largest open-access journal publisher by purchasing the open-access journal BioMedCentral. (Apparently BioMedCentral had already begun to turn a profit before the purchase, which suggests that there are sustainable economic models for OA journals.)

Colleges and universities should begin to review their policies regarding promotion, tenure, funding and awards to ensure that early disclosure, publication in OA journals, and allowing one's work to be mashed together with that of others, are not viewed as somehow less worthy than delaying disclosure of research, publishing in proprietary journals, or restricting access to one's scholarly production. Government agencies that award research funds should also be examining the potential effects of their policies on the growth of openness in research.

### *Recommendations*

Governments should:

- Recognize changes in the dissemination of research results (immediate release rather than delayed publication and the rise of open access journals), and acknowledge the value of such activities when recognizing scholarly achievement such as in the awarding of grants, awards, participation on panels etc.
- Fund research on the impact of immediate-release policies and publishing in open-access journals on

[*] In a related effort to make research that is now available only in proprietary journals more accessible, a new group, Acawiki, is using graduate students to summarize the research which can then be made freely available without infringing on the copyrights.

tenure and advancement practices in institutions of higher education.

- Fund research on new methods of peer review and evaluation in the age of digital scholarship.
- Fund research on best practices in research collaboration.

Colleges and universities should:

- Reevaluate recognition policies regarding tenure, advancement, and the granting of awards to acknowledge (and not discriminate against) new practices regarding the dissemination of research results via immediate release and publication in open-access publications.
- Encourage faculty to publish in open-access journals and to include the costs of publication in applications for research funding.
- Consider using institutional funds to support the publication of faculty research results in open-access journals supported by "author-pays" policies.

## Digital Repositories

There have been two recent milestones in making university research more accessible through the use of digital repositories. The use of such repositories is a well-accepted aspect of fields such as high-energy physics but has not been broadly adopted in other fields.

The Faculty of Arts and Sciences at Harvard recently adopted a policy requiring Harvard faculty members to grant Harvard a non-exclusive license for their research.[112] Harvard will deposit a copy of the research into its electronic repository. The research will be electronically accessible to the world at large unless the author petitions to "opt out" of making his or her research broadly accessible. Even then, metadata about the research would be available from the repository, allowing other researchers to know of the existence of the research, avoid redundant efforts, and contact the original researcher. A critical practical issue will be establishing standards for the metadata to facilitate electronic searches across repositories.

The MIT faculty has gone a step further. The MIT faculty voted unanimously to establish a depository policy for the entire institution, based on that adopted by Harvard's Faculty of Arts and Sciences. Electronic copies of all faculty research will be available in D Space, an open source digital repository established by MIT.[113] As the head of MIT's faculty explained the decision, "We speak with a unified voice that what we value is the free flow of ideas."[114]

Other institutions have been adopting similar policies, with the University of Kansas being the first major public institution to do so. Depository requirements vary, in part, in the nature and extent of waivers available to researchers.

Policies requiring graduate student dissertations to be deposited in an institution's digital repository would make this research more open. Student e-portfolios might also be deposited at the student's discretion.

*Recommendations*

Governments should:

- Fund research to develop standards for metadata to be used to facilitate search and use of both public and private research deposited in digital repositories.

Colleges and universities should:

- Establish open-source digital repositories and require faculty to provide the institution with a non-exclusive license to the products of their research.
- Deposit electronic copies of the research into the repository using standardized metadata to facilitate search and use.
- Faculties should be permitted to withhold research from general availability but the existence of the research and its author(s) should be disclosed using standardized metadata to prevent redundant research.

## Educating Faculty Members on Their Intellectual Property Rights

The debates over open-access versus proprietary journals and requirements for depositing electronic copies of their scholarly articles in digital repositories have revealed a substantial ignorance on the part of academics about their intellectual property rights. Faculty members have traditionally signed agreements turning over their intellectual property rights

to proprietary publishers as part of the publication process for their scholarly research. But faculty need not do so. They can retain the rights that allow them to make pre-publication material available to all, as well as to deposit materials in digital repositories when required to do so, while still providing publishers with sufficient rights that they need for publication of the research results.

*Recommendations*

Colleges and universities should:

- Educate their faculty about their intellectual property rights. Knowledgeable faculty could then make more informed choices about access to the fruits of their research, the rights they are prepared to retain, and those that they are prepared to relinquish as part of the publication process.

## Openness and Commercial Support of Research

There is another related point to be made about the intersection of the research mission and the operation of intellectual property rules.

Intellectual property rights holders have, in some cases, attempted to use those rights to limit research on their products just as some software companies attempted to use the End User Licensing—which we all routinely click to accept—to prevent customers from criticizing their products. Recently, for example, producers of genetically modified seeds have placed conditions on the "licensing" of such seeds to control how the seeds are used. They have argued that these conditions are necessary to fulfill their obligations to regulators to prevent the unauthorized spread of genetically modified plants.[115]

At the same time they have attempted to use licensing provisions to prevent academic research at state institutions from comparing, for example, the productivity of the patented seeds with seeds not covered by patents. Restrictions on such research—research that one would expect to be in the mainstream of agricultural research conducted by institutions chartered to aid a then primarily agricultural nation—do not seem to be in the public interest.

Commercial support of research may also, according to recent studies, affect the findings and conclusions of the sponsored research.[116] For that reason we believe it is important that colleges and universities require disclosure by researchers of financial interests that may be perceived as creating a potential conflict of interest, including sponsorship by commercial organizations, consulting relationships with firms potentially affected by the research, non-de-minimus payments for lectures or presentations, and the use of ghost writers etc. As Justice Brandeis noted "sunlight is the best disinfectant."

Colleges and universities should be at the forefront of efforts to ensure that intellectual property rights are not utilized in ways that undercut their research mission. Those who oversee university research should be charged with carefully scrutinizing the impact of conditions that inhibit the free exchange of ideas or that might otherwise adversely affect the quality and integrity of research conducted at the university. We have no intention of undermining commercial support of research. But because of the potential issues regarding commercial sponsorship it is important that it be covered by conditions agreeable to both the sponsoring party and the university; such conditions must pass a threshold test of being consistent with the university's mission to generate and disseminate new knowledge.

*Recommendations*

Governments should:

- Require disclosure of financial interests that might appear to present conflicts of interest by researchers receiving government funds.

Colleges and universities should:

- Require disclosure by faculty of financial interests that might appear to present conflicts of interest with respect to research they conduct.
- Designate an official to be responsible for examination of commercial support for research that might inappropriately reduce the availability of research results or inhibit collaborative activities among researchers.
- Oppose commercial policies that would use intellectual property rights and licensing provisions to

inhibit or prevent research that would otherwise be in the public interest.

## Access to Government-Funded Research Results

Another landmark in making the results of research more open was the decision by Congress in 2007 to require that the results of National Institutes of Health (NIH)-funded research be deposited in Pub Med and be made publicly available within twelve months of publication.[117] Studies by John Houghton have shown billions of dollars in additional economic activity generated by making such research more openly available.[118]

Some 4,000 articles a month are now being deposited pursuant to the mandate and the impact of the decision will only increase. About 80,000 peer-reviewed articles are generated each year with the help of NIH funding; the 2009 economic stimulus package, which increased NIH funding by billions of dollars, is likely to increase the number of such articles.[119]

The National Science Foundation has now established a policy requiring that all scientific and engineering data generated with NSF funding must be made broadly available and useable.

The European Union has taken an even more aggressive stance toward increasing access to knowledge by adopting a "Fifth Freedom—Freedom for the Movement of Knowledge" as part of the Union's basic mission and has proposed shortening the period of exclusivity for government-funded research to six months. At the same time it is supporting research to determine if particular domains should have longer or shorter periods of exclusivity and to analyze the impact of various forms of public-disclosure requirements.[120]

Some proprietary publishers have embraced the NIH public-access policy; some have even announced their intentions to deposit articles that they publish into PubMed even though the articles are not formally covered by the policy. In contrast, the American Psychological Association initially proposed charging authors subject to the NIH policy $2500 to deposit their articles in PubMed; the association withdrew the proposal after considerable criticism.[121]

Other proprietary publishers have even more strongly attacked the policy. They have protested the mandate on the grounds that it violates their intellectual property rights by unfairly appropriating the contributions they have made through peer-review. Instead they are supporting a new bill HR6845, the Fair Copyright in Research Works Act which would overturn the NIH mandate.[122] (Opponents of this bill have argued that it would not only overturn the NIH public-access mandate but would reverse long-standing law governing federal rights to federally funded research.)

For now the mandate remains in place. The public-access policy was, in fact, reaffirmed when the American Reinvestment and Recovery Act was signed into law. New legislation, S. 1373, the Federal Research Public Access Act of 2009, has recently been proposed to extend the public-access policy to cover the 11 federal agencies that provide over $100 million each in research support by requiring research that they fund to be deposited in an interoperable digital repository and to be made publicly available within six months. Conservative lawmakers have pointed out that taxpayers should not be paying twice for the fruits of publicly funded research.

Universities have a substantial stake in this debate. University faculties conduct federally funded research. They submit the resulting articles to proprietary journals. They voluntarily conduct peer reviews for these journals. University libraries subscribe to them. Consistent with their research missions, universities should be advocating greater openness and should be supporting the extension of the NIH policy to other non-classified federal and state-funded research and the data underlying the research results.

### *Recommendations*

Governments should:

- Retain the existing requirements of the NIH public-access policy regarding the results of NIH-funded research (public availability within 12 months of publication).
- Stimulate research and increase the pace of innovation by extending the NIH public-access policy to cover all non-classified research funded by the 11 federal agencies providing over $100 million each in research support.

- Extend the NIH public-access policy, under appropriate conditions, to primary data resulting from federally funded research and data gathered in support of government regulatory activities.
- Extend the NIH public-access policy to publicly funded research at institutions of higher education at the state, and local levels.
- Adopt policies that promote the accessibility and utilization of all non-classified government procedures and processes, data and information products (e.g. databases, publications, audio and video products etc.) as well as materials held in government-funded museums and collections. Lower, to the extent practicable, barriers to access and use, including permission and attribution requirements and technological barriers. Consider the utilization of standardized formats and metadata to facilitate searching and use. (Policies should neither favor one commercial entity over another nor commercial entities over noncommercial entities.)
- Develop long-term plans and policies for ongoing permanent public access to government information in whatever form, taking into account the fragility of digital media and the format migration that has impeded access.

## Openness and University Libraries

In this new digital world, colleges and universities may also have to "reinvent" their libraries. Library staff have traditionally played a key role serving both faculty and students as information intermediaries. But that role may be shifting.

Faculty reliance on the library has declined as disciplines have embraced digital information sources. Similar forces are at play with the digital natives; a Pew Foundation survey found that nearly 75 percent of college students used online sources more than their libraries for information and research.[123] And online resources continue to get richer. Just recently, for example, the World Digital Library—a joint venture that fittingly involves the U.S. Library of Congress and the Biblioteca Alexandria of Egypt—announced its opening.[124]

Access to information will only increase due to the efforts by a number of parties, including many of the leading university libraries, to digitize the world's books. The Google Book Project, the Open Content Alliance, the Internet Archive and others aim to take these physical objects and produce corresponding digital objects that would be globally available.[125] All of these efforts are to be applauded as they will dramatically reduce barriers to access to millions of works and increase the social utility of materials that were previously unavailable to most of the world's population.

But these efforts are not all the same and will, if they proceed as planned, provide differing degrees of openness. The Google Book Project is the largest effort and has received the most attention. Google sought to take books covered by copyright, as well as those in the public domain, digitize them, make small portions of them available on the Web for free, and then make the whole works available for viewing by fee-paying subscribers or for sale. The Authors Guild and the American Association of Publishers sued Google in a class-action suit alleging that the copying and display of even small parts of books still under copyright without the explicit permission of the copyright holder constituted copyright infringement.[126]

Google and the plaintiffs have since proposed a settlement of the case. The tentative settlement, which must be approved by the court overseeing the case, would allow Google to continue to copy and digitize books covered by copyright and display parts of them (up to 20 percent) for free, while at the same time, providing a means by which libraries could obtain subscriptions so their readers could have access and individual searchers would be able to purchase the material (with rights holders receiving a portion of the proceeds). Under the proposed settlement, public libraries would have one free subscription to Google's digitized collection; all other parties would have to pay subscription fees set by Google which might reflect whether an institution—a library for example—worked with Google on the project and the extent of that institution's assistance.[127]

The court must make a determination as to whether to accept the settlement guided by legal and public interest principles; it is aided by advice from the federal government which is now analyzing it.

Opponents of the settlement argue that it would give Google an insurmountable advantage in making available digitized books because the settlement would give Google alone the right to digitize and commercialize millions of "orphan works"—those still under copyright but whose copyright holders cannot be located—without specific permission from the copyright holders. Any other party wishing to digitize and display these orphan works—which some estimates put at more than 50 percent of all works published since the 1920's—would have to gain affirmative permission from these same unlocatable rights holders. Others have attacked the settlement as providing Google an anti-competitive edge in the online sale of digital materials and for making payments to identifiable copyright holders for the display and sale of orphan works for which they do not hold the rights. (Other critics have raised a different openness issue, that of the danger of Google or others retaining and potentially making available data on the reading behavior of those who access the digitized materials.)

We are grateful for the actions of all the parties working on the digitization of books. Without their efforts, millions of works that would be otherwise inaccessible will become globally available. We take no position on the merits of the case or the proposed settlement. But we believe that to gain the maximum societal benefit from these remarkable efforts, the court should seek to ensure that the settlement increases public access to the digitized material to the maximum extent possible using open and interoperable formats, and does not anti-competitively disadvantage other search engines, other groups working to digitize materials, or others that wish to offer digitized materials online.

Many suggestions have been made as to ways to maximize access, particularly with respect to orphan works. Legislation has been introduced to limit the liability of those who use orphan works in good faith; Google has indicated its support for legislation increasing access to orphan works. It has been suggested that all parties involved in digitizing books be given the same rights as Google regarding access to orphan works. Other organizations have suggested allowing digitization and display of an orphan work until the appropriate rights holder explicitly asks that it be taken down.

Beyond their efforts to assist in the digitization of books as described above, many college and university libraries are deeply engaged in the creation of digital repositories and the preservation of existing special collections. The preservation function may be under appreciated because too many people equate it with making sure that collections of plants or beetles or local artifacts are kept intact.

In this digital age there are new items to be preserved and new challenges to be faced. Digital media are surprisingly fragile. They may be rendered unusable due to continuing changes in formats. If we want to preserve our heritage, we will need to place the burgeoning amounts of digital media in the care of librarians with the requisite digital skills.

Perhaps the most intriguing question about the future role of university libraries and their staffs is whether they can retain an important role as trusted information intermediaries promoting digital literacy and helping faculty and students identify reliable sources of information. We all need help in locating and evaluating information in the vast new information landscape; we need guides and advice on how to cope with the information overload which openness brings.

*Recommendations*

Governments should:

- Pass legislation to improve access to "orphan works" by limiting liability for their good faith use, particularly if they are taken down upon notification by the rights holder or alternatively permitting good faith use of an orphan work until receiving a valid take-down notice.
- Review the proposed Google books settlement with a view toward maximizing public access to digitized works and preventing any anticompetitive effects in the market for search, the sale of digital materials online, and on the efforts by others to digitize the world's books.

Colleges and universities should:

- Have their libraries participate in efforts to digitize the world's books
- Support the digitization and preservation of materials in library and museum collections. Facilitate accessibility and utilization of these materials with the lowest appropriate barriers to access and

use, including permission and attribution requirements, as well as technological barriers. Consider the use of standardized formats and metadata to facilitate searching and use. (Policies should neither favor one commercial entity over another nor commercial entities over noncommercial entities.)

## Openness and Academic Presses

Universities should rethink the role of their scholarly presses. In the past, the university press served as a vehicle for the dissemination of scholarly work which might not have sufficient commercial appeal to be otherwise published, including the monographs that junior faculty produce, in part, to get tenure. The scholarly press was an important part of the academic ecosystem.

The ranks of university presses have thinned over time. They are expensive to operate and few have the necessary economies of scale. They are now facing threats similar to those faced by proprietary scientific and technical publishers, particularly from the posting of scholarly work online.

Some university presses are reacting much like commercial publishers. The American Association of University Presses has joined other publishers in backing legislation to overturn the NIH public-access policy—although a number of leaders of individual university presses have supported public access. The Princeton University Press has complained about the unauthorized posting of its copyrighted materials on the Web and, like commercial publishers, has filed copyright "take-down notices" with those hosting the disputed materials seeking to have the materials removed from public access.[128]

Such actions might be more easily justified if the university press provided substantial financial support to its host institution. On the other hand take-down notices appear at least arguably inconsistent with the mission of the university to further the dissemination of knowledge, especially when one compares the access provided by even the most accomplished university press with the global access made possible when digital materials are made freely available on the Web.

It seems clear that universities and their presses will have to adjust to a future in which scholarship is delinked from print publication.

Alternative models are being developed. Some presses are going completely online. Some are attempting to achieve financial stability through the sale of subscriptions to their restricted websites. A different model is being developed by Rice University Press and other members of its university press consortium that are embracing openness and Internet distribution but also providing inexpensive on-demand printing services for those who want OER in hard copy. The University of Michigan press has announced that it will provide on-demand printing of over 400,000 out-of-publication books digitized by Google. The National Academies are providing free digital access to over 4000 Academy reports. Indiana University has recently proposed an infrastructure for digital publishing that could be shared by colleges and universities and that could provide economies of scale for journals, universities presses and non-profit societies.[129]

*Recommendations*

Colleges and universities should:

- Rethink the role of the university press, including the alternative of Internet publishing and the provision of on-demand printing services.

## Openness and Technology Transfer

An embrace of the values of greater openness might also change the way colleges and universities treat technology transfer and the licensing of the fruits of on-campus research.

Based on a concern that the results of federally funded research at universities might "languish" unexploited, Congress passed the Bayh-Dole Act (35 USC Sections 200-12) in 1980. Because universities were not seen as particularly effective at the commercialization of their discoveries and not likely "to invest in developing and marketing" them, the legislation encouraged the commercialization of federally funded research by making it clear that universities could patent the results of such research and profit from the licensing of the resulting patents.

From many perspectives, the Bayh-Dole Act should be viewed as a success. Universities are clearly patenting more discoveries; they obtained 16 times as many patents in 2004 as in 1980.[130] Mark Lemley has noted

that many of these patents are foundational; they lay the groundwork for even more discovery. "More and more university patents are patents on the very earliest stages of technology. It is universities, perhaps not surprisingly given their role in basic research, who are patenting the basic building blocks in new technologies."[131]

Over 3300 colleges and universities have set up technology-transfer offices and the licensing of university patents has generated over $1 billion of revenue.[132] A 2007 report claims that university research led to 686 new products and 555 start-ups.[133]

But it is not clear that the creation of so many technology-transfer offices, or the dramatic increase in university patenting, or even the increase in licensing revenues, should be the criteria for judging the long-term success of university technology-transfer policies or for determining what technology-transfer policies should be in place in an era of increasing openness.

Universities are not, for the most part, profit-maximizing institutions. Their research mission is to create and disseminate knowledge. But the present attempts by many universities to maximize their licensing revenues may actually reduce the dissemination of knowledge and the "societal impact of technology."

Colleges and universities face real and continuing financial pressures. Leaders of higher education are seeking all possible revenue sources and are well aware of the very substantial returns that have come to universities that hold commercially valuable patents, such as the University of Wisconsin's stem-cell patents.[134] Technology-transfer offices therefore have a strong institutional incentive to work to maximize the licensing revenues which they help generate and by which they are likely to be evaluated.

This incentive encourages technology-transfer offices to offer exclusive licenses which, at least in the short term, are more likely to produce more revenue for the university. Those who seek to license technology are likely to prefer exclusive licenses so they can exercise greater control over the use of the patent and minimize their competition.

A strong case can be made for the importance of exclusive licenses in the pharmaceutical and biotechnology areas due to the enormous financial and regulatory hurdles that exist for the successful commercial development of discoveries in these fields. But in other areas, particularly those related to information technology, there is no reason to believe that exclusive rights are important developments in information technology have emerged from universities and been commercialized without any need for university patents.

The hope of a financial windfall from the grant of an exclusive license may drive university licensing policy, even if that hope is more like a dream. Less than 1 percent of all university patents generate over $1 million in revenue.[135] The number of universities obtaining significant licensing revenues is a tiny fraction of those with technology-transfer offices.

Exclusivity, in the long run, may actually reduce royalty payments as there are fewer firms trying to commercialize the patented technology and thus fewer chances of successes that will generate royalties. Exclusive licenses for patents on "enabling technologies," which have the potential to open up whole new fields of innovative activity raise particular concerns for innovation overall.

The choices for colleges and universities need not be between exclusive and non-exclusive licenses. In order to further the dissemination of knowledge, encourage innovation, and foster competition, institutions of higher education could utilize licenses that "grant field-specific exclusivity, or exclusivity for a limited term, or exclusivity for commercial sales."[136] Given the crucial role that universities play in basic research, it is particularly important that they employ non-exclusive licenses for patents on fundamental enabling technologies.

In other cases, important ethical and moral reasons may add to the case for limiting exclusivity. Yale University, for example, concluded that it should carve out non-exclusive access to its patents regarding pharmaceuticals that were critical to treating infectious diseases ravaging the developing world.[137]

The lesson is that universities should not evaluate technology-transfer policies based solely on the lottery-like possibility that they will generate very significant revenues. They need to look at the costs and benefits of their technology-transfer activities, including the

benefits of greater openness. In the end, their technology-transfer policies should reflect a balance between the need to generate revenues and the fulfillment of the fundamental mission of the university to discover new knowledge and make it broadly available.

*Recommendations*

Colleges and universities should:

- Reexamine and readjust technology transfer policies and programs in light of the research mission to create and disseminate new knowledge, while recognizing the need for the institution to increase revenues.
- Reconsider the use of exclusive licenses and consider alternatives that better reflect the nature of the patents and the social utility of the knowledge underlying them.

# CHAPTER 6. OTHER APPLICATIONS OF OPENNESS IN HIGHER EDUCATION: EXTENDED COMMUNITIES AND ADMINISTRATION

The third mission of colleges and universities—beyond teaching and learning and the creation, dissemination, and preservation of knowledge—is to contribute to the well-being of the communities with which they are involved. These communities include the geographical community in which the institution is located as well as the many other communities that colleges and universities touch such as students, faculty, staff, alumni, and, increasingly, the interconnected global community in which their graduates will live.

## Improving Connections to Extended Communities

The potential to improve relationships between colleges and universities and their various stakeholders by acting more openly is clear. Institutions, for example, are beginning to use social-networking technologies already familiar to their students, automatically connecting in-coming students with each other, linking students registered for a particular course, or facilitating contacts between students and potential applicants to provide more credible sources of information about life on campus. Entrance interviews are beginning to be conducted online. Chat rooms are being utilized to answer questions from potential applicants. Groups of alumni, strongly bonded through mutual interests beyond the fact of having attended the same school, are supplementing traditional alumni organizations with encounters in Facebook or other social networks.

There are, of course, negative aspects of this greater openness. Colleges and universities—and potential employers and landlords—are checking social networking sites and discovering "youthful indiscretions" that have become part of a student's permanent attributes. Stalkers, spammers, even the mildly curious have access to information that previously would have been ephemeral. Our legal ideas about privacy have often turned on societal expectations and these expectations may be changing, at least for those born digital. Colleges and universities should initiate discussions among students, faculty, and staff about the meaning and utility of privacy in an increasingly digital and interconnected world.

Greater openness would allow the rich intellectual life of the campus to be made accessible not only to those who can physically visit, but to the world at large, utilizing streaming audio and video technology. As technology improves and connectivity and bandwidth increase, this flow of lectures, colloquia, sports events, concerts, convocations, and symposia could reach larger global audiences, while at the same time strengthening relationships with alumni, parents of students, and others with an existing relationship to the institution but who might visit the campus rarely, if at all.

Given these opportunities and their relatively meager costs, universities should change the "default" position for making on-campus activities more available electronically, from "no" or "hadn't thought about it" to "yes." If greater openness is adopted as the default condition the question would no longer be, "Should we make this available? Should we post it on the Web?" but rather, "Is there any good reason why this should not be available to everyone?"

### *Recommendations*

Colleges and universities should:

- Make digital accessibility to open college and university activities the "default" condition rather than the exception. Expand the use of new technologies to make institutional activities more broadly available to various communities—geographically proximate areas, alumni, parents, funders, self-directed learners etc.
- Educate students about privacy issues surrounding the use of social networks and other electronic data-gathering activities and disclose their institution's practices regarding the use of social networks for decision making purposes.

*Continuing Education*

Many colleges and universities offer continuing education programs. These programs have sometimes been an awkward fit for colleges and universities geared primarily toward serving 18- to 22-year-old students and have often been treated as ancillary to the university's core activities.

Increased openness may provide new opportunities to strengthen this function. A nationwide consortium of land-grant universities, for example, recently announced a public launch of eXtension, an interactive, collaborative, electronic form of the cooperative extension programs that have made these institutions such important players in local agricultural communities.[138]

Educational opportunities aimed at alumni, now offered on campus or via faculty visits to local alumni clubs, could also be enhanced. Baby-boomer alumni, physically healthier than past alumni and with at least a touch of Internet savvy, are reaching retirement age and constitute a potentially rich market for life-long learning. While some might prefer to engage in such courses face to face, (for the social aspects as much as anything) others might be willing to participate in, even subscribe to, online mini courses offered by an institution to which they already feel connected.

*Recommendations*

Colleges and universities should:

- Re-examine their continuing education and alumni education programs in light of the new opportunities created by information and communications technologies.

*Openness and Participation in the Global Community*

Increased openness on the part of colleges and universities in the developed world has its greatest potential in making higher education accessible to those for whom institutions of higher education are open only in their dreams. Creating and expanding the use of open (or more open) educational materials, whether entire courses, course materials, web-accessible lectures and seminars, or more modular open-educational objects, can improve the intellectual lives of self-directed learners and can supplement the efforts of under-resourced institutions of higher education in the developing world. The World Bank and other international institutions that have been focusing on increasing access to higher education would be remiss if they, and governments in the developing world, fail to embrace and support the open education movement.

Many U.S. institutions have successfully recruited international students over the years. But the increasing mobility of students around the world and the growth of well-respected colleges and universities abroad have increased global competition among institutions of higher education. A number of leading universities in the United States have recognized the opportunity to enter underserved higher education markets abroad to compete with foreign universities old and new.

They have taken many different paths. Some have established their own "branches" in other countries with varying levels of autonomy. Others have partnered with indigenous institutions; some have been specifically invited by countries, often resource-rich, less-developed countries, to partner with or advise in the creation of new or expanding universities, such as New York University's program in Abu Dhabi.[139] Others are building new relationships with colleges and universities abroad that are far less sweeping, involving student and faculty exchanges or joint programs.[140] The technologies that facilitate greater openness can provide acceptable substitutes for physical exchanges, reducing costs and the institution's carbon footprint.

It is hard to predict whether increased efforts by U.S. institutions to expand abroad will be fruitful. The record so far is mixed. But it would be a sadly missed opportunity for the improvement of higher education around the world if new or expanded institutions were to simply replicate traditional models of higher education and forego the opportunities to benefit from greater openness.

An assumption underlying greater openness is that everyone has the potential to contribute based on their unique experience and insight. This is surely compatible with the view that students should understand and participate fully in a multicultural world. The relatively low numbers of U.S. college and university students who study or even travel abroad threaten our ability as a society to understand and navigate our way in an interconnected and frequently contentious world. The difficulties faced by foreign students who seek to come to the United States to study, particularly post 9/11,

reflect diminished openness and limit our opportunity to benefit from their differing backgrounds.

It is therefore heartening that now some institutions of higher education are now attempting to increase opportunities to, or even requiring, study abroad. Goucher College, for example, now has a universal study-abroad requirement for its students.[141] Other institutions are beginning to require study abroad or a related learning experience. In a recent survey over 80 percent of the respondents said that they were trying to send more students abroad, although the absence of funding was a major issue.[142]

*Recommendations*

Governments should:

- Support the open-education movement to serve the large number of qualified potential college and university students who are unable to attend an institution of higher education.
- Increase financial support for bringing foreign students to U.S. institutions of higher education and work to minimize associated administrative obstacles.

Colleges and universities should:

- Provide greater openness as part of their efforts to participate more fully in the global provision of higher education.
- Support programs to increase international educational experiences for students.

## Improving the Administration of Colleges and Universities

Colleges and universities constitute a substantial market for goods and services. One way of increasing openness would be for these institutions to use their procurement activities to express a preference for open standards and interoperable products. By including these preferences in their purchasing decisions they could encourage outside vendors to open their proprietary products, increase interoperability, and provide more products based on open standards.

*Recommendation*

Colleges and universities should:

- Establish rules requiring, to the extent practicable, the procurement of software and hardware devices that comply with open standards and promote interoperability.

*Community-Source Software*

Institutions of higher education, particularly those with substantial expertise in information technology (whether via faculty, staff, or students) have led the way in creating open source "community-source software" (CSS), such as SAKAI's open-source course management system or KUALI's financial management systems. (SAKAI's system has been successful enough that Blackboard, the leading proprietary course management system, has chosen to make its software interoperable with it.)[143]

Community-source software is the product of a structured software production effort involving multiple institutions. CSS may provide a vehicle for the creation of other open-source administrative systems–such as for administration of outside-funded research—optimized for college and university use. CSS holds the potential for a reduction in software costs and an increase in institutional control.

But successfully creating and maintaining CSS is not easy. The goals of the consortium members must be aligned, institutions must be prepared to rely on their competitors to contribute scarce programming resources and to meet project goals in a timely way, and the software must be diligently maintained. Community-source software is therefore likely to be generated only when the function is critical and proprietary software vendors fail to meet higher education's particular software needs in a cost-effective manner. Working on CSS, however, does not foreclose cooperation with commercial firms; there are opportunities for CSS to be developed and maintained in conjunction with commercial firms much as LINUX development and maintenance takes place in an environment populated by commercial firms such as Red Hat.

Institutions of higher education can also increase openness by recognizing that born-digital students can play an important role in the creation and maintenance

of community-source software as well as in writing software to improve the functioning of other university systems. In the same way that students can become co-creators and maintainers of OER, they can improve the interfaces of administrative systems, help design institutional websites aimed at prospective or incoming students, and build collaborative teaching tools.

*Recommendations*

Colleges and universities should:

- Consider support for, or participation in, the development of community-source software for institutional purposes where existing software does not meet critical needs or where there are substantial gains in cost and customer control that can be practically achieved.
- Utilize student programming skills in the creation and maintenance of software for institutional purposes.

*Personal Health Records*

Another possible application of greater openness might help the functioning of the health services that colleges and universities provide to their students. Personal healthcare records (PHRs as opposed to electronic healthcare records, EHRs) are now being offered by numerous vendors.[144] PHRs allow an individual to have ready access to vital medical data, and are touted as helping individuals take greater responsibility for their own health.

Many students enter colleges and universities at the time when they are reaching their legal majority. For the purposes of the law they are adults. Their parents and guardians may no longer have any legal right to receive certain kinds of sensitive information about them, including healthcare-related information, without the student's specific consent. The institutions in which the students are enrolled neither have nor seek an *in loco parentis* relationship with them. So just when students are expected to begin to take responsibility for their own healthcare, they often have to make important decisions with little assistance. PHRs may help provide access to useful data and advice.

If PHRs are useful—it's too early to judge—colleges and universities might provide significant assistance to their students (and potentially to faculty and staff) by identifying the best of the PHR systems and facilitating access to them. Early involvement by colleges and universities with providers of PHRs might also help improve the way PHRs serve the higher education marketplace.

*Recommendations*

Colleges and universities should:

- Consider facilitating the utilization of Personal Health Records for students.
- Work with PHR vendors to optimize PHR's for students.

*Trade Offs Between Physical Facilities and Cyber Facilities*

Many of our most prestigious colleges and universities have undertaken or planned massive building booms during the first years of this decade; Stanford, for example, announced a $350 million dollar building project for its business school.[145] But if the technologies that have created opportunities for greater openness begin to affect higher education as they have affected other sectors of our economy, a far larger proportion of the teaching, learning, and research activities of institutions of higher education will be carried out in cyberspace rather than being conducted at the university's particular geographical location. The physical location of a campus may well become less central to the identity of an institution; one can imagine that in the distant future it might be hard to "identify" an institution's physical campus.

As institutions of higher education consider various scenarios for their futures, they might at least consider whether they would be well served to stay on the present trajectory of expensive expansion of physical campuses. Will their needs for physical facilities continue to increase at the same pace in the future? Will they be relying to a greater degree on ever more capable ICT tools in their teaching and learning and research functions? Will the notion of "place" be as central to the identity of the institution or will the institution be increasingly defined by the quality of its cyber-presence?

The potential cost savings from moving from physical space to cyber space could be considerable. Perhaps the naming opportunities of the future for donors to higher education will be cyber collaboratories rather than research buildings or classrooms.

*Recommendation*

Colleges and universities should:

- Review current facilities planning activities in light of the potential for online educational activities to reduce the need for new physical facilities over the next several decades.

## Openness and the Challenge of Piracy

Colleges and universities are under growing pressure to curb downloading of music, videos, movies and other copyrighted materials by users of their institutional networks.

There is no question that the misappropriation of copyrighted materials is wrong. Institutions of higher education should be educating members of their communities about the proper use of network facilities and their responsibilities regarding copyrighted materials. But the copyright industries—movies, music, and video producers—have increased the pressure on institutions of higher education to do far more than that. They have successfully backed legislation that requires colleges and universities to develop plans to combat unauthorized distribution of copyrighted works and to offer alternatives to illegal downloading. They even proposed legislative provisions that would ultimately threaten colleges and universities with the loss of federal aid if their efforts to control unauthorized distribution of copyrighted works on their networks are deemed to be inadequate.

The Higher Education Opportunity Act provisions place colleges and universities in a far more vulnerable position regarding piracy than commercial parties providing Internet access. At the same time, the copyright industries are seeking broader legislation (or voluntary agreements by entities providing Internet access), requiring that individuals be disconnected from the Internet if they are subject to three unadjudicated accusations of music or video or movie piracy—sometimes called the "3-Strikes Rule. (There is a vast difference between acting upon a finding of an actual rule violation by a neutral third party following agreed upon rules of evidence and accepting the accusations of an interested party and disconnecting a student from the Internet.)

Should institutions of higher education be acting as enforcement agents for commercial entities in what are commercial disputes? Should they face the potential loss of federal aid if they fail to do so to the satisfaction of a copyright holder? We think not. Colleges and universities should aspire to have more than a commercial relationship with those enrolled. Trust rather than suspicion is required for the best interactions between students and teachers.

Institutions of higher education can rightfully be asked to educate students about their responsibilities but should not be forced to serve as agents for private parties seeking commercial gain. Colleges and universities should also be part of a continuing dialogue among rights holders, users, and public-policy makers about what should constitute a fair and enlightened copyright policy in the digital age.

Institutions of higher education have not yet been required, as proposed, to screen all traffic on their networks for copyright violations, but such a requirement is not far fetched given the push by copyright holders for stricter copyright enforcement. On the other hand, many institutions do closely monitor their network traffic as an integral part of their network security operations. Whether it is done for security and reliability, or to enforce copyright rules, colleges and universities should honor their obligations to users of their networks and inform them if network monitoring is taking place that raises substantial privacy issues.

*Recommendations*

Government should:

- Oppose any extension of the provisions of the Higher Education Opportunity Act to threaten institutions of higher education with loss of federal funding if their efforts to curb privacy or their choice of alternative means for delivery of copyrighted materials are considered inadequate.

Colleges and universities should:

- Educate students about their rights and responsibilities regarding copyrighted materials.
- Oppose any extension of punitive provisions of the Higher Education Opportunity Act or any legislated role for colleges and universities in enforcement of commercial copyright agreements.
- Actively participate in a dialogue with rights holders, users, and policymakers about a fair and enlightened copyright policy for the digital age.
- Disclose network monitoring activities that potentially raise substantial privacy issues.

# CHAPTER 7. EVALUATION, CERTIFICATION, ACCREDITATION, COMPATIBILITY, TRANSPARENCY, AND COMPETITION: WHAT WE ARE MISSING?

## What Do We Know About Educational Materials and Practices?

It seems obvious that we should be evaluating the utility of educational materials and the practices that utilize them. One of the attractions of digital educational materials, including OER, is that they potentially allow teachers and learners (and authors) to identify the material a student uses, watch what the student does with the material, automatically determine when the student was successful given the learning objectives for the materials and when he or she had difficulty—even discover problems with the materials themselves.

But we often fail to take advantage of these capabilities—or to focus sufficient efforts on evaluation in general. As we noted earlier we need more comparative effectiveness research on digital and open materials versus existing materials as well as comparisons among online teaching, face-to-face teaching, and various blends so that we can learn what actually works well, how, and why. And if we increase our focus on what a student learns rather than what a teacher teaches, we will need to increase our support of research on the appropriate means of assessing student performance in light of the targeted learning objectives.

## Degrees and Certificates—What Do They Mean?

We appear to have better and more accessible information about degrees and certificates than about the more fundamental issues of the effectiveness of educational materials and practices. We can learn, for example, how many credit hours in particular subjects a student must accumulate in order to obtain some certificate of mastery. We can relatively easily compare the credit hour requirements across various institutions. Credits, by and large, are fungible, all being treated equally. And, at present, credits are more likely to represent levels of effort rather than demonstrations of learning outcomes.

Should we believe that all credit hours are comparable? Within an institution? Between institutions? Across state boundaries, given that colleges and universities are licensed at the state level? Do we have access to the proposed learning outcomes of each course, the activities that are undertaken to achieve them, and the assessments used to determine whether they are, in fact, accomplished? Based on the information now available, can we determine a student's competencies after successfully completing a course? A degree? Can an employer or another educational institution find real meaning when comparing one degree or certificate with another? Is there enough compatibility, comparability, and transparency to allow portability of degrees and certificates?

In trying to provide useful and actionable information about degrees and certificates, we lag far behind the efforts of the 46 nations participating in what the Europeans call the Bologna Process (named after the city where the process was initiated and the site of the oldest university in Europe). Since 1999, the European Commission, in conjunction with 19 non European Union members including Russia and Turkey, has pursued the goal of creating what might be called a European common market in higher education. Once the European Union began to permit free movement of labor across national boundaries, it became clear that employers or other academic institutions would need to be able to understand what a degree or certificate meant and how to compare one granted in Germany with one awarded in Portugal.

In April of 2009, the Bologna Process participants announced the establishment of a Framework for Qualifications for the European Higher Education Area under which degrees will be standardized to have the same meaning regarding student learning. Each nation state was expected to develop its own Qualifications

Framework appropriate to its institutions and needs. "Diploma supplements" will accompany each degree or certificate to provide details about what the degree or certificate holder had to do to receive it—rather than simply how many credit hours were taken. As part of this effort the various national governments are engaging in what is called a "tuning process" to reach agreement on what learning outcomes are necessary for someone to receive a particular certificate or degree.

It is far too early to determine if the Bologna process will prove a success in practice in Europe. But its objectives—compatibility, comparability and transparency regarding degrees and certificates—do not seem to apply only to Europe.

Three U.S. states, with the assistance of the Lumina Foundation, are now engaged in a "tuning process" similar to that of Bologna, helping faculties to reach agreement on the learning outcomes required for a degree in fields as varied as history, graphic arts, and education.[146] There are academics who have opposed such efforts—they argue that what they teach can't be measured or the effects of which can't be known until years have passed or that these efforts are an intrusion into their professional autonomy. But they have an obligation to say more than "trust us." They should work with their colleagues in their disciplines and with relevant experts to determine appropriate outcomes and measures for the particular field.

Such efforts are not easy. The American Sociological Association, for example, has been working on the meaning of competency in the field and how to measure it for a number of years. An increasing number of sociology departments are engaged in related efforts. But the number of departments engaged in the process has increased very slowly, rising only 10 percent between 2001 and 2007.[147]

These activities provide another demonstration that increasing openness is not limited to the use of information and communications technology. Qualifications Frameworks and the Tuning Process are based on providing access to the learning outcomes that a course seeks to provide, the activities designed to achieve these outcomes, and whether the aims have been achieved. Making such information accessible can benefit both faculty and students by helping them concentrate their efforts and increase the "intentionality" of what they do. Because the information is accessible, faculty members can focus on providing learning experiences geared to the achievement of the learning objectives. Students should more easily understand why they are doing what they are doing and what they need to do to succeed. Because the outcomes are about what a student can "know, understand, and do" in a given area, the process becomes more student centered, more about what a student learns than about what a teacher teaches.

While institutions of higher education are licensed primarily at the state level, there is a substantial federal interest in the issues of compatibility, comparability and transparency of degrees and certificates. Given the mobility of students and workers who may attend multiple institutions and cross state lines, the rise of distance education, and the importance of improving student learning performance for national competitiveness, it would be a mistake to ignore the need to provide better portability for credentials or to suggest that the federal government should be excluded from efforts such as Qualifications Frameworks.

Given the contentiousness around defining learning outcomes, and the often more difficult task of assessing their achievement, it may well be that there is a role for the Department of Education, the National Endowments for the Arts and the Humanities, or the National Academies, working with academic and professional societies and relevant experts, to support and facilitate these activities. At the same time, there is a need to go beyond the traditional disciplinary organizations to build better means of evaluating non-traditional and experiential learning for purposes of degrees and certifications as well as exemptions from requirements.

*Recommendations*

Governments should:

- Establish compatibility, comparability, and transparency regarding degrees and certificates as federal goals in higher education and support efforts to increase them.
- Support research on improving the ability to assess the achievement of learning outcomes including examinations that would more effectively demonstrate mastery for purposes of degrees and certification.

- Support research to improve the ability to assess and recognize non-traditional and experiential learning.
- Charge the National Endowments for the Arts and the Humanities, the Department of Education, and the National Academies, as appropriate, to support efforts by academic and professional societies to develop relevant learning outcomes and assessment measures.

Colleges and universities should:

- Make more explicit the learning outcomes they seek in certifying mastery and take greater responsibility for ensuring that students "know, understand, and can do" those things that degrees or certificates are meant to signify.

## Accreditation and Reform

Accreditation in higher education in the United States has a hundred-year history. It involves non-governmental membership organizations—80 or so in the United States operating at a regional, national, or disciplinary basis—that certify, among other things, that their members provide higher educational services that meet a basic level of quality and possess sufficient resources to continue to do so. Their seal of approval is, by and large, required if their member institutions are to receive federal and state assistance; because of their special role the accrediting bodies are regularly subject to review by the federal government in a process known as "recognition."

In 2005 and 2006, the National Commission on the Future of Higher Education, then advising Secretary of Education Margaret Spellings, issued a call for greater accountability in higher education and a more rigorous system of evaluation, to be accomplished, in part, through a reform of the accreditation system.[148]

This call for reform, in itself, might have been seen as non-objectionable. Proponents of the changes cited a need for greater accountability by institutions of higher education based on meaningful and uniform standards of quality, greater transparency for potential customers/students, and greater competition among colleges and universities—all on their face laudable goals.

But the Commission's recommendations, and Secretary Spellings' proposals in response, generated tremendous controversy in the higher education community. They were vigorously opposed by states and accrediting bodies as an unwarranted intrusion by the federal government into a realm of state activity—setting educational standards—as well as a possible threat to innovation and self improvement in higher education, to the professional autonomy of educators, and even to academic freedom. Higher education was, it was argued, already highly regulated and accountable. Opponents attacked the proposals as veiled attempts to develop and apply standardized measures of success for higher education that echoed the requirements and testing mandates of the No Child Left Behind Act. Secretary Spellings' efforts became so contentious and politically charged that when the Congress passed the Higher Education Act of 2008 it curtailed the Department of Education's efforts in this area and placed limits on the federal role in accreditation.

Should the present decentralized accreditation systems be the vehicle for educational reform? The core missions of the existing accreditation bodies do not seem to be to improve the overall performance of higher education in the United States or to measure learning outcomes or to determine the value added provided by any college or university. They do seek to ensure minimum quality standards (which vary among the different accrediting bodies) and provide an opportunity for institutional self study and self improvement so their members can, at the very least, meet these standards. They are careful to avoid actions that could be seen as impinging on the ability of institutions and academic departments to determine their own internal standards and procedures. Nor do they seek to provide comparability and compatibility in the meaning of a degree or an educational experience across different institutions. As organizations funded by their members—the institutions they accredit—they have been criticized as suffering from inherent conflicts of interest and being unaccountable to the public. Questions have been raised about their transparency; although they collect significant amounts of information from the institutions being reviewed, only 18 percent of the accrediting bodies provide information generated by their accrediting processes other than the formal actions that they take. This is not surprising given that their first loyalty is to their members; this loyalty reduces their willingness to disclose information which may be seen as damaging to the membership.

Is there a justifiable federal role in the accreditation process beyond accepting the findings of accrediting bodies that colleges and universities are meeting minimal standards and "recognizing" the accreditors? We think yes. As we noted with respect to the comparability, compatibility, and transparency of degrees, a perspective broader than that of an individual state or a regional accrediting body is useful.

The goals of higher education policy (and that of the accrediting agencies) should go beyond ensuring that institutions of higher education meet minimal standards. The goals should echo those of the Baldrige Award—encouraging continuous improvement of student learning performance in higher education. This does not mean the federalization of curricula, certification, or accreditation, or the imposition of command and control regulation. But it suggests that, as with K-12 education, the federal government should carefully consider how it might encourage a "race to the top" for higher education, including financial incentives.

*Recommendations*

Governments should:

- In light of proposals to increase the number of Americans with some higher education experience, work with states, accrediting bodies, academic and professional societies, to identify promising initiatives in improving student learning outcomes and the components of a program for a higher education "race to the top" so that the learning experiences to which students have access are more effective and rewarding.
- Encourage accrediting agencies to increase their focus on learning outcomes and the performance of their members in achieving them, and on students rather than on institutions.

## Openness and Reform

Greater openness—particularly the provision of more meaningful data and greater transparency—is a necessary component of any effort to improve student learning. We have pointed out the need for information on how students are progressing from high school to colleges and universities and then into the workplace. We have noted the advantages of providing useful information about the learning objectives of a course and the meaning of a degree or certificate. But we also need more useful information allowing us to compare colleges and universities.

Research supported by the Social Science Research Council has shown, not surprisingly, that colleges differ in the results they achieve with comparable students and that those differences can be measured. We need to know the learning objectives sought by the institutions. What do they do to meet them? How successful are they in achieving these objectives? What value do they add to their incoming students? The College Learning Assessment and other instruments were intended to provide some of this information but there is not yet agreement that we have the right means to generate the information we need in the form that we need it.

As we noted, the accrediting agencies collect substantial amounts of information that would be helpful in comparing institutions, but much of that information is withheld in the interest of encouraging candid self evaluation and improvement by their members. More of this information should be made accessible and useable. The federal government which "recognizes" the accrediting agencies should be a powerful voice for greater openness from the accreditors to promote competition among institutions, spur improvement in learning outcomes, and provide some assurance of quality and value to the purchasers of higher education services—a traditional consumer protection function. At the same time, colleges and universities which on their own possess considerable amounts of data from their institutional self-study efforts should make more of this data accessible and useable. Data that the federal government already collects should be reviewed to determine what should be made accessible and what additional information might be useful given the aims described above.

With better, more accessible, and more useable information we would be able to reward successful educational outcomes with greater funding, as opposed to providing financial support to institutions of higher education based on their enrollments as most states do now. Potential students ranging from our children to displaced workers would be able to make better choices about what institutions to attend based on outputs such as the institution's success in

achieving educational outcomes and the value it adds to its students. Now many of these potential consumers pour over rankings—too often "gamed"—based on inputs such as the test scores of matriculants, faculty-to-student ratios, the level of the institution's financial resources, and peer reviews. (In a recently published example, the leader of a major but not very highly ranked institution rated his institution above all other colleges and universities.) Greater openness would facilitate a movement away from "reputational" competition and toward competition based on learning outcomes and value added.

*Recommendations*

Governments should:

- Support research to help develop and provide meaningful educational outcomes related data that would facilitate comparisons among institutions of higher education.
- Support efforts to measure the "value added" by institutions of higher education.
- Increase disclosure of federal data and encourage increased data by the accrediting agencies.

Colleges and universities should:

- Make accessible and useable more of the data they have generated as part of their institutional self-study efforts.

## The Emergence of New Forms of Certification

Five facts suggest to us that some new means of certification in higher education are likely to emerge that will transcend state and national borders. The first is that the present system does not produce the kinds of information useful to those who wish to find high-quality educational experiences that will allow them to obtain mastery over a particular set of skills and have that mastery recognized. Second, the existing system does not produce the kinds of information useful to those who seek to find and employ individuals who have demonstrated mastery of a particular set of skills. The third fact is that many, perhaps a majority, of those who download MIT's OCW and other OER, are self-directed learners. The fourth is that there are an enormous number of young people unable to formally enroll in institutions of higher education around the world. Finally there is recognition that certain life experiences can, and should, be recognized as educational and worthy of more formal credit.

It seems improbable that the critically important and economically significant global marketplace for higher education will not draw in those who can produce and market reliable certificates of mastery. It seems improbable that employers would fail to recognize the value of an outcomes-based process. It seems improbable that students who master materials online will remain content with only their sense of personal accomplishment. It seems improbable that no one will find a new way to efficiently and effectively meet the needs of those unable to attend today's institutions of higher education. We believe that some new institutions that match the global nature of open education and address the currently underserved markets in higher education will arise to provide a means of demonstrating mastery of a subject whether it be for obtaining opportunities for further education or to better serve employers.

The META University envisioned by Charles Vest has not yet come into being, but new institutions such as the proposed University of the People are emerging to attempt to harness the power of the Internet. But we still have much work to do on defining appropriate educational objectives, determining what activities are necessary to meet these objectives, providing useful information to students about where to go to obtain high-quality educational experiences that will meet their objectives, and certifying an individual's mastery of particular skills in a meaningful way on a global basis.

# CHAPTER 8. LESSONS FROM FOR-PROFIT INSTITUTIONS OF HIGHER EDUCATION

Our analysis of openness in higher education has focused on traditional, not-for-profit educational institutions. This is not because the for-profit segment of the higher education community is uninteresting or unimportant. Given the dramatic growth of this segment over the last two decades, the substantial number of students it serves, the new resources, capital and otherwise, it has brought into higher education, and the specific issues it raises due to its for-profit nature, it deserves very substantial attention. Our analysis and recommendations are not comprehensive or exhaustive. Our goal is to start a discussion and to provide a starting point for future work by others who may want to apply the lens of openness to for-profit institutions of higher education.

## Background

For-profit institutions of higher education are not really a new phenomenon in the United States. In 1892, for example, the president of the University of Chicago initiated a correspondence school for those students who were unable to come to the campus for classes. For-profit institutions served a substantial number of students attending schools under the G.I. Bill immediately following World War II. The segment expanded as for-profit institutions became eligible to participate in federal financial aid programs in the 1980s. Some have become regionally accredited and have adjusted their target markets to become more direct competitors to traditional not-for-profit colleges and universities. (Although the segment has expanded and has drawn substantial interest from Wall Street, the percentage of students in higher education served by for-profits and the number of for-profit institutions remain relatively low compared to traditional institutions.)

Because we have not studied the for-profit model intensively and because of the considerable differences among for-profit institutions, we are not in a position to make overall judgments about the strengths or weaknesses of the for-profit model or about the performance of specific institutions. As with not-for-profits, there is an enormous range in mission, approach, performance, quality, balance between applied and more general studies, and revenue sources (federal financial assistance, corporate tuition programs) among for-profit institutions.

We have attempted to extract practices relevant to our understanding of openness from the most successful for-profit institutions. These practices are not universal; they may not even be widespread. Some of them might lead to improved outcomes in specific institutions while having little or no impact in others. We are not in a position to make judgments about these practices in a particular setting or at a particular institution. But we hope that they are suggestive about the possibilities for improving higher education through greater openness and may provide a starting point for others who undertake a more thorough analysis of this segment.

## Mission Clarity

Historically, for-profit institutions could adopt tightly focused missions such as serving working adults by providing educational experiences that help them improve their performance in a specific kind of workplace. In contrast community colleges are asked to serve a variety of missions to satisfy the many different types of students they enroll. (In the future even those for-profit institutions that had achieved operational clarity through a well-refined mission statement may face mission creep as they are pushed by the "grow-or-die" imperative of financial markets to serve new educational markets.)

## Assessment and Learning Outcomes

Clarity of mission makes it much easier to determine the appropriate learning objectives for courses, short and long, and the appropriate learning outcomes.

Among the best practices of for-profit institutions is an admirable focus on defining learning objectives, letting them drive pedagogical practices, employing technologies appropriate to accomplish them, and assessing the resulting learning outcomes.

This drive for data and emphasis on assessment may reflect the fact that institutions serve working adults who want an education that works, that helps them hang on to their jobs or to advance, and who need to justify to themselves paying a higher price to the for-profit institution than they would to a public one. It might be encouraged by employers who establish tuition-reimbursement programs and who want to make sure there is an appropriate return on their investment in their employees; employers want to be sure that the courses generate learning outcomes that will increase the productivity of their employees and of their companies. For-profit institutions may have particularly strong incentives to present clear evidence of positive learning outcomes if they are subject to regional accrediting agencies; these agencies, membership organizations made up primarily of traditional not-for-profit institutions, have been accused of being unduly skeptical of accrediting for-profit institutions. Their own profit-driven need to understand the costs and benefits of their practices should lead for-profit institutions to spend more time examining their educational programs to see what works and what is cost efficient. The fact that they are scrutinized by numerically voracious Wall Street analysts may also help fuel their drive for data. Whatever the reasons, among the best for-profit institutions there appears to be a much greater emphasis on measurement and assessment than is found in many traditional not-for-profit institutions.

## Flexibility and Willingness to Experiment with and Employ New Technologies

As participants in financial markets for-profit institutions must grow to succeed. They therefore have strong incentives to discover more efficient methods of serving both existing and new markets and should be more likely to be willing to experiment with and employ new technologies. For-profit institutions, for example, were early in recognizing the potential of distance education. They have been early experimenters with e-texts. If disruptive technology allows them to serve new markets, or serve markets more efficiently and effectively in order to profit, then they are more likely to utilize them. The growth imperative also drives institutional flexibility. To maximize the potential number of customers, for-profit institutions must expand the time and place where education is available, the delivery mechanisms used, and the formats in which material is offered in order to make their products more convenient, accessible and affordable for their adult students.

If they are to grow dramatically they would be hard pressed to rely completely on the traditional model of classroom education which does not scale well. Some have increased the number of their campuses—face-to-face instruction remains important—but the profit motive constrains capital-intensive campus development. (Some traditional not-for-profit institutions might see the expansion of their physical campuses as demonstrations of their success.)

All in all, the drive for increased profits provides a powerful incentive for growth and efficiency and can be a very positive force but, it must be stressed, only if aligned with appropriate goals. We are not, by any interpretation, raising a call to make the profit motive the dominant force in higher education. But under the right circumstances it can overcome inertia that inhibits beneficial change. In contrast there is less incentive for efficiency in not-for-profit colleges and universities. The leader that cuts costs will not earn a large bonus. Increasing productivity is sometimes used as a criticism rather than as a compliment. More important, his or her status is not often based on improvements in educational outcomes.

## A Faculty of Practitioners

Both philosophy and economics affect the choice of faculty and their roles in for-profit institutions. The composition, treatment, and power of the faculty are sources of great contention between supporters and critics of for-profit higher education. But, in at least one regard, public community colleges and successful for-profit institutions share a practice different from most traditional four-year institutions. Both utilize part-time faculty more and welcome "practitioners" as teachers. Both public community colleges and for-profit institutions recognize the need to have teachers who are able to help their students (in the case of community colleges those students focused on

applied education) learn the skills necessary for them to succeed in the workplace. Although these two types of institutions may differ in the amount of general education required for a degree or certificate, both value real-world experience in those who teach applied arts and sciences. (While there are gains in access to "real-world" learning, there are substantial issues raised by increasing the use of part-time faculty.)

## Enhancing Teaching

Neither community colleges nor successful for-profit institutions provide much support for research by their faculty. Both are focused on the teaching and learning mission of higher education. But the best of the for-profit institutions provide considerably more training in teaching to their faculty. The University of Phoenix, for example, has required faculty to participate in a four-week training program that includes adult learning theory; all teaching candidates must also attend a six-week mentorship program. Part of this training is to familiarize the faculty with Phoenix's culture and practices, but other aims include improving their teaching abilities and establishing mentoring relationships for them with more senior teachers.

This level of teacher training is not always found in traditional colleges and universities (or in all for-profit institutions of higher education). Even though the quality of an applicant's teaching is relevant for a teaching position, faculty are often hired on the basis of academic training that devotes little, if any, time to training in teaching. The faculty hiring process may include a lecture by the applicant but it might improve the quality of teaching if applicants for teaching positions were asked to provide videos of their own actual classroom teaching.

Critics of for-profit institutions have often objected to the faculty's reduced role in establishing the curriculum. The curricula, learning objectives, and required learning outcomes are generally established centrally and are held constant throughout a for-profit institution. Faculty members may be given a twenty-page syllabus that includes the learning objectives, the choice of text, and the required outcomes. But in the best of the for-profits, teachers are given considerable freedom to design their courses, choosing how they will fulfill the objectives and produce the required outcomes based on their own training, knowledge and experience. Supporters of for-profits argue that the centralized approach to the development of curricula allows greater focus on learning objectives and outcomes and avoids enormous duplication of effort as individual teachers no longer have to create their own courses from beginning to end.

## Learning in Groups

In at least some for-profit institutions students are required to be members of a learning team in each of their classes. In institutions with such requirements, a significant part of out-of-class assignments are group exercises. This emphasis on the utility of group problem solving is consistent with recent educational research on the value of learning in groups and better reflects what students will encounter in the workplace than classrooms where the faculty member is the sage on the stage.

## Openness to Business

For-profit institutions have particularly strong incentives to build lasting relationships with employers. Still largely targeting working adults, they could not survive if the students they certify regularly fail to meet employer expectations. At the most basic level, these institutions have to pay close attention to what is happening in the workplace and what is likely to happen in the foreseeable future. When they plan for growth, they need to identify emerging fields that will require, and hire, their graduates. These institutions must also be responsive to the needs of employers because many of their students are funded via employer tuition-reimbursement programs or are participants in employer-funded contract training.

# CHAPTER 9. CONCLUSION

In this report we have only begun to plumb the potential for greater openness to improve higher education. As we have made clear in our previous reports we believe that openness is not a paramount value or an unalloyed good. For example, just as we see opportunities to use greater openness to provide certifications of competence to those around the world who cannot attend institutions of higher education but who need credentials to enter the workforce, we recognize that we will need to find ways that limit openness to ensure the integrity of online testing. Just as new, more open, means of electronic distribution for scholarly work should accelerate the dissemination of new knowledge and hasten the pace of innovation, they pose financial challenges to existing vehicles for scholarly publication that have, and are, providing valuable services. The list goes on.

But with all the difficult issues to address, and with all the unforeseen consequences of these new pathways, we are convinced that institutions of higher education should move toward greater openness on their own with support and encouragement from businesses and governments. We are firm believers in the value of higher education, and we believe that greater openness will improve colleges and universities. We hope that our analysis will help persuade others that this is the correct approach and that the concrete recommendations we make will help provide a responsible path to the benefits of greater openness. We want to encourage thoughtful experimentation to learn more about the effect of greater openness in practice. And in the spirit of openness, we hope that others who know more than we do will share with us their insights and experiences and correct our mistakes and misapprehensions for the benefit of the global higher education community.

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|---|---|
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| CEAL | Consejo Empresario de America Latina<br>Buenos Aires, Argentina |
| CEDA | Committee for Economic Development of Australia<br>Sydney, Australia |
| CIRD | China Institute for Reform and Development<br>Hainan, People's Republic of China |
| EVA | Centre for Finnish Business and Policy Studies<br>Helsinki, Finland |
| FAE | Forum de Administradores de Empresas<br>Lisbon, Portugal |
| IDEP | Institut de l'Entreprise<br>Paris, France |
| 経済同友会 | Keizai Doyukai<br>Tokyo, Japan |
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