UNIVERSITY TEACHING AS E-BUSINESS?

RESEARCH AND POLICY AGENDAS

Selected Conference Proceedings
University of California, Berkeley
October 26-27, 2001

Edited by
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CSHE

Center for Studies in Higher Education
University of California, Berkeley
2002

We thank all of the authors for their contributions and for generously agreeing to include them in this publication and on the website. Additional editing of the proceedings has been provided by Shannon Lawrence, the assistant director of the Higher Education in the Digital Age project, Jenny L. White and Sandra Ouyang.

–Diane Harley

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Introduction

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/october.html

Our original intent with the University Teaching as E-Business research project was to begin to bring some order to the myriad on-line ventures in which both new and old higher education providers were engaging. Our focus has been on the placement of research universities, as initiators and respondents, in this universe. We were especially interested to see whether, with discussion and analysis, we could define a common language and reveal underlying patterns that would be useful for higher education decision-makers and scholars alike. At the peak of the confusing dot.com frenzy, in 1999, these concerns seemed especially timely. Needless to say, the landscape shifted as much between 2000 and our October 2001 meeting as it had in the few years prior to 1999. It is just this rapid pace of change—in business models, technologies, stakeholder demands and attitudes—that drove our original interest in issues of typology, categorization, and conceptual models. Cataloguing these shifts and rapidly disseminating our work has been an important goal of this project. The progress we have made to date is reflected in the materials and papers in this publication and on our website.

Background

With generous support from the Andrew W. Mellon and Hewlett Foundations, we held planning meetings in early 2001. It was clear from these meetings that there were five broad areas in need of further exploration and discussion:

- The tensions between economics, education, and culture.
- The costs, benefits, and risks of e-learning ventures to the institution.
- The factors that influence decision making, including how to define niche and determine viable structures for e-learning ventures.
- The placement of e-learning initiatives within or outside of the institution, as reflected by the array of business models that are currently available.
- The establishment of a common conceptual framework and the fleshing out of a possible future research agenda.

As preparation for the October meeting, we assembled:

1. Background readings

2. Twelve detailed case studies that represented a broad range of e-learning initiatives, with a focus on efforts at research universities, including: Army University Access Online (AUAO), Fathom, The George Washington University (GW), Global Education Network (GEN), MIT OpenCourseWare (OCW), NextEd, NYUonline, OnlineLearning.net (OLn), UMassOnline (UMO), UNext/Cardean University, Universitas 21, and Western Governors University (WGU); and,

3. A Typology Overview for Organizational and Funding Models in E-Learning.

Participants

The October meeting assembled a stellar group to discuss specific areas in more depth. The diversity of views represented at this meeting raised fresh questions and possible new solutions to understanding the significant external and internal pressures facing universities in the marketplace for higher education. We were not interested in facilitating conversations among like-minded individuals, as the complexity of the questions being asked demands multidimensional and interdisciplinary approaches. Instead, we insisted on involving a mix of experts with backgrounds in ICT research and implementation, higher education administration, social science scholarship, foundation program development, and entrepreneurship. In that we succeeded admirably.

Saul Fisher's background paper, *Teaching and Technology: Promising Directions for Research on OnlineLearning and Distance Education in the Selective Institutions*[1], presented as an overview in this publication, provided an essential scaffolding for many of our discussions. Not only did we focus on what we knew, but we spent a significant amount of time exploring what we needed to know, and how we might develop methodologies for knowing it. As you read the proceedings, you will see that the theme of potential future research agendas appears again and again.

Proceedings

After reviewing the transcripts of the meeting, we decided that their high quality warranted asking individual authors and respondents to review and revise their contributions in light of the discussions. The results of their efforts form the basis of this collection. Although both they and we have done significant editing of the original transcripts, we did not attempt to force the papers into one editorial style; rather, each represents the style and perspective of its author. Some authors chose to rework their talks into formal papers, and some authors chose the extemporaneous tone that emerged on the transcripts. In some cases, authors also integrated the Q&A sessions into their talks.

Finally, although I have not created a formal summary of the October meetings, I prepared a paper shortly thereafter which draws on our discussions, and which reflects much of what I learned from the interactions, in addition to my own research. An abstract and the full paper are included as the conclusion to this publication.

All information presented in this publication may also be found on our website:
http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/

Diane Harley, Ph.D.
Director, Higher Education in the Digital Age Project

[1] This paper is drawn from a chapter in the forthcoming volume, *Making A Market: The Rise of the Corporate University,* Breneman, David, Pusser, Brian and Turner, Sarah E. (eds.) Albany: SUNY Press.

E-LEARNING TRENDS AND PRESSURES DEFINED:

INDUSTRY VIEWS—UNIVERSITY VIEWS

Developing a Conceptual Framework & Vocabulary for E-Learning

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/GMatkin.html

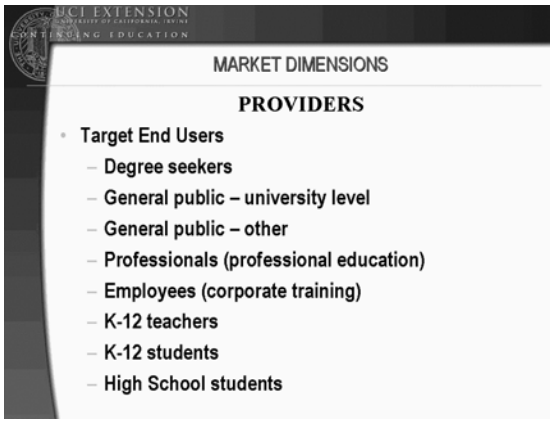
Gary Matkin
Dean, UC Irvine Extension

Colleagues, we begin this conference where many academic papers end, with a comment that whatever we say here may or may not be correct or valid, but that more research needs to be done.

In deconstructing conversations about e-learning and online education, I find that a common conceptual framework and vocabulary is lacking. "What is online learning?" "What is distance learning?" Each person has a different understanding of these terms, and the conversations about these topics can become very confusing. In this meeting we hope to establish some common conceptual frameworks through which to view the e-learning industry, the university responses to e-learning, and what useful research questions might be asked.

What does the e-learning industry look like and how is it structured? The way I approach an analysis of it is by asking what the market for the industry is. I hope this list captures most of the major dimensions of the market for e-learning.

Slide 2



In selecting the elements of this categorization, I asked three questions about each proposed element: Are the products differentiated? Is the marketing to reach the audience for the market differentiated? Are the services aligned with the learning products differentiated? If there are differences in these three elements, then a category is defined. Most of us see these as fairly large categorizations in the e-learning industry.

I list both high school students and K through 12 students because I think they are distinct. High school students, obviously, have been targeted by a lot of providers. These markets of end users (students) are targets of the providers shown in the next slide.

Slide 3

The providers are categorized into the groups listed here, with colleges and universities listed first. For-profit companies that are targeting many of the markets listed in slide 2 should also be listed as a separate category. These provider organizations are, in turn, the targets of a large number of what I call suppliers to this industry. (These suppliers, by the way, have helped lower the barriers to entry for providers in this industry).

Comparing slides 2 and 3 helps us understand a bit about the dynamics of the industry. For instance, many universities initially targeted degree seekers. As that market did not develop as rapidly as people thought it would, universities and other providers refocused their efforts on the employee market. This shift has occurred with the universities, and also with for-profits allied with universities, such as UNext and Fathom.

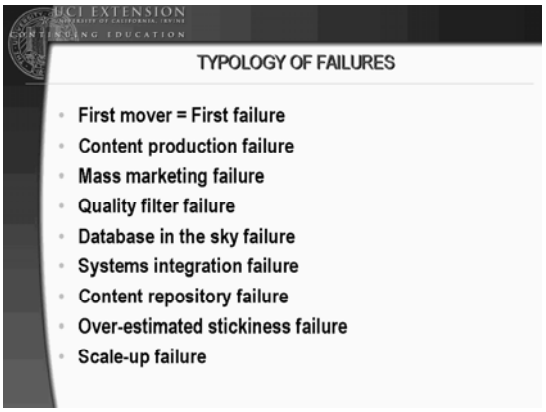
When you get to the supplier side you see a large number of suppliers to the e-learning industry. These suppliers can be categorized in terms of the kinds of functions they offer.

Slides 4 & 5

First, of course, we're all familiar with the technology infrastructure suppliers such as Blackboard, Web CT, Prometheus, e-College, and many others. The large number of these suppliers has helped lower the barriers to entry for universities, which don't have to bear the high cost of developing and maintaining their own technology infrastructure.

This industry is very young. We still don't exactly understand all of its structures and the dynamics of those structures, but we can, to some extent, begin to understand what is happening by analyzing successes and failures. Unfortunately, I think, there are many more failures than clear successes right now. If you look at those failures, you begin to see some patterns. Here's a quick list of what I see as the source of failures. In the interests of time, I'll only talk about two of them.

Slide 6



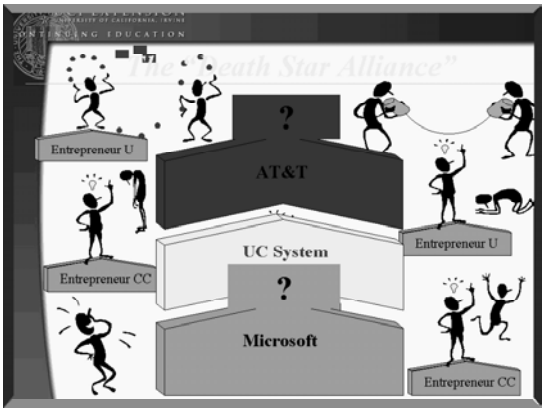
The first one I'll discuss is what I call the "failure of content production." We've seen a lot of companies get bogged down in content production. The grand idea these organizations begin with is: "We're going to produce the best course in this field that anybody ever produced, and it's going to roll over the market and drive everybody else out." Well, it's not happening. Content production is very expensive, and many companies and universities are moving away from content production because of the cost. UNext, for instance, is producing courses for $750,000, according to the case studies. That's very, very expensive, and it's very difficult to generate returns sufficient to recover the investment.

The second example is the system integration failure. We've seen a lot of suppliers to this industry come in and have to integrate their brand new, wonderful systems with not-so-wonderful, or new, institutional legacy systems. This has been the failure: many people who have approached the university market with a great new technology, such as a new learning management system or course management system, have run into a brick wall as they encounter university technology and politics.

Three or four years ago, as I was trying to figure out what was going on with this industry, I envisioned two possible models of how the industry might develop. These models represent two ends of a continuum. At one end was the idea that e-learning in the

university world would continue to be a cottage industry, categorized by small players, geographically dispersed, serving small niche markets, the current model of higher education in this country. At the other end is what I'm calling the "Death Star Alliance."

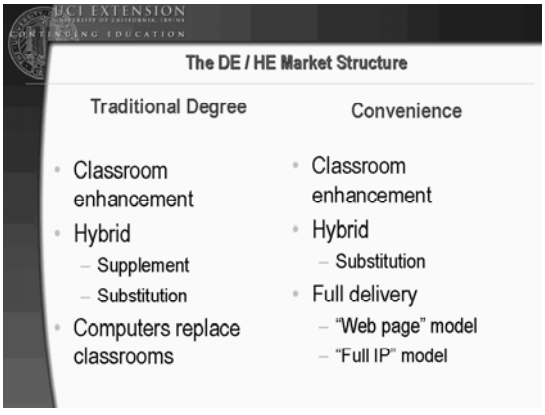
Slide 7



The Death Star Alliance is driven by the notion that if large-scale consolidation were to occur, standardization would increase, along with quality, and the Alliance could sweep over the industry, commanding a large share of it. A big university system, like a UC system, might be allied with a big software company like Microsoft, and with a big transmission or distribution company like AT&T; this combination could command a huge share of the market. This model appears less and less likely, partly, I think, because of the suppliers coming into the market.

To understand how technology is beginning to influence the higher education market, it is useful, I think, to divide the market into two segments. One might be called the traditional residential degree market and the other the convenience market, or to be more politically correct, the access-sensitive market.

Slide 8



Traditional degrees are generally delivered in a residential setting, and we all know what they are, I think. The convenience market is basically the market for part-time degrees, where a large segment of the market is responsive to convenience, the main elements of which are time and place. This slide is an attempt to show the direction of use in each market segment.

As the new technology was introduced, both markets were forced to use the technology for classroom enhancement.

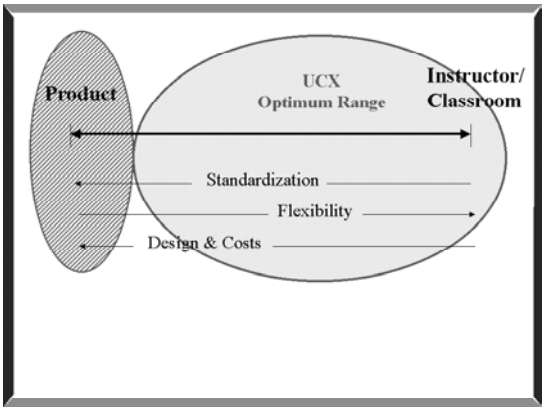
Next on this list is the hybrid course, in which online technology begins to substitute for class time. Finally, on the traditional side, we see computers replacing classrooms in several universities. Typically, if a university offers students the choice of an Econ 1A course at 8 o'clock in the morning or online, a fair number of students will enroll in that online course. They don't have to come to a classroom, so there's a replacement of the classroom experience by technology.

On the convenience side, we see hybrid courses being actively utilized. However, the usual concept of online learning is at the last level that I'm calling the "full-distance-delivery model, with no face-to-face classroom instruction." Here is an important distinction in online learning between what I call the "web page" and the "IP" models. The web page model is something we're fairly familiar with. In this model an instructor is introduced to a technology, like Blackboard or Web CT, taught how to use it, and then teaches the course. The instructor supplies most of the instructional design. The IP model, on the other hand, begins with the development of intellectual property. This usually involves the work of an instructional design professional, a technologist, editors, artists, and so forth, working along with a contract expert, usually a faculty member. This second model results in something that can actually be transferred either from one term to another, or from one organization to another. This results in some form of intellectual property. The web page model is the one that's generally in use by universities today, such as UCLA, through OnlineLearning.net; the IP model is being used by a few universities: Penn State, Universities of Washington and Wisconsin, Berkeley, and by some for-profit providers such as UNext.

These two models are often confused. Their underlying financial structures and philosophies are different. The web page model has greater flexibility, more reliance on instructors, low up-front cost, but no transferability. The IP model has high up-front cost, and more standardization, but more transferability, as well as the possibility of getting a return from selling the intellectual property.

My assertion is that one of the earliest strategic choices that universities have to make is where on this continuum they will operate, and how much money is going to be spent on instructional design. A classroom requires little formal instructional design. A self-learning product such as a CD that will teach you Spanish in 10 easy lessons with no instructor requires a great deal of instructional design. On-line learning falls somewhere in the middle.

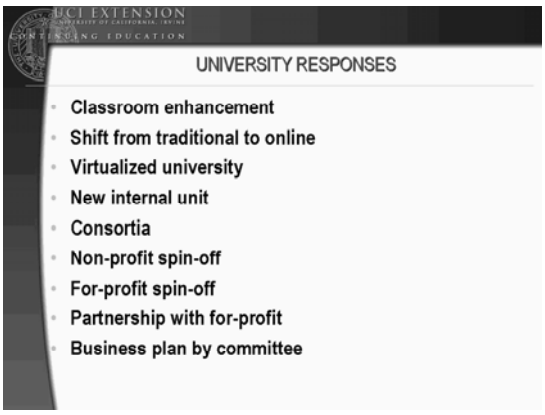
Slide 9



The difference between the IP model and the web page model is the first of a number of differences I see that are often confused. Here are a few others: there's a big difference between instructor-led online instruction and computer-based instruction (CBT). It's surprising how many people think online education is all CBT; that is, involving no instructors. Even tenured professors suggest: "I'm going to be out of a job because of what the universities are doing." (Another important distinction is between the cohort and the independent study model.) The philosophy, the format, and many other respects of these two models are quite different. In an independent study course, one may start anytime, and go through it at one's own pace. In the cohort model, one proceeds through the course with a group of other students. Finally, another important distinction is between synchronous and asynchronous delivery.

Here's a sample of what we've seen with regard to university responses in our early research. Again, this is certainly not a complete list, but a number of these, I think, are important.

Slide 10



The last item on the list is something I've seen almost uniformly throughout higher education. When I do consulting, usually what happens is that I'm sent a packet of material to look at, and it always involves some report by a committee. Right? The idea is that a committee is going to find out what to do about e-learning. An interesting research project might be simply to collect all of these reports from all of these committees and do an analysis. At least it would give us the conventional wisdom among universities about what's happening in on-line education, and what universities think they should do.

When we're thinking about the full-delivery service model, there are some elements which are absolutely necessary for success.

Slide 11

I think every university, and every organization that's doing e-learning on a serious basis, on the full delivery model, has to have each of these elements covered. Now, it doesn't mean that they have to provide each element themselves. Frequently, many of these are outsourced. An effective delivery infrastructure, for instance, might be bought from Prometheus, eCollege, or Blackboard. Even student support can be out-sourced, to some extent. But these are the absolutely essential elements. I included faculty roles and academic quality assurance for obvious reasons. If the university is doing e-learning, these elements have to be understood and handled.

The last element on this list is also a very important one, and it has so many important subcategories that I had to put it on a separate page: Administration.

Slide 12

You have to have very good administration of the e-learning program, and that means not only logistical activities like registration, organization, getting students books and other logistical elements, but you also have to have partnership, financial, project, political, and contract/legal management—these elements have to be a part of an administrative provision.

Conclusion

Any university response to e-learning should be informed by the basic information covered briefly in this presentation. It should contemplate what is happening in the e-learning industry and take into account how that industry is structured and how it is changing. Much of this change is driven by technology. University administrators should also understand the causes of failure in the industry, not only to avoid making mistakes, but also in order to assess the stability of potential partners. Administrators and university faculty members should also understand the differences between the use of technology for enhancing residential degree instruction and delivering to a distant audience. "Online education" is a term that covers many different delivery modalities, with quite different underlying financial models and infrastructure requirements. For instance, the "web page" or "walk-up" model requires very little up front funding (assuming the delivery infrastructure is available), while the "intellectual property" (IP) model can require considerable capital investment.

Finally, universities should understand the full range of elements and capabilities required for successful online, distance delivery (slides 11 and 12).

All this can be quite intimidating for universities. This presentation and the ones following are designed to help us all sort through the issues and come to practical solutions.

The Economics of E-Learning

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/MGoldstein_presentation.html

Michael Goldstein
Member of Dow, Lohnes and Albertson, Washington DC

I am in a very strange position. I am a Washington lawyer, who just this morning was meeting with the California Post-Secondary Education Commission in Sacramento. I therefore have the unique honor of saying I'm from both Washington and Sacramento and I'm here to help.

I'm reminded of the Trinity Experiments, the creation of the atom bomb, when the theoretical physicist said, "You know, there is a possibility based on our calculations that when this goes off we'll vaporize the atmosphere," to which the experimental physicists said, "That's fine. 10, 9, 8, 7…" Apparently, there's truth to that. I think that's sort of where we are. On the one hand we are trying to analyze what's happening in this market. At the same time, there's a whole bunch of people who are plunging forward, tripping in some cases—tripping fatally in some cases—but building an experimental base. And I think that is what is extremely important. We are looking at is trends and pressures, but we are not yet sure what we are seeing.

The first issues are: what is the pedagogical model, and how are we trying to teach? what do we mean by teaching and learning? A lot of what is happening in various e-learning/distance learning/technology-mediated learning is just trying to figure out what works. Remember, we are going from a couple of hundred years of the standard classroom model— the teacher up front, the students in the rear. 'I talk, you listen.' Now, particularly with the advent of technology, the educational model is rapidly evolving. We are seeing a lot of different efforts to figure out what does or doesn't work, particularly in the context of complex technology and hugely expensive courseware. The question is whether one could ever afford that kind of an educational experience, whether one can ever actually afford that process. So we have a tension between coming up with what works, and coming up with what is, in fact, affordable and available to a learner population.

The second trend that we are seeing is an organizational model issue. And I want to suggest that when we talk about for-profit versus non-profit, what we are really talking about is organizational models. There is nothing inherently different between a for-profit organization providing educational services and a non-profit or public institution providing educational services. Now, there is an enormous amount that happens at Berkeley that goes far beyond providing teaching and learning. But if we're talking about teaching and learning, there really is no fundamental difference; the execution may be dramatically different, but that difference does not depend on ownership. And what we are seeing in the marketplace is a very, very real blurring of lines between the different organizational models of providers. Particularly, we are seeing a hybridization of providers, of non-profits that are partnering or creating for-profits, of public institutions that are partnering with or creating for-profit entities. We are seeing a

fundamental breaking down of this notion that there is a category called "the good guys"—and we know, by looking in the mirror, who those are—and there is another category we are used to calling "the bad guys"—and we used to know who they were as well —and we were darn well going to try to keep that separation. We now know better: in this particular field, we are they, they are us.

The third piece where I think there is both a tremendous amount of development going on as well as a tremendous amount of learning is the issue of what sells in the marketplace. We started out with a lot of different assumptions, depending upon from whence one came. There was the argument that brand is the gold standard, that brand sells. If you put your name on it—if Berkeley puts its name on a product, pretty independent of the quality of the product, people are going to flock to it because it is, after all, Berkeley. And one model of that is UNext's Cardean University, which by co-branding with four very distinguished institutions, assumed that the brand was going to carry over to an institution they created, Cardean, which had no brand value whatsoever. What we are finding in the marketplace is that the traction of branding is rather less than people expected.

Price is another issue. The assumption was, 'What we are really going to do is be price competitive.' You can get what you need for much less money by doing it this way, as opposed to other offers in the field, whether it is doing it live or doing it online. We are finding, interestingly, that price competition is not as strong a driver as we would have expected. The low-priced brands are not necessarily getting the market position, everything else being relatively even. And no one is quite sure why, it's counterintuitive. But apparently it is a real phenomenon.

Another piece is quality. The assumption here was that if you make really, really, really good courseware that is really interactive and really attractive it will drag in and hold the student, and you will win the marketplace. Cognitive Arts is the great example of that, and some of the UNext products are good examples. Yet it is still not clear where the tradeoff is between the cost of creating a product and the quality of that product in terms of its place in the market. Really good product is good, but is it good enough to create value proportionate to its cost? It is very interesting to look at the University of Phoenix Online, which essentially replicates what the University of Phoenix does in the classroom: Phoenix Online provides a low tech, relatively low quality experiential environment, but it has unquestionably achieved good traction in the market.

The next issues, and they are really tied together, are convenience and service. Where Phoenix is really, really good, and where most institutions are really, really bad—and what we're learning really, really counts—is student service. We have had a lot of examples of institutions coming up with really good models of learning, and really good content, really well presented, and yet it fails to hold an audience. And the reason it fails to hold the audience is that when the student called with a question, nobody answered. The ease of registration in true 24x7 service, in truly having counselors available whenever the student needs it, in truly having that kind of personal interactivity, seem to be very strong drivers in terms of the success of the program. Now, this should be no great shock to institutions because I suspect we have all heard endlessly the students' major gripe: it's not typically the quality of education, it's the quality of things that

surround the education. In this regard online is no different from the campus: a long registration line, whether snaking across the gym or while placed on hold, is a long line. And students hate it.

The last piece, which seems to be running precisely counter to what the conventional wisdom was a very short time ago, is the value of the credential. The futurists told us, and many of us bought the assumption, that the traditional academic credential was an endangered species, to be overtaken by the Microsoft Certified Network Engineer and its ilk. Why, we were told, do you need an Associate Degree, a Baccalaureate, a Masters, a Doctorate, when you can have a piece of paper that says you're a Certified Widget? The answer, to the shock of many experts but apparently not to the consumer, is that both learners and employers still want the *real* piece of paper, a degree. There is no alternative credential. The MSCNE, when you think about it, is just like a pilot's license. It says you are qualified to carry out a particular narrow task. If that's what you want to be trained for, then that's what you need. If you want to be a Microsoft Certified Network Engineer, you need that particular piece of paper, but it is not replacing the academic credential, either in the minds of consuming students or consuming employers. What is interesting in the market, is that those companies who thought they could sell into the marketplace without offering a credential at the end of the day are finding much more difficulty than those that have, in fact, found a way, either as incumbent institutions, or acquiring institutions—for example, as Kaplan did in buying a small Iowa college and renaming it Kaplan College—to shroud their program within a standard academic credential.

I want to end my piece with a little discussion of the economic model. Some millennia ago, the good people of California spent many millions of dollars—billions of dollars in replacement cost— to build this campus. At some varying points, more money was put into the campus to put a new building up, to put a new roof on a building, to put sprinklers in, and so forth. These are long foreseeable costs, part of building and maintaining the campus. That is the capital cost of traditional higher education, and once the campus was built it was there to use.

We also have had a pretty predictable revenue stream, consisting of tuition and subsidy, to pay our faculty—and I'm talking now about the instructional role of the university, not the research or service role—who turn around and teach our students, who pay tuition, which pays our faculty, etc. It's like running a very simple kind of service business, because you have no actual working capital cost. Your faculty creates the capital: they create the intellectual knowledge, they disseminate it, you pay them a salary for that purpose, and they are—relatively—grateful.

What's happened in online learning, and I think we ignore this to our considerable peril, is that the economic model is fundamentally different. To start, you spend a lot of money to create courseware, and then—and this is very important—after some relatively short period of time, you have to spend more money to do something to that courseware. You have to improve it technologically because the technology is evolving so rapidly, or you have to update it to make it more attractive to learners. We are at the very, very earliest points in the technology, and we know we're going to have to keep reinvesting just to

stay modestly with the technological curve. Like the Energizer Bunny, the cost of creating courseware just keeps going.

We also have another economic problem. Once they built this campus, they opened the doors, the students flooded in, and you immediately had your revenues. But when you build courseware, you have no revenue until the courseware is completed and into the market. So we have something that we've never seen in higher education: a working capital deficit. This is the way the business world works, but it is not the higher education model. The reason we have a working capital deficit is that we had a fundamental transformation. This is why the businesses that are involved in this sector are moving ahead of us. We are creating property, tangible property as well as intellectual property. We never worried about that before because the intellectual property we had was in the heads of the faculty, and they carried it with them. They taught a course, and you paid them for it. If they didn't teach, it wasn't there, and if they left to go somewhere else, they carried it with them, and there was no residual value. We just hired another professor. But when courseware is created, you are now creating a thing that embodies the knowledge provided by the faculty member, along with whatever else the instructional designers and such have done, and that lives on beyond the mere presence of the faculty member who contributed with it.

It becomes tangible property that should be financed as capital, not as an operating expense. If we talk about the capital assets of technology, we are talking not only infrastructure, but we are also talking about courseware, intellectual property. This is reflected by a trend in the marketplace, for example, eCornell as a for-profit entity created by Cornell University, fully owned by the university, financed by an investment of the university of up to $36 million of endowment. A large part of that investment is going into the creation of courseware, the assumption being that the value created by that property, by that intellectual property, will then come back as a return investment for the institution. The investment committee of the university board is treating it as exactly that.

What we have seen over the past couple of years—this is really a compressed time frame—is the beginning recognition that there is a fundamental difference in the economics of e-learning versus the economics of what we have done for what feels like millennia. It is going to be those in the public and non-profit sectors who can adapt to this new economic model, in terms of their ability to generate funds, who will be able to compete with the commercial sector, which historically has the mechanisms and the capacity to create capital. We are learning, under enormous pressure, that success goes beyond our traditional strengths of knowledge, wisdom and integrity to a new skill in understanding—and managing—the economic model. We are seeing some of the victims littering the sides of the information highway, but we have yet to know who will succeed in travelling that road.

The Complexity of Decision-Making

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/SJohnstone.html

Sally Johnstone, Ph.D.
Executive Director, Western Cooperative for Educational Telecommunications (WICHE)

While my organization does a lot of different kinds of projects, they all revolve around assisting colleges, universities, and state systems in making good decisions about how they're going to integrate technology into their organizations.

One of the ways we are doing this involves a project we call the Technology Costing Methodology Project. It was funded by the U. S. Department of Education's Fund for the Improvement of Post Secondary Education and the Andrew W. Mellon Foundation. It is designed to get inside the institution to really describe the organizational and economic models that Michael Goldstein discussed previously. We've been working on this for the last couple of years and have pilot tested it in eighteen institutions/states. Those pilot applications involved individual institutions as well as university and college systems. We are currently evaluating the use of our costing framework with the Massachusetts Higher Education System, the Colorado Community Colleges, the University of North Carolina system, and also the Florida Virtual High School. The goal is to come up with a useable set of standard protocols that allow an institution and/or multiple institutions to really understand what their costs are when they invest in technologies. By technologies, I mean those that are used for teaching and learning, whether on campus or off campus.

I want to share some lessons that we've gotten out of the first few years of this project:

- We know that if you use technology to simply replicate the classroom, it just costs more. You are basically replicating all the classroom costs and paying for technology on top of it.
- The most critical element in all of the costs associated with this is, not surprisingly, the people—how you use them and what they're paid.
- The third big thing that has come out of this is that *scale* matters. It matters a great deal. If you are just doing what we usually do in higher education, running the technology project like a cottage industry with a single faculty member serving a set group of students, it doesn't work too well in terms of the ultimate cost. You also tend to burn-out the faculty member.

One of the biggest questions that arises out of this costing approach, which Saul Fisher mentioned in his presentation as well, is, 'how do we sort through institutional models that can support the roles of individuals to make the use of these technologies feasible?' The structure we now have really just doesn't work. We need to shift traditional faculty roles. We need to create additional definitions for professionals working within higher education on the teaching/learning process. We also need to balance what that means in terms of status and cost to the institution that's supporting them. Right now I do not know exactly how we do that, but I know we need to start. I also know we will have to look at other professions for models because there are none within higher education.

It's also important to keep in mind that to keep these costs manageable, we can't have a single faculty member developing a course, running it, and supporting all the students. As I said before, this really burns out the faculty member. As Saul Fisher pointed out in his paper[1], when you work in an on-line environment, and you have e-mail as the primary mediation between the student and his or her faculty member, there is a lot of it. Paying the proper attention to all this e-mail is very time-consuming from the faculty member's perspective. The students do take advantage of it. The available evidence seems to suggest that students use e-mail for more frequent (and perhaps more meaningful) communication with their instructor than they tend to have if they have to stop by a faculty member's office on campus.

James Taylor, a professor at the University of South Queensland, is experimenting with using an artificial intelligence (AI) system to work with conversations with students. If a student asks a question in his class at 10 p.m., and he doesn't happen to be online, instead of the student waiting forever to get a response back, the e-mail system replies, 'Professor Taylor is not currently available. Would you like Professor Jones to answer your question?' Professor Jones is really an AI program, and it's based on what Taylor calls Extensible Mark-up Language. The responses within the AI program are based on questions from students asked in previous classes and the answers given by Professor Taylor. The students are really impressed by how responsive the system is, and they don't know that Professor Jones is actually a computer program. They think Professor Jones is the greatest guy in the world, because no matter what time they log-on, he answers their questions—and he does it pretty well. This is one approach to solving the faculty time commitment problem for on-line work with students.

Let me switch from cost for just a moment to mention the public policy perspective. I work in a lot of states that are not as big as California. There are states in which the system offices have a lot of influence on what happens in higher education statewide. In several states, regional universities and community college systems are beginning to buy and lease and trade courseware between themselves. They are setting up consortia in state after state after state to enable that to happen. Some questions arise as these consortia grow, and we don't have good answers for them. We need to find good answers, which means that these research questions are very important.

One question is: what are the skills and the role of a faculty member at an institution serving students, whether this is a liberal arts college or a community college, when the courseware is coming in from the outside? This goes beyond just the teaching/learning piece; it involves engaging the student in all the other kinds of activities that go along with being part of the campus environment. Now it is not just a textbook that's coming in from the outside; it is, in essence, the whole course. I've had some interesting conversations with faculty members who find this troublesome until we break it down a

[1] Saul Fisher's paper, *Teaching and Technology: Promising Directions for Research on OnlineLearning and Distance Education in the Selective Institutions,* is drawn from a chapter in the forthcoming volume, *Making A Market: The Rise of the Corporate University,* Breneman, David, Pusser, Brian and Turner, Sarah E. (eds.) Albany: SUNY Press.

little bit. Then they begin to understand the concept and how it can work. We still don't know, however, what it really means in terms of the role of the faculty member at the local institution, working directly with students. What should he or she be prepared to do for the student? What will make a difference in the student's ability to succeed?

Another question we have involves student support needs. It is sort of a flip-flop of the faculty side. What are the essential services that students need that are not provided by the faculty member? A corollary to this question is whether or not American higher education can really learn from the open universities around the world. The open universities have been working on this problem for many years. They have some very good information, even though they may not be using the exact same technologies. Will we be able to translate this information into U.S. higher education practices?

One of the universities at which I studied did something that really impressed me. The sidewalks were made of bricks, and when a new path was worn, the bricks got moved. Where the bricks had been but were no longer being used, they planted flowers, or let grass grow. This is an example of smart adaptation. We know right now, from data that comes out of the U.S. Department of Education, that the majority of people in this country earning a Bachelor's Degree have attended more than one institution. They're going to multiple campuses, in some form or another, to earn their degrees. As online courses get better and even more available, it is likely that this "swirling" will increase. What does this mean? How do we begin to adjust what colleges and universities are doing to accommodate to this change?

Another question is 'who is taking these online courses?' In many of the institutions that I have worked with over the past dozen or so years, when they develop a good, strong, online program, the majority of the students served by this program are on campus. They thought they were doing this to serve students who wouldn't come to campus, but they are finding that their students are opting to sit in the dorm room and take the same course online that they could walk across the campus and sit in the lecture hall to take. What does this tell us? Is this a real trend? What are the lessons to be learned from it? I think this is a viable issue to think about, and there is a need for some good solid research pretty quickly.

Anecdotally, the institution's commitment to the use of technology seems an important variable in high school students' choice of a college or university. Many friends who have kids ready to go to college have told me that when they take the campus tours, the first question the kids all ask is, 'How connected is this campus? How much bandwidth can I get in the dorm?' I've been hearing this for the last three years or so. We do need to question what the kids are doing with the bandwidth in the dorm, besides downloading songs. Are they taking online courses from other campuses? Are they taking online courses from their own campus? Having a better sense of what they are doing could guide policies on campuses, and there are problems with some campus policies regarding online classes. For example, at some of the institutions with which we have worked, online courses from the same campus will not transfer into the departments that are teaching the course face-to-face (and sometimes even online) because the online course is administered through a separate organizational unit.

To sort out some of the chaos that currently exists for students and the online courses they are taking, we need to think in terms of what kinds of policies should guide faculty and departments that will lead to some predictability. Students and their parents want reasonable transfer policies. We need policies that are demonstrable to state legislators as well. In several states of which I am aware, the legislature either has considered or is very seriously considering mandating transferability between community colleges and research universities. I'm not sure it's appropriate, but it has already happened in a few states. This very real problem is being exacerbated through electronic learning.

Finally, I want to bring up one more issue. We know that the U.S. has some of the best higher education resources in the world. But a number of my colleagues in third world countries frequently make comments about how we're hoarding it. You can get a Duke MBA if you have the $50,000 a year, or you can use some high-end online activities, but very few people in developing countries who really need these resources can afford that. I think it's time that we begin, in a research setting, to come up with some guidelines, policies, and frameworks for thinking about how the U.S. can effectively export some of our renewable intellectual resources. Perhaps we can help the U.S. develop a different role in the world besides being just an exporter of fast food and action movies.

Thank you.

Response

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/PLyman1.html

Peter Lyman
Associate Dean and Professor, School of Information and Management Systems (SIMS), UC Berkeley

My job as respondent is to focus on some of the themes that we as a group might discuss, with the greater goal of beginning to define a research agenda for the Center. Our speakers have been so articulate that I don't know that I have a lot to add, except on one theme. In the papers we read and in the presentations we have heard, a unifying theme has been the identification of drivers of change. What are the drivers of change around e-learning? My own list includes four drivers of change, but it's not intended to be comprehensive.

The first driver is enhancement of the quality of teaching. I saw this particularly in Saul Fisher's paper[1], in which he commented that while classroom teaching has always advocated the teaching of collaborative learning, it has not been particularly successful in attaining that goal. However, he also said, online tools are remarkably successful in encouraging collaborative learning. That fascinated me, and it is a good example of the way in which our traditional understanding of teaching and learning would be enhanced by instructional technology. And that would probably require that we truly understand which medium to use for which kinds of teaching and learning.

The second driver, which is very prominent in the paper but also in a number of the talks, is productivity. In our minds, here in California, every day is Tidal Wave II—the rapid growth in the number of college age students—and the question is how colleges and universities in California can be more productive and absorb more students without a great deal more investment in the capital infrastructure of the state. So that's the reason the productivity argument is actively on our minds.

The third driver in what I have heard is the theme of new markets. Private enterprises like the University of Phoenix have made us aware that there are underserved educational markets. There are also major issues of equity of access that traditional higher education institutions have not met, issues which the private sector or the commercial sector is forcing us to look at. One of the things that fascinated me in the discussion of new marketplaces is MIT's strategic planning process, and their thoughts about the boundaries of their academic community. About alumni, they ask: once you graduate, are you outside the institution? This makes us think about the boundary between the institution and its various environments. Continuing education raises another boundary question about new markets. So this issue of becoming aware of unserved markets and using technology to serve unserved markets is a major driver.

[1] Saul Fisher's paper, *Teaching and Technology: Promising Directions for Research on OnlineLearning and Distance Education in the Selective Institutions,* is drawn from a chapter in the forthcoming volume, *Making A Market: The Rise of the Corporate University,* Breneman, David, Pusser, Brian and Turner, Sarah E. (eds.) Albany: SUNY Press.

To me, the most dramatic finding at this session has been that politics is a driver. This question of politics has always been latent as a driver in higher education, but it seems especially significant right now. A comparative perspective might make the political driver look very, very salient. Great Britain and Australia have both forcibly reorganized higher education in the last decade. The Australian National University, formerly the preeminent research university in Australia, now must struggle with Polytechnics for performance-based funding. There is a possibility that the subsidy for public education may be called into question by the various polities that we serve, ranging from local to state and federal. So, if you look at the trends in other countries, it is possible that political drivers for innovation could become much more important.

A related theme is that of organizational change, and the link between e-learning and organizational change. I just finished an ethnography of a start-up that sold educational technology. Having spent my entire life as part of the University, seeing it through the eyes of a start-up was pretty devastating. The most damaging memory is of the time this company persuaded four vice presidents of a university in California that this software product was a way to put them in the lead in innovation in higher education. They went to their President. He called a meeting of the entire executive cabinet, to which the company made a presentation. The executive cabinet of the University collectively agreed that this was indeed the solution for becoming an innovative institution, but that they collectively did not have the authority to make a buying decision. It was staggering to me that all of the decision-makers together could not choose to innovate. It comes back to the point that Sally Johnstone and Hans Weiler each made, that the connection between innovation and the decision-making procedures in organizations is often broken.

This is true not only in higher education. If you read Clayton Christensen's book *The Innovator's Dilemma*, the private sector has this same problem. Organizational decision-making structures always reflect successful decisions in the past, and are not optimized for risk-taking. For this reason, I've been looking at Royal Roads University, up in British Columbia. The province of British Columbia has two very successful and very innovative e-learning programs, at Simon Fraser University and at the University of British Columbia. However, they decided that they should create an entire new university optimized for distance learning, as they felt that traditional institutions really could not reform themselves to systematically take advantage of e-learning technologies. That may very well be what the commercialization of higher education should teach us: that our organizations are optimized to administer, not to manage or to lead, and that only new institutions can truly innovate.

This leads directly to a consideration of the role of the faculty. In every presentation we have heard, I think, the key problem with innovation is not about technology, and is not about interesting new pedagogical models, but rather centers on who owns the issue of the pedagogy and the content of instruction. It's not the institution, it's the faculty member, the individual faculty member. It is striking that every single talk mentioned the faculty, in the context of institutional control over both the content of teaching in the classroom, and the social relationships surrounding teaching and learning. Can we identify strategies by which faculty can be engaged in discussions about their role in the changing pedagogy, and about the content, in a constructive, non-violent manner?

Finally, it struck me that our four speakers used different vocabularies and different conceptual models. I think that's a very good thing to do in the initial stages, but it would be awfully helpful if we could, collectively and over some reasonable period of time, come to a common vocabulary and common understanding of problems. This might take the form of looking at the projects and case studies that various institutions have engaged in, and trying to assess their successes and failures, in order to present to decision-makers some kind of a rational inventory of what the choices are, what the costs are, what the possible benefits are, what the managerial strategies are, and so forth. That is, can we begin to rationalize this in a way that actually helps people who are trying to implement these changes?

Response

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/RGeiger.html

Roger Geiger
Professor of Higher Education, Pennsylvania State University

My first observation is that one of the major things that we've been asked to do is to identify research issues in this area. But we also need to think about research methodologies. What tools can we bring to bear to better understand what's going on in this world of e-business and e-learning? A subtext of this meeting is to attempt to contribute to a social science of higher education. But there are real problems here. The possibilities for traditional social science research are very limited. In particular, there is no database that we can turn to, so perhaps getting better data on this whole subject is one of the things that we ought to work toward. But right now, the kind of economic or sociological research that many of us are used to doing is extremely difficult in this sector.

Learning research is one relevant area of research. There's a tremendous amount of literature on teaching and learning, the psychology of learning, and so forth, but very little of this seems to have been brought to bear on e-learning. To do that, obviously, would be a major undertaking, so that is one of the areas that I think we might address, and I hope we will. Other approaches have been suggested. Hans mentioned comparative analysis; some of you have applied business models to higher education; organizational analysis would be another approach. All of these things are useful; they tend to do what good policy analysis should do, which is to bring an analytical framework to a body of empirical material.

However, the problem in this area is finding out what is actually going on. Partly this is simple empiricism, but then again maybe it's not so simple. E-learning is a very fast running experiment, and our task as scholars is to interpret the results of that experiment as best we can. What this really means, then, is that we're often in a descriptive rather than a prescriptive mode. However, prescription—or policy guidelines—is the ultimate goal.

So, in terms of policy prescriptions, or suggestions, let me just bring up two issues, two macro-level developments in higher education. One is the knowledge revolution—not only the great expansion of knowledge, but the expansion of knowledge industries, in which more and more people are employed. The second issue is the privatization of higher education that has been occurring. One effect of the privatization of higher education has been to diminish the boundaries that formerly existed between non-profit or public higher education and for-profit higher education. In part, the relentless attention to performance measures, accountability in higher education, has helped to beat down these barriers and put traditional educational institutions on the same playing field as for-profit institutions. At the same time, privatization has allowed non-profit institutions to venture into the for-profit realm. So it has worked both ways.

The knowledge revolution has been, on the whole, very beneficial to universities. If your business is creating intellectual capital, then the fact that expert knowledge is becoming more vital and more valuable is certainly an advantage. But overall, tertiary education has been expanding more rapidly than universities, and universities have been expanding much more rapidly than their regular faculties. These developments reflect two different forces. One is a centrifugal force—the expansion of tertiary education, the demand for lifelong learning, and increased demand for university knowledge. And, of course, we know that universities have taken advantage of these conditions, largely by spinning off divisions or companies away from their central core. Because for the academic core, the chief forces have been in the opposite direction, they've been centripetal. What has really paid for universities over the last decade or two has been the cultivation of an intense learning community, competing to have the best faculty, the best students, the best facilities for research and learning.

Within tertiary education, then, a clear division of labor has evolved. We talked a lot about that at the March meeting, and if anyone has not read the summary that Diane produced, I highly recommend it.[1] The problem with this division of labor comes from the fact that the boundaries—between universities and community colleges and distance education and e-learning—are contested. Competition is taking place where functions overlap. The future division of labor will be determined in part by the economics of each particular market segment, but in other respects, public policy is likely to play a very important role. Decisions will be made about who pays and how they pay. Will government get involved in e-learning? Will government provide financial aid for students to take courses online? These policies will have a tremendous effect on moving those boundaries. The issue of intellectual property rights for courseware also has the potential to affect how these boundaries are moved. State policies towards e-learning are also relevant. Most states are looking at ways to deliver more higher education more cheaply. The Western Governors University was one gambit. The Board of Higher Education in Pennsylvania is now looking at distance education for the same reason. Certainly, if states make major efforts in this area, they will have an impact on how these boundaries change.

So, my main point is that these policies need to be addressed now rather than later. David Breneman and I were talking this morning about the 1970's, and how student-aid policies opened the barn door to for-profit education, and we were never able to close that door again. Thus, it is important to anticipate these issues, rather than rely on the kind of empiricism that I talked about earlier, and to anticipate what is likely to occur, what the likely consequences will be, and to make relevant arguments before the die is cast. To do that, we need the overview of the whole relationship between e-learning and traditional higher education that this meeting is meant to clarify.

My final point concerns the "mess" that Sally Johnstone referred to. What is the situation within universities concerning the emergence of e-learning? Now, it seems, universities are beginning to compete with themselves, and they don't quite know what to do about it. Something like this occurred at Yale College in the 1840's, when they first established a scientific school. Yale knew exactly how to avoid competing with the college. They

[1] See http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/summary_032701.html

specified in the laws for the scientific school that it was open to graduates or other qualified students, "other than those enrolled in Yale College." So it was open to everybody except Yale students. Some universities have tried this approach to e-learning, putting up a kind of firewall, but, in fact, it's not working. It's difficult to maintain; as long as a university admits transfer credits from other institutions, it's pretty hard to put up a wall like that and make it stick.

E-learning has, in fact, already infiltrated traditional learning. Students in our doctoral program are now taking statistics courses online. Statistics is a requirement; we don't care how they complete it, we're not worried about variations in quality, we just want them to understand statistics. Online courses are the most convenient way for many of them to meet the requirement. The same thing is happening elsewhere.

What is the policy issue here? Well, colleges and universities are extremely hard pressed financially, and they're looking for ways to provide education more cheaply, just like states are. So why haven't they gone wholesale into providing online courses at a much lower cost? For one thing, of course, they don't know how to do it yet, and it's not clear that these courses actually cost less. But this might very well occur in the near future. I want to make an analogy here, an analogy to the use of part-time faculty. We all know that the current use of part-time faculty has grown enormously over the last couple of decades. It is the private scandal in higher education that nobody likes to talk about. But why have part-time faculty been substituted for full-time faculty in the delivery of instruction? For several reasons: it's been done incrementally, it's very inconspicuous, and it's supported by the faculty departmental culture. Providing some courses more cheaply allows universities to occasionally give an annual raise to the regular faculty, etc. It's a budgetary necessity. But, in offering courses by part-time teachers, no one raises the question, 'What works?' No one asks, 'Does this enhance learning?' It is simply a matter of, 'This is the best we can do.' At some point, I think, online courses are going to cross this threshold and become a cheaper way to deliver higher education—the best that institutions are able to do. And at that point, the substitution effect may become dramatic. So here's another area where we ought to recognize the issue and at least ponder the consequences before it occurs, rather than afterwards.

STRATEGIC PLANNING AND IMPLEMENTATION

THE CHALLENGE OF ADAPTING ORGANIZATIONS AND CREATING PARTNERSHIPS TO TARGET NEW MARKETS

MIT, the Internet, and the Commons of the Mind

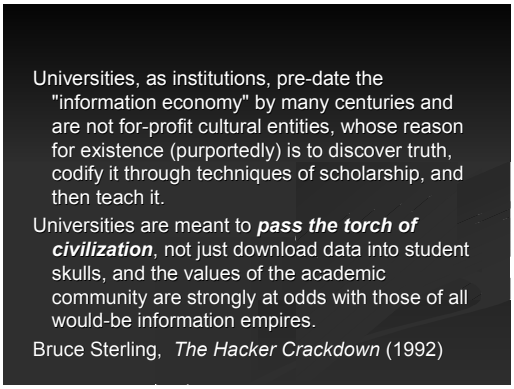
http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/HAbelson.html

Hal Abelson
Professor of Computer Science and Engineering and Co-Chair of the Council on Educational Technology, MIT

Vijay Kumar
Assistant Provost and Director of Academic Computing, MIT

Hal Abelson: I'm here as a representative from what might be called the ultimate niche market, but I find that I'm a bit of a Luddite. I also spend a lot of time in business. I coordinate MIT's 'Death Star Alliance' with Microsoft, and I do a lot of consulting at HP. There's interesting jargon that happens in the business world; people use funny words, like "e-learning" and "e-business." I get a little scared when universities start adapting that rhetoric because I worry that the rhetoric, as it so often does, will lead into adopting business styles of thought.

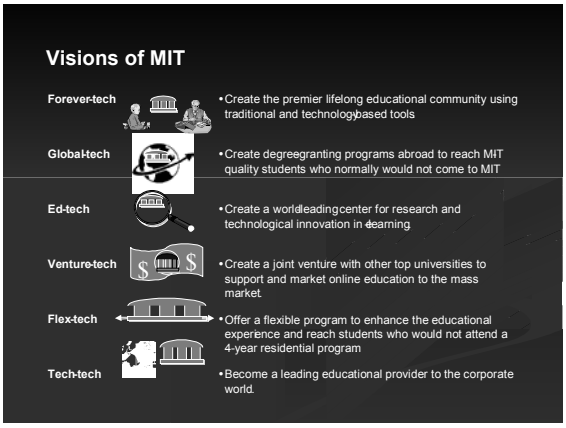
Slide 1



This is one of my favorite quotes by Bruce Sterling, who likes to say, "Universities are not in the business of producing intellectual property, they are in the business of broadcasting free thought." I hope we remember that, even though this is a very complicated world and the issues we're talking about at this conference are extremely serious.

We have already discussed the importance for universities to proceed from a strategy, and what we're doing at MIT has the illusion of deriving from a strategy. We actually did a five- or six-month full-time study with some people from McKinsey & Company, looking at the Internet and telecommunications. When you do a study like this with consultants, they have you start with a visioning exercise, and this is one of our visioning exercises.

Slide 2



They asked, "What can you imagine that MIT might become?" There are all sorts of possible visions. There's a Venture Tech, to create a joint venture, using the MIT brand, to take a big chunk of the science education market, hundreds and thousands of people that we can brand at MIT. We weren't interested in that, even before a lot of the companies that we were looking at, and being tempted by, declared Chapter 11.

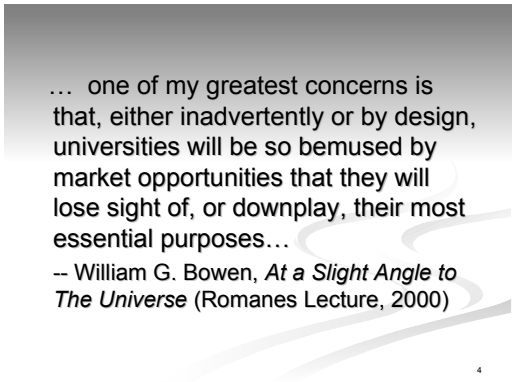
Another possibility is Global Tech. That's a perfectly reasonable thing to do. MIT has the aspiration. MIT believes that it educates from among the top five percent in the United States, and a few sprinklings of people from across the world. You can imagine MIT saying "MIT's position would be to the top two-and-a-half percent in the world as it is to the top two-and-a-half percent of MIT." We didn't do that, either.

In general, these opportunities fall into two classes. One says that we would like to expand the market for the university, either become a commodity publisher or global publisher or work with industry in something they call tech-tech, which is a strategy like the one Wharton is following, a business-to-business strategy involving top technical universities. The other one, which we focused on, we called Forever Tech, which says that the opportunity for MIT—and I just want to stress that this is MIT's view—is to transform what it means to go to the university. Rather than the typical university experience—you go there for four years or five years, and then you go away, and they send you a letter every year asking for money—MIT wants the university experience to be more of a lifelong association with a very, very special community. And, by the way, there is a rather quirky four-year initiation ritual that happens in Cambridge, Massachusetts, starting at the time you are 17 or 18 years old.

So let me start with what I was actually going to say. I want to apologize for this rather pompous title, but I'd like to publicize the phrase 'commons of the mind,' which comes from Jamie Boyle, who is a theorist of intellectual property at Duke. The commons of the mind is a kind of mental ecology that certain of us live in that has to do with free-flowing and free-exchanging ideas. It is important to use economic jargon so that this ecology, like a real environment, is largely non-rivalrous and non-exclusionary. Like the real environment, the commons of the mind is being threatened by various kinds of pollution

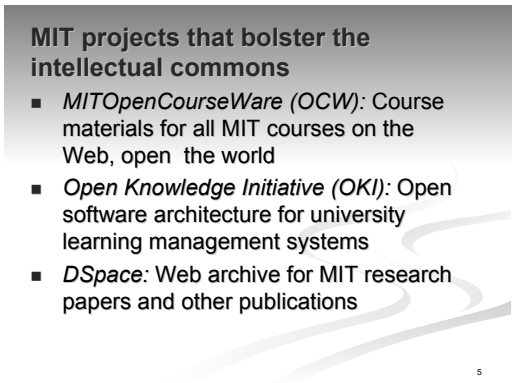
these days. That pollution largely consists of people asserting intellectual property rights. What a university does, by and large, is to try to feed on this natural resource, and it's important that it does so. At MIT, we are doing a wonderful experiment in studio-based physics, which is blatantly taken from what Jack Wilson did at Rensselaer Polytechnic Institute (and I am thankful, daily, that Jack and RPI did not patent that; after all, it's not clear that you couldn't patent that). But I worry that the pressures that we're talking about, the investment pressures that Michael Goldstein brought up, of having to recover your investment and thinking about capitalization, will start to undermine this commons of the mind for universities, and will make our lives much more difficult.

Slide 4



Here I quote Bill Bowen, who is President of the Andrew W. Mellon Foundation, blatantly out of context. Saul Fisher references Bill's Romanes lecture in his wonderful paper[1], which I strongly recommend that you read. This quote is taken completely out of context because in the very next sentence Bill goes on to say that this doesn't mean that universities should not engage in distance learning, but there are certain trade-offs and dangers and things to worry about.

Slide 5



[1] Saul Fisher's paper, *Teaching and Technology: Promising Directions for Research on OnlineLearning and Distance Education in the Selective Institutions,* is drawn from a chapter in the forthcoming volume, *Making A Market: The Rise of the Corporate University,* Breneman, David, Pusser, Brian and Turner, Sarah E. (eds.) Albany: SUNY Press.

What I want to talk about are MIT's initiatives, and there are a lot of them. I want to focus on three that have to do with using the university's infrastructure to bolster the commons of the mind, the intellectual commons.

There's OpenCourseWare, which says we're going to put up all of our course materials, free, for everyone in the world. There's the Open Knowledge Initiative, which Vijay will talk about; we are trying to create an open-source, open-software learning platform that universities can build on. Then there's D-Space, which is the analog of OpenCourseWare for university research publications.

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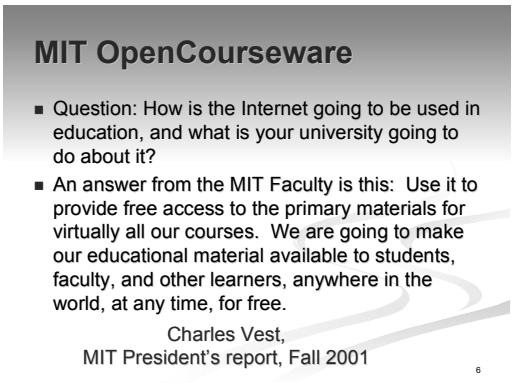

So let me go from quoting Bill Bowen, out of context, to quoting MIT's president, in context. This is from our current president's report, which has not quite been published yet, and while it's not an official statement from MIT, it really does represent an official statement from its president. It asks, 'When you consider the opportunities for using the Internet, what do you really want to do?' One answer, from the MIT faculty, is that we're going to use the Internet to put up all of our course materials, free, for everyone in the world.

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Now, when we announced that, it got a lot of publicity.

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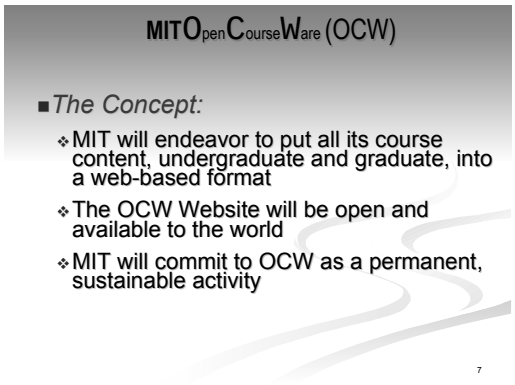

The idea is that we're going to put this up for free, make it accessible to everybody, and MIT, as part of an arrangement with the Andrew W. Mellon Foundation, is undertaking to structure itself so that it can take this on as a permanent, sustainable activity. I should have mentioned that, of the three initiatives that I spoke of, the Andrew W. Mellon is intimately involved in all of them. The Mellon and Hewlett Foundations fund OpenCourseWare; Mellon is the funder for the Open Knowledge Initiative. Mellon is also funding a business study to try to help us to understand the sustainable business models for the university library around these goals.

OpenCourseWare received a lot of publicity, and it even made the front page of *The New York Times*. It got literally thousands of responses from all over the world. Here's one that I like to quote:

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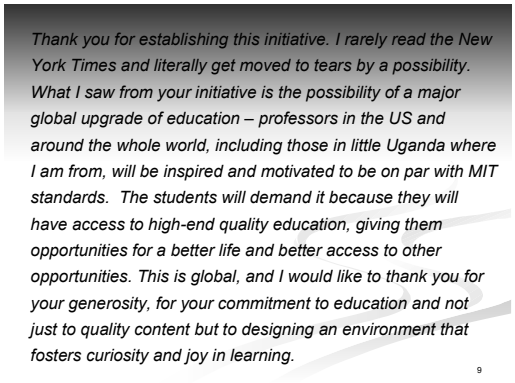

So there has been a lot of remarking, and people saying, "What's MIT doing?" "Are we giving away the store?" "Why in the world are we doing something like this?" So here are some of the reasons that we present.

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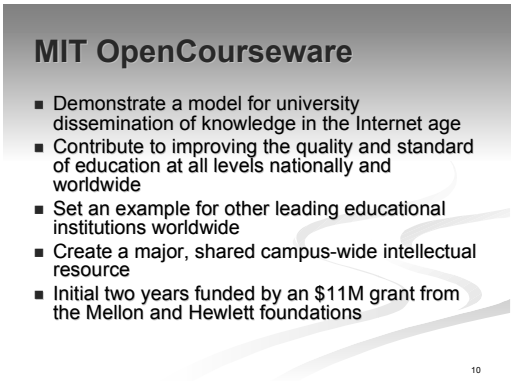

People have asked if we foisted OCW on people, or if it came out of nowhere, but this was probably the most discussed initiative that MIT has had. A few of us have battle scars from making individual presentations at every one of MIT's departments, and listening to faculty feedback.

Interestingly enough, the biggest criticism we have received is that we are going to set up some terrible bureaucracy that faculty will have to deal with in order to put their courses up on the Web. That was actually our biggest worry in mounting this initiative, but we do want very much to set up a model. The best thing we can imagine is that many other universities will follow us in putting up course material, helping to create this commons, this ecology. People and universities can then build on this commons to help fulfill their mission, which is educating students, bringing students into a very special kind of community, without having to worry about, 'Well, can I take this piece of material from there and there and there, because I have to clear rights, and who owns this and who owns that?'

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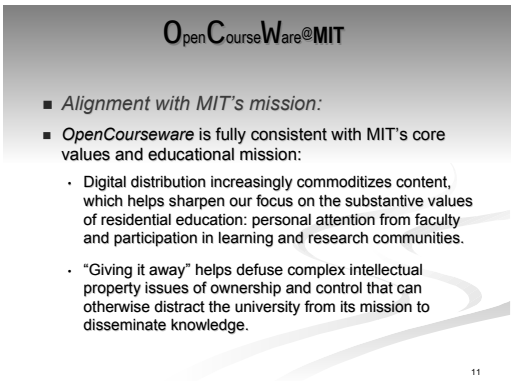

OCW is very much in line with MIT's mission. A lot of people point to this as being a wonderful, altruistic gesture on the part of MIT, but in cold business terms, I don't view this as an altruistic gesture at all. MIT is much more a consumer of course material than it is a producer of course material; any university is. MIT, at least, is very much about the interaction between faculty and students that happens on campus.

Michael Goldstein made a comment about the university that just shocked me. I forget the exact words, but it was something about the university, the teaching and learning part, and then there's the other part. At least for MIT, I don't know how to think about that separation. It's not meaningful, in the way MIT thinks about itself or the way many universities think about themselves, to separate the teaching and learning part from everything else. In cold business terms, forget about altruism; if you're producing an entire thing and there's a value chain, and you find your unique differentiator, it is to your advantage to commoditize the rest of the value chain. This is why IBM is putting so much money into Linux and open source. It's really wonderful that people see tremendous benefits to the world from what MIT is doing, but I do not view this as altruistic. I view it as a way to help preserve university values in the face of the threat of commercialization of this thing called courseware.

Not to mention the second point, which is the problem of intellectual property. For all of us who have been in any discussion about online learning, we usually get sucked into these horrible discussions about intellectual property, and about the rights of faculty and faculty commitment. But in this case, MIT's point of view is that this courseware continues to be owned by the faculty, and, formally, the faculty is giving MIT a free, non-exclusive license to map this stuff as part of the OpenCourseWare initiative, and we'll fight about ownership someplace else, as I'm sure we will.

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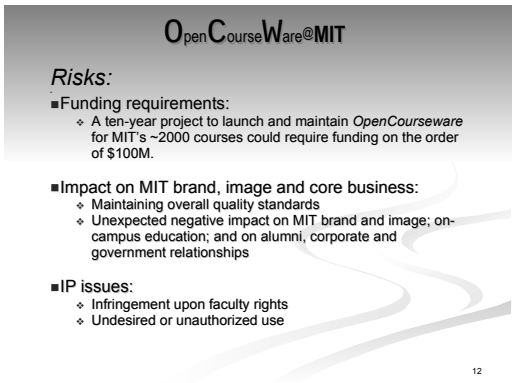

There are a lot of risks in this initiative. I think the worst is that we create some terrible overburdening mechanism that faculty has to deal with. We're talking about 2,000 courses. I know that's not a lot in terms of UCLA, but at MIT it's a lot, and it's a hard thing to do.

Then we have the usual issues, such as parents. We unmasked this project just about the same time as parents' visiting week; I don't know how we did this. So poor Marilee Jones, our Dean of Admissions, was faced with parents asking, "You mean I just signed up to pay $35,000 a year to send my kid to MIT, and you're putting it on the web for free?"

Another risk is that we don't actually meet this challenge. This initiative is MIT's way of saying that the thing that's unique about an MIT education is not what is put on the web.

If you really believe that you're going to get this same education from the stuff up on the web, or that your son or daughter is going to get that, we can suggest ways to save $35,000 a year. This is also a question for the faculty, who say things like, "If I put all my course notes on the web, why will students come to class?" to which the appropriate response is, "Well, why do they come to class now"? So it really is a challenge to us, the faculty, to deliver on that vision. There is something special that is going on in classes and something special that is going on in that interaction we call education, which is not courseware.

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Let me switch to the second initiative, D-Space. This is a vision of D-Space.

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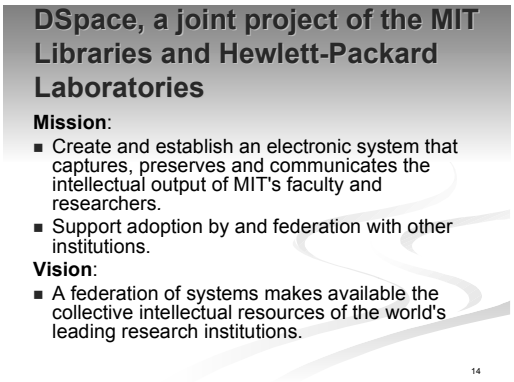

D-Space is a joint project of the MIT Libraries and Hewlett Packard Laboratories, which are sort of fighting the same fight. These are adjacent communities in terms of thinking about for-profit education and intellectual property. There is blood all over the place in scientific journals with the issue of putting a preprinted journal article on the web. It is an equally horrible fight. But the voice of the university is not really a part of this discussion; universities have not put any skin in the game. There are faculty who write angry articles, but what we're trying to do at MIT is to create an infrastructure that allows the university to develop something like the Los Alamos Publication Archive, which as you probably know, just moved to Cornell. The question is whether the university can say, 'This is our research output, and we will have a say, and we will have a seat at the

table in the discussion about how that information is put up on the web.' D-Space is almost ready and will open in March as an archive for all MIT faculty. It is also designed as a federated system, so we would love it if universities took the software, put it up, and created a big interoperable publication archive among universities.

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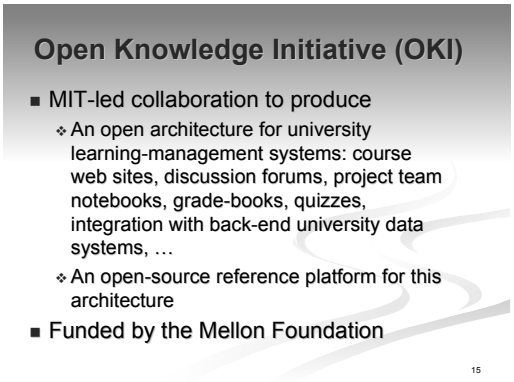

The third initiative is the Open Knowledge Initiative, which also has to do with this 'commons of the mind.' It is concerned with the architecture that allows people to put up courseware, along the lines of things like Blackboard and WebCT. Someone said in the last session that these learning management systems have created a very low barrier to entry for universities mounting course material. But what you have to appreciate is that while it creates a low barrier to entry, it creates a high barrier to exit. That's part of what OKI is about. I'm going to hand it over to Vijay Kumar, MIT's Assistant Provost in Charge of Education and Director of Academic Computing, to talk about this initiative.

Vijay Kumar: OKI's goal is to build an open extensible architecture for educational applications—one that allows educational applications to inter-operate with campus infrastructure services, such as authentication/authorization, all those things that the business of higher education institutions need and, at the same time, to allow the efficient creation of interesting pedagogical tools.

One of the popular educational application areas that OKI will support are learning management systems, like Prometheus, Blackboard, and the intent, again, is to make sure that they can be easily extended to a variety of educational domains.

OKI is about creating a community; it's not just about specifications to be created, although we recognize that without the architecture, without the specifications, there are no tools and there is no community. That's a low-level, but high order goal. The Andrew W. Mellon Foundation, which supports OKI's project at MIT, is a partner. We have some significant collaborators. Stanford is certainly a key collaborator, and there are about eleven institutions, including Berkeley, that are contributing to shaping the architecture and are hoping to help build applications.

There are two critical aspects of OKI's philosophy and approach. One is that OKI recognizes that there are common infrastructure services that need to be accessed in order to provide functionality to educational applications. But there's no need to build these services again and again. That way, people who are building educationally useful tools can focus their attention on pedagogy and educational value without being distracted by infrastructure services. There was some mention about a sustainable ecology, which brings to mind the notion of renewable resources—which is why we want to build these common services so they don't have to be built anew each time. This way educational tools can be used in different ways at different locations, they can be borrowed and shared efficiently.

In that sense OKI does not compete with the marketplace; it enables the marketplace, instead, to be doing interesting things without worrying about this level of the infrastructure. OKI's intent is to build an architecture that enables good educational practice. OKI's intent is also to build enduring educational practice, that lasts over time and technology variations, and that's where the sustainability notion comes in. The other main aspect of OKI is that it adopts a business or distribution model—the open source model—which is exactly intended to facilitate large-scale adoption of the tools, and of the model itself, so that good things can continue to happen. That's where OKI is focused. The project is progressing well, and we are hoping that in about six months, there will be some very elegant and definable applications.

One additional thing I did want to point out is about strategic planning at MIT. The most significant part of the strategic planning exercise is that there was a lot of reflection about what is unique about an MIT education, and how that could be amplified and extended to different communities. The kinds of strategies that came out of subsequent work with consultants tried to address that issue of extending the uniqueness to other communities and amplifying it. What followed was a series of large-scale experiments because, while we hypothesized and speculated on good directions to pursue, we felt that we had to understand more. So we undertook some large experiments and provided incentives for people to participate, and then started building infrastructure components like D-Space and OKI, in order to increase the likelihood of success and sustainability of these experiments. That's where a lot of the strategy is. What has to be done to close the loop is to conclude and assess those experiments. We're hoping to pay a lot of attention to that.

UCLA Extension in Its Context

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/RLapiner.html

Robert Lapiner
Dean of Continuing Education and Extension, UCLA

The title of this seminar, "University Teaching as E-Business," reveals that relative emphases—and the values they signify—are changing. Because digitally based teaching breaks the barrier of place, it has introduced the notion that teaching is a tradable commodity, for which there are presumed external markets, to be reached through forms of sales and promotion. Moreover, institutions are increasingly interested in the post-baccalaureate audience, although residential degree study and research remain the essence of "brand identity." In the past, such external markets had been considered adequately served through the relatively marginal programs in executive education and continuing education units.

The change is driven because university-level learning is a growth industry: educated people need to learn throughout their lifespans. The more states regulate professions, the more re-licensure or re-certification requires continuing higher education. Nationwide, adults already constitute the majority of enrollments in higher education. Combine the needs for access to forms of university-level education with pressures of work, family, the stress of traffic, etc., and it is obvious why distance education appears particularly well-suited to meet soaring demand.

Contextual Questions

These societal phenomena lead to broader questions about optimization of institutional structures. Are existing university organizational models adequate for a fundamental expansion of mission? What advantages accrue in maintaining continuing higher education responsibilities within separate/parallel academic and administrative entities, often mandated to be self-funded? What advantages accrue where they are integrated/distributed? How does each model assure that institutional standards are advanced, flexible support services provided, financial risk absorbed, and entrepreneurship encouraged? Assuming that e-teaching for and outside of degree programs—along with research and commercial licensing of university discoveries—is becoming a routine expectation of faculty life (and a contributing basis of extramural reputation), are our reward structures for faculty and academic staff adequate?

Apart from the issues of structure and mission, potential for augmenting resources, and greater focus on external publics, e-learning is spurring equally fundamental changes in student expectations. Those in the pipeline of higher education over the past decade have been using technology for self-paced learning, inquiry, and entertainment since childhood; when they arrive at the university, they have already been conditioned to anticipate e-learning as an unexceptional part of the educational landscape. No wonder students welcome faculty didactic approaches that use digital media effectively—and see such development as the logical fruition of consumer demand. The advent of e-learning

contributes to the widespread vocabulary shift in university discourse, where students, faculty, and staff are now commonly described as internal *customers* and *clients*.

As an agent of change, e-learning represents a truly new phenomenon within higher education—when the test for the "new" means that its arrival inalterably changes what came before, the way a newborn child changes an existing family unit and, by her presence, may be said to re-create the family itself. In "Tradition and the Individual Talent," the poet and critic T.S. Eliot suggests another test of the new. Eliot theorized that the arrival of authoritatively new great works of art (or artists) permanently adjusts the received canon:

> The existing monuments form an ideal order among themselves, which is modified by the introduction of the new (the really new) work of art among them. The existing order is complete before the new work arrives; for order to persist after the supervention of novelty, the *whole* existing order must be ever so slightly altered; and so the relations, proportions, values of each work of art toward the whole are readjusted…. (T.S. Eliot, "Tradition and the Individual Talent," 1920.)

Extending Eliot's notion of "works of art" more broadly to ideas/processes and their applications, his aesthetic theory sheds light on the impact of e-learning in the academy. Just as we read Sophocles' *Oedipus* and Shakespeare's *Hamlet* differently because of the insights of Freud, e-learning is altering relationships, values, and hierarchies, and rearranging long-standing practices and patterns within the university.

The Case of UCLA Extension

UCLA Extension's experiences in online education may elucidate a number of these issues. E-teaching has changed UCLA Extension. (It has not introduced business notions into our thinking, because the University of California requires us to function as a not-for-profit business in whatever we do.) It has made us less of a regional institution—the definitional essence of Extension programs everywhere—and more of a regionally-based institution serving a global audience.

Since launching our distance learning initiative in 1994, we have become the putative leader for non-residential post-baccalaureate online instruction in California. Out of our annual total of more than 100,000 enrollments—from some 65,000 adult learners—about 7,000 are online, coming from all fifty U.S. states and as many nations. This achievement arose through a contractual alliance with a corporation, in which we attempted to balance an apparent convergence of our mission and academic interests with their resources and commercial aim of capturing a foothold among those who serve the vast market of adult learners. The company in question, OnlineLearning.net (OLn), is now a division of Sylvan Learning Systems.[1]

[1] CSHE prepared a case study about OLn for this seminar. That case study can be found online at: http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/case_studies.html
The casual reader might not realize that it is as much about UCLA Extension as Oln—which was founded upon its relationship with us. In its corporate role, OLn has been responsible for marketing, technology support, and distribution. Virtually all the academic reference points in the case study—courses, student profiles, standards of instruction and evaluation and assessment—are

Goals and Strategy

In 1990 (when I arrived at UCLA), there was no independent distance education capacity anywhere, in contrast to other land-grant universities, where technology had been routinely used in continuing education units to make university resources accessible to external constituencies. Thus I set out to explore whether existent campus instructional technology infrastructure for internal use could be directed outward on behalf of UCLA as a whole. Among the faculty, administrators, and Senate leadership consulted at the time, the concept held no intrinsic interest. Thereafter I focused my attention on Extension alone.

Our story about university teaching as e-business has to be understood with regard to the question about placement within larger institutional structures. Where the continuing education division is predominantly an academic administrative apparatus through which the faculties teach their disciplines to non-traditional students earning degrees, the continuing education units have become the natural locus of comprehensive campus or systemwide approaches to expand capacity through technology. Penn State, the University of Illinois, and the University of Wisconsin are corroborating examples; their continuing education and outreach divisions administer distance education for their universities as a whole. In contrast, at places like the University of California, where Extension is organized as a parallel, instructionally independent, self-supporting academic unit within each campus, the path of development has been very different.

UCLA Extension embarked on its path for its own sake, mindful of course of the responsibility to be prudent citizens of the university body. Our goals were not expansionist. *Our strategy was not exponential growth, but diversification to maintain our market position.*

Our expectations were informed by what we knew about our students, about our unique academic profile, and from a keen awareness of our resource limitations. However much our strategy appeared conservative and risk-averse amid the heady optimism of the early '90's, our fundamental objectives were to roll out sustainable distance education models that were consistent with our pedagogy and our mission of providing accessible high quality learning opportunities for adults—without incurring undue risk.

UCLA Extension's programs and student populations are primarily post-baccalaureate; a high proportion of our students hold an advanced degree, including thousands with a doctorate. We do not confer degrees (though our courses are routinely accepted for credit toward degree programs elsewhere). Within our field, we enjoy a reputation for innovation in pedagogy. Thus it was also important for us to be an early and successful adopter of technology-delivered education, to be faithful to a defining aspect of our identity. Our motivations were thus, reputationally, to be and to be seen as a "player" in the new instructional paradigm, and economically, at the least to maintain our "audience share." A motivation arguably unique to us was to retain a number of our highly accomplished instructors, in the development of whose didactic skills we had significant

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UCLA Extension standards and processes (some of which OLn has replicated in order to serve other institutions besides us).

cumulative investments. Our academic leaders were equally convinced that many of our students would try e-learning for reasons of convenience and the appeal of novelty.

Why we allied with a commercial firm

Necessity drove the alliance with OLn. No funds were available to us from our own or general campus resources to launch a major distance learning initiative. (Until 1996, Extension was enjoined from fund-raising or seeking grant support for our internal infrastructure.) Consequently, in 1993-4, after eighteen months of broad and deep consultation within our campus and the Office of The Regents, we elected to work with a newly formed company. (The original agreement had been intended for other forms of distance education, but by 1996 had been amended to include online learning.) Its responsibilities were to generate capital, assume all financial risk, provide technology resources, and take on marketing and new kinds of support services for audiences outside of our region, that exceeded our own means. For example, we knew that we did not have the customer service capabilities that market expectations in the instant-gratification environment of the nascent e-business world might require (e.g., real time web-enrollment capabilities, 24-hour technical support service to accommodate students across time-zones, rapid complaint resolution, or the ability to execute marketing contracts at the speed of business). On the other hand, we welcomed the ancillary benefits, namely that designing new services for distant learners would make us more effective in our own backyard.

UCLA Extension vs. extending UCLA

When we began, I had convinced our Chancellor that Extension's undertaking was vital to UCLA, by showing what was possible (and what was not), and by our assuming the sole risk for potential highly public failure. To protect the rest of the university from possible unintended consequences of our efforts, we erected firewalls in our relationship with OLn, all the while hopeful that our potential success and the lessons to be learned could foster intra-campus collaboration. (They have.) Managing our identity as UCLA Extension was essential. In Southern California, the public may understand the difference between UCLA, a selective degree-granting research university made up of internationally renowned faculty, and UCLA Extension, a public service open enrollment emanation of the university that uses primarily expert practitioners to teach adult learners. From the outset, we have exercised great care about how our worldwide visibility and ubiquitous online presence might alter perception of UCLA in undesirable ways. Besides the necessary vigilance about the characterization of UCLA Extension in all OLn promotional materials, we strove above all to ensure that our activities would not interfere with distance learning plans that might be undertaken elsewhere at UCLA. Consequently, I withheld offering online a part of our instructional program, namely courses that are exact replicas of the UC curriculum. Though we have offered these for most of our nearly 85 year history (those who teach them pass scrupulous review by the faculty and the Academic Senate), I decided that no such online courses would be developed while we were contractually bound to a corporate partner. This avoided all potential confusion about open enrollment access to UCLA degree credit offerings online.

We also embargoed some of the programs that define us, such as our unique curricula in the fields of entertainment and our short courses in Engineering. We did so out of familiarity with the expectations of the targeted learning communities to interact personally with each other, in the manner of a graduate seminar, and to network professionally. Moreover, we were sensitive that were we to translate these programs online, expectations to manipulate the most advanced digital applications (conditioned by their work environments) would not be met by our broad-market approach to instructional design. We therefore tested Moore's law, waiting until the needed technological breakthroughs and readily accessible bandwidth would become more available in the marketplace, for us to exploit economically at some future date.

Our prudence was also conditioned by the consumer behavior of post-baccalaureate students. Though many of our 65,000 students are enrolled in certificated programs that require concerted study for consecutive years (at a part-time rhythm), many more enroll primarily to obtain particular information or to quickly master higher level skills. They leave us once they feel they have gotten what they need (particularly in a healthy economy). Moreover, non-academic issues—careers or family obligations—frequently require them to drop out. Awareness of the enrollment volatility of the typical post-baccalaureate student necessarily moderated our expectations. It also informed our decision not to present online courses that would either require especially high investment and maintenance or might have too narrow an appeal.

Structuring the enterprise

The development and oversight of online courses required organization. Innovation rises up; it can rarely be imposed. I was thus convinced that we needed to mainstream adoption of distance learning as a natural medium for instructional delivery for all academic departments, enlisting corollary support from administrative and support units. We thus deliberately eschewed a centralizing "command" model that many institutions have deployed; fraught with early tensions, this distributive approach respected our organizational academic structure and ambient values—and it has worked. A Distance Learning Unit was established—not to drive development, but to support it. It troubleshoots across all departments; organizes uniform training to instructors (and students) in the use of the online technologies; oversees consistent evaluation and assessment of courses and instructors; manages the routine relations with OLn; and it identifies for resolution the resource constraints and academic policy issues arising from our approach to online teaching, namely the triumvirate of expectations of distant learners, specialized needs of instructors, and the cultural challenge of working with a commercial partner.

Pedagogical standards

Like the university in general, Extension cherishes the authorial voice. The Extension experience is thus not defined by course materials, but by our instructors' expertise, their teaching skills, and the relationships between instructors and students and among students resulting from the learning experience. Consequently we were indifferent to the siren call for state-of-the-art courseware, to repeat courses again and again independently of a living, breathing instructor. Massive scalability was never our expectation (though it was

an underlying economic expectation of OLn). Furthermore, we applied university practice and policy toward ownership of intellectual property, meaning essentially that while Extension had the right to the underlying curricula—and thus remained free to hire instructors and faculty to teach a subject area—we made no claim upon the course materials that they developed themselves. Such rights were reserved entirely to the creators of digital content. We painstakingly secured OLn's formal agreement with our position as a condition of our collaboration.

This double insistence that each class represents a unique learning experience and that enrollments be capped to guarantee effective pedagogy was a noteworthy tension in our relationship with OnlineLearning.net. For the company, re-purposing for subsequent re-use was seen to be key for generating profit. However much this tension was a source of strain between us, both sides shared a desire to develop a highly visible profile and multiple capabilities—and sought economies of scale elsewhere in areas of infrastructure, customer service support and processes. Progress on these shared objectives overcame some of the unresolved tension.

For the last half decade, together we have offered about 200 individual UCLA Extension course titles in multiple sections (more than 650 total at the peak) each year, using a web-based approach. A single instructor, after going through obligatory training in online pedagogy, leads a cohort of students through a highly interactive program over a finite period. (Most courses require an academic quarter and carry four units.) Students must complete their study within the prescribed interval. Though instruction is asynchronous, the students and instructor must interact regularly each week. Active participation is obligatory. To spot problems, support staff routinely check that instructors and students are indeed logging in and communicating. In this regard, our didactic approach is *flexibly* paced within established guidelines; it is *not self-paced*. Nearly ninety percent of our students maintain that the online experience is as good or better than what they would have expected from a face-to-face class; forty percent of our enrollments in any given quarter are returning students, reflecting high levels of satisfaction and retention. Equally significant, many instructors ardently affirm that online teaching is the most didactically gratifying, effective (and demanding) form of teaching they have ever done.

In Conclusion

Our original objective in working with OnlineLearning.net had been to secure the means to engage in distance learning while containing the risk and fostering (but not forcing) broad institutional willingness to participate in the new learning economy. Although Extension's original ambitions may have seemed circumscribed, the success of our approach stands out in a now less crowded field. We benefited from OLn's capitalization of the original enterprise and its early willingness to underwrite experiments and under-enrolled classes to "capture market share." There is little doubt that our reputation as a "player" is (temporarily) secure. Today our program has reached a point of economic stability and increasing pedagogical richness. Because of our acknowledged expertise, we are also assisting other UCLA academic units to launch independent and collaborative online programs of their own, and are involved in a number of funded projects with faculty. Our contractual relationship with OLn has also evolved. For the two years remaining in our agreement, we have assumed or are about to assume full responsibility

over the totality of our online program, except in courses for educators (which align especially well with the audience profile of OLn's new parent company). Thereafter our entire portfolio returns to UCLA Extension's exclusive institutional control.

This overview has not described the inevitable turbulence wrought by e-learning within UCLA Extension. It was predictable, as in any phase change, and came about because we consciously made way for the "truly new." Today our original strategic vision has been validated by the ranks of enthusiastic instructors and sizeable numbers of students from around the globe, who constitute alternative learning communities within the dynamic equilibrium of our programs overall. It is prudent to note, however, that while we have seen incremental growth from truly distant locales (from Seattle to Singapore to Saudi Arabia), a substantial body of online learners has simply elected to study via the Worldwide Web, rather than contend with Southern California traffic. This reality suggests why it is imperative that institutions adopt an e-teaching strategy, not necessarily to grow revenue or use internal distributed/learning systems to substitute for building classrooms, but simply to survive amid the changed expectations of students of all ages.

Will electronically delivered university instruction be an independently profitable auxiliary business of universities? If UCLA Extension's experience is predictive, at least within research institutions of standing, e-learning may never become any more financially "profitable" than other forms of university education. Without question, however, it is now part of the "core business" of higher education: an instrumentality for teaching, research, and public service, and a form of the teaching and learning arts particularly well-suited for discernable needs among the most educated and longest lived population the world has yet known.

Possibilities at UC Berkeley

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/PStark.html

Philip B. Stark
Professor of Statistics, Faculty Assistant in EducationTechnology; UC Berkeley

I want to talk about a couple of things today. Neither exists yet, but these are plans at Berkeley, partly for things that will be rolled out in time for the spring semester, and then a grander vision that adopts many of the MIT ideas.

First of all, in looking at an online component for courses or for education, it seems that the low-hanging fruit, in a certain sense, is to deal with administrative issues. It's very difficult to create good online pedagogy, but it is pretty easy to save some time in the classroom so that the instructor can devote more time and attention to pedagogy by doing some things online (e.g., distributing syllabi, having lecture notes posted there, doing a variety of things like that—books lists, facilitating communication between faculty and student, etc.). For example, enabling faculty to broadcast e-mail to all students enrolled in a class with a single click (without having to populate some database of e-mail addresses for himself or herself) could promote better communication between faculty and students with little faculty effort.

My view of my colleagues here at Berkeley is that most of us are extremely busy. We don't have time to learn how to use new tools. We don't have a lot of time to develop something different; what we're doing is working well enough. There are a few people who are out on the fringe, as I am, who are willing to spend 5,000 or 6,000 hours developing online content, but most of us are not like that. So what we're trying to do as an institution is to increase the number of faculty who are involved. What we're doing is automatically generating course websites for every course that we offer, and putting useful information on these course websites by solving the data integration problem across campus: being able to pull from the Registrar's database, from the Scheduler's database, from individual departments, and from the directory database, to post where the instructor's office is, the instructor's e-mail address, etc.

We want to have book lists online. We want to have a simple way that faculty can broadcast e-mail to everyone enrolled in the class or everyone on the wait list of the class. Once we've done all this, we'll generate an e-mail message to each instructor of record before the semester starts that says, "We built you a course website. You can look at it or you can not look at it. Here's a URL you can go to in order to manage it, if you want to upload lecture notes, etc. But, by the way, if you just reply to this e-mail message with an attachment, we'll treat the attachment as your syllabus and we'll post it for you." The idea is that faculty, without having to do anything more complicated than hit 'reply' in their e-mail program, can post a syllabus. This way, we hope to get much higher buy-in. There are issues that we need to resolve with the Academic Senate regarding specific features. There are faculty who grow livid at the idea that their e-mail addresses will be there for students to see. And we need to work on policies for whether that's just their problem; whether they can opt-out, or whether they should have to opt-in, etc.

We're building this infrastructure to be compatible with OKI. We've joined OKI and we're hoping to be part of what goes on. We're looking at putting up modules like discussion boards, bulletin boards, etc., that would be built to the OKI standard. There's an opt-in/opt-out issue for that as well. Some faculty feel that if there's a bulletin board on their course website, then they're obligated to monitor to it and to respond to things that are posted. And some people see this as an imposition.

One of the other things that we're doing with online components to learning is webcasting lectures. This is something that grew out of Larry Rowe's work, and has been used in Digital Chem 1A. Webcasting allows us to broadcast lectures, essentially in real-time, and then archive them. One of the problems is making webcasting something other than 'vanity video.' Professors might like to see themselves on the web, but for webcasting to actually be a more useful resource, it has to be marked up with metadata in some way so that it becomes indexable, searchable, and retrievable. In that way, we're trying to change our strategy.

We don't have a very good system yet for dealing with the metadata. We're not sure what metadata we should have for things that are long enough to evolve over time, like a lecture. It's very hard to mark up a lecture. Larry Rowe has a solution via the Lecture Browser, which makes it much easier for courses with a PowerPoint presentation that accompanies the lecture. You can use changes in PowerPoint slides as tags to mark up what's going on. But providing metadata is a problem that we have more generally. We also want to look at recorded lectures as a cultural artifact that might be useful to people. We would like to specifically seek out faculty who are particularly good at it—such as those who have won the Distinguished Teaching Award, Nobel Prize winners, etc.

So now I'm going to talk about something that's even more speculative. We have an initiative that's just starting. The acronym is BRIDGE, which stands for Berkeley Resources for Internet Delivery of General Education. We're taking sort of a scatter-gun approach at the lowest level, automating the generation of websites for every class. At a higher level, we're trying to take a much more targeted approach and look at the large enrollment, lower-division classes. What we intend to do is to develop online instructional materials that are in some sense analogous to the Berkeley physics series of the early 70's. We want to have the next generation of textbook that incorporates interactive components, streaming media, every bell and whistle you can think of, but in a pedagogically sound, tested, well-developed way.

We'll try to do this for 20 courses over a five-year period, and then add more after that. We have 29 'gateway' courses. They range across departments, and I can tell you what these are: Anthropology, Biology, Chemistry, College Writing, Computer Science, Economics, Environmental Science, History, Mass Communications, Math, Political Science, Physics, Psychology, Sociology, Statistics, and Undergraduate Interdisciplinary Studies. We're hoping to start with one course from each of these groups, and build on that as time goes by.
In order to get faculty to participate in producing something that has really high production values, sound pedagogy, and is really useful to the students, we somehow need to get faculty buy-in. One of the things we want to do is involve two faculty in each department in producing each class, to make ownership more inclusive, so that it

becomes more of a collective resource. We also want to work with the Budget Committee to change what the incentives are for faculty to continue to use online materials, even if they're not online materials produced by that particular faculty member. We're really trying to reorient things, so that faculty will find it in their interests, not only to create, but also to use. Our idea for that at the moment is to have short-term endowed chairs with a lot of prestige or panache associated with them, maybe some sort of a stipend, and try to get two faculty members working on each class. So a faculty member would hold the chair for a couple of years, and be relieved of all administrative responsibility. They would still have the ability to do research in the summertime, but during the year, that person would work with the staff, and teach the class for which the materials are being developed. We would try to be very thorough about this, with a large professional support staff.

In order to be able to do this sort of thing, we're going to need to elaborate on our infrastructure. I think that the right way to be delivering this course content is through a learning management system, but one that is integrated with a campus-wide portal. So we need to think about how we're going to bring a portal online, how we're going to solve these metadata problems, specifying what the metadata are, and marking things up. Those are very difficult things to fund on their own, but to fund them as a component of a large venture that's really focused on giving away sound online pedagogical content to the world might be possible.

We feel very strongly, as MIT does, that our value-added is largely in the contact between faculty and students, and we are not taking a distance learning model for residential instruction, but that does not mean that the technology cannot be used in other useful ways. What we want to do is to build this course content in a modular fashion, so that it will be more useful to us and to the community in a variety of ways. For example, we're hoping that this course content will be useful for building advanced placement courses in high schools. It might be that there are five modules associated with the Berkeley course, but for an advanced placement class in high school, you would use four of them. We'd like to be able to give the materials to junior colleges in the same way, but perhaps they're on a quarter system instead of a semester system. We need to be able to break up the content into pieces in some way. The intent is that it will be modular, so individual faculty can customize the bits and pieces that they want to use.

Breaking the content into pieces has another advantage—we accept a lot of students who have two-year degrees, and take them in as transfer students, as juniors. This is part of an official program in California, to try to increase the number of students who can graduate with University of California degrees. In order for these students to graduate in a timely way, once they're admitted, they need to fulfill a lot of prerequisites, many of which are not offered at the junior colleges that they've come from.

Currently, there's a procedure that we call articulation, where we look at the junior college course offerings and decide whether or not they're equivalent to some course offered at Berkeley, and, particularly, whether they're equivalent to a prerequisite for declaring a major. It's just a binary decision—yes, it is; no, it isn't. What we're hoping to do is to refine this, so that we can say, "Well, it almost is. This Statistics class would be equivalent to the Statistics prerequisite for Business majors, but for the fact that it's

missing a unit on regression." Then offer students a one-unit class by distance learning that covers that single missing module, which, in conjunction with what they've already done, will satisfy their Statistics prerequisite for declaring a Business major. By breaking things up into pieces this way, we hope that we can improve the throughput of junior college students, who otherwise tend to take longer to graduate than students who enter as freshmen. Fulfilling prerequisites does seem to be the stumbling block.

Why target the large-enrollment classes? Well, it economically seems to make sense to us to devote more resources to them, because they touch more students. They also are the courses that are most likely to be helpful to us for the junior colleges in this articulation issue, and that are going to be the most useful to the community to give away.

We're planning to start an inter-session between fall and spring semesters. This is roughly a three-week session, which is about the right period of time to do a one-unit class. It would give transfer students an opportunity after they arrive in the Fall to figure out what's missing. Hypothetically, they could pick up that extra one unit module during inter-session, and be on track in time for the spring semester.

People here are familiar with the CITRIS Grant, perhaps. UC Merced is a new campus at the University of California. The educational component of the CITRIS Grant here at Berkeley is to provide our lower division Computer Science curriculum remotely to the UC Merced campus.[1] These courses are being built in a modular way, using tools that were developed at Berkeley, the WISE System. What we're hoping to do is to use that as the starting point. Here we have modular course content. We have the tools to be able to deliver it remotely. We can kick-start BRIDGE with our Computer Science 3 and Computer Science 61A-B-C, to try to see how and whether or not breaking up a course into one-unit pieces will work.

The modular course content that we hope to develop for these other classes we also intend to be able to offer remotely to UC Merced, to help them get going, as they're hiring faculty, etc. The Dean of Engineering there seems to be interested.

We want to have a lot of human outreach and training in how to use these materials. We're hoping to bring junior college faculty to Berkeley for the summer to teach them how to teach from these materials, to bring high school teachers to Berkeley with some of the students who will be comprising their senior class the following Fall, also to teach them how to use the materials. And we hope to use the high school students in testing, evaluating, and updating the online pedagogical materials that we're developing. Moreover, it's a way for us to do outreach because we have these students close by. It gives us an opportunity to target, and then, possibly, to offer fellowship or scholarship support down the road, to those students we identify as having promise.

One of the most important things that we're looking at using these materials for is to supplement our disaster recovery program. We have a SAFER Program, a big seismic retrofitting seismic safety improvement program. And it's a large capital project. But we

[1] It turns out that the person who is in charge of building a lot of the course materials for CITRIS is also the person who does the articulation of CS classes for the junior colleges, Mike Clancy.

know that even if we succeed completely and manage to get people safely out of the buildings after a big earthquake, they're not going to be able to go back into the buildings for quite some time. By using a server in Arizona, we could deliver course content remotely. By having archived streaming video of faculty who are particularly good at giving these lectures, and core content for our largest classes, we can continue to function as a university, even while we can't occupy our buildings. Because it is easier to find a place for small classes to meet (such as cafés in the area) than it is to find a place for the larger classes to meet, it makes more sense to target the large lower division classes with this effort. In this way, we can continue to function and teach our core curriculum.

UNEXT: Innovator or Barbarian?

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/GCox.html

Geoffrey M. Cox
Cardean University President /UNext Vice President for Academic Affairs

I'm giving a talk next week for which the organizers have set a title: *A View from the Dark Side.* Given some of the remarks I heard yesterday, I suspect that some of you feel that I'm here as a representative of the Dark Side today as well. UNext seems to be a kind of Rorschach test—some people see us as exciting innovators, others as barbarians at the gate. I'll let you draw your own conclusions.

Just to level the playing field, let me give you the elevator pitch version of our story. UNext is a for-profit corporation based in suburban Chicago. It owns and operates Cardean University, which is licensed in the state of Illinois and accredited by the Distance Education and Training Council (DETC) to give MBAs and a few other degrees. We work with a consortium of five schools (University of Chicago, Stanford, Columbia, Carnegie Mellon, and the London School of Economics), and on an ad hoc basis with faculty at a few other places, including UC Berkeley and the Harvard Law School.

We were founded about four years ago, but have been in the market of selling courses and degrees for only about a year. Our first market has been large corporations that are seeking business and management education for employees. We have relationships with about 40 companies, most of them Fortune 100; GM is our largest customer but others include Barclays Bank, Time Warner, Samsung and others. We also accept individual students and have some sales through colleges and universities.

I'm going to frame the rest of this around five theses. Here is the first:

1. Traditional universities are better than we are.

We do not see ourselves in competition with our consortium partners, or with other good residential brick-and-mortar institutions. In fact, our academic provenance, both as a corporation and as individuals, is a point of pride for us. Our courses are created in partnership with great universities; our board includes three Nobel Laureates and other academics; every one of the senior people in our company has close, ongoing ties with a major research university.

To be a full-time, residential student at a good quality university is a great opportunity for any student. We would never argue that one should take our courses instead of attending a college or university. Furthermore, universities perform many functions that we do not claim to perform: they socialize and acculturate students in various ways; they provide a home for research and the creation of new knowledge; they select and mark some people for elite status in society, etc. And most of the time they provide a more intimate and robust education than we can online.

The problem with traditional universities is that they are very expensive and quite limited in their reach. The US has the most elaborate and extensive higher education system in the world. Yet even here, only 50 percent of all high school graduates go on to college, and only half of those earn a degree by they time they are 25 years old. Until recently, most college campuses were not very hospitable to returning, older students.[1]

On a global scale, established universities touch a vanishingly small percentage of the population. Only about one percent of the world's adult population holds a higher education degree. We often say at UNext that we'll be quite content to serve the other 99 percent.

What are the limitations on providing traditional university training to more people? Well, first there are the apparent costs: building campuses, training faculty, setting up the necessary infrastructures to recruit students, etc. But that is not the greatest cost. Very few economies in the world can afford to take a significant percentage of their most talented people offline during the height of their productive working years to attend college full-time. In developing economies this is nearly unimaginable.

Most people who consume higher education are going to do so part-time while working at other jobs, and sporadically over long periods of time. Current universities are not built to accommodate this kind of study, and many of the best universities are simply hostile to this kind of student.

2. In the past ten years we have witnessed a confluence of four developments that are potentially very important for higher education. Three of these seem to have lasting influence; one was very transitory, but no less important.

The rise of the Internet. The rate of adoption has been orders of magnitude faster than any other technology in the past 100 years. It has been faster than TV, radio, telephones, air travel, etc. More important than ubiquity, the Internet has some features that are especially powerful for teaching and learning:

- Multipoint to Multipoint, so networks of communications can exist,
- The ability to track learners—what they do, what they succeed at and what they fail at—improves the ability of the instructor to diagnose and teach, and
- The ability to put learning resources at the command of the student, which allows self-paced, non-linear instruction.

Most of what we call e-learning today fails to take advantage of these three features, and therefore the capacity of the Internet as a learning tool has not been realized. It's like the early days of film, in which a fixed camera recorded what amounted to a stage play. This

[1] It's important to note that the mental image of a university that many of us have—full-time faculty and full-time, traditional-aged students living and working closely together on a pastoral campus—is not the norm. While this remains an idealized picture of university life, it is not an experience open to very many people, even among those US students who complete undergraduate degrees.

didn't improve much on the model of the stage play, and it certainly didn't take advantage of the power of the medium to tell stories in different ways.

The increasing importance of Human Capital. Seventy percent of a nation's wealth is represented by human capital, rather than physical capital or natural resources. Education is one of the most direct ways to increase the value of human capital. In developing economies this is critical. Even in the US we under invest in human capital (remember the 50 percent who lack higher education), and there is a growing realization that one must continue investing in education throughout life, not just during the years prior to age 25.

A renaissance in thinking about pedagogy. I use the word 'renaissance' advisedly here. I don't think there is much new in this field (between Socrates and Dewey we have long known what constitutes good teaching). But on most campuses that I'm familiar with there has been a renewed interest in learning and methods of teaching. Part of this is driven by technology, but there are other reasons: sensationalized reports about overcrowded lecture halls, TA's who can't speak English, curricula that are shaped more by political sensitivities than educational goals, the rise of consumerism among students and their parents. Almost every major US research university reformed its undergraduate curriculum in the 1990's, and most research universities added at least some reference to quality of teaching in evaluating and promoting faculty.

Availability of investment capital. (This is the transitory one). The Internet bubble made huge amounts of money available to create new forms of educational institutions. UNext was a dot-com, mostly to raise money, even though we were somewhat embarrassed by the associations this created (and we have since formally dropped dot-com from our name!). We turned down as much money as we actually raised. This level of investment in education is not unprecedented—think of the great fortunes that went to endow private institutions in the late 19th century, or the state investments in the land-grant institutions. But we haven't seen this level of investment in higher education in a long time, nor are we likely to see this again anytime soon.

3. The best universities were not—and are not—suited to take advantage of this confluence of events.

Why? First, because they are essentially peripheral to the main work of the institution. This was my experience at Stanford and at Chicago as head of continuing education. I'm amazed that places like Cornell and Columbia have heavily invested their own funds in these ventures, but this is not the norm even among the wealthiest institutions, and it may not be sustainable. Most universities have experimented with technology to improve quality, not to expand access. For the most part, ventures in distance learning have been made to strengthen or exploit a niche; this seems perfectly reasonable, and it was the strategy I recommended when I was in charge of planning at Stanford. But by and large, everything from the physical structure of most campuses to the incentive structures for most faculty militates against large expansion or sharply different approaches to teaching and learning. UNext, on the other hand, is built from the ground up to capitalize on these new opportunities.

4. To capitalize on these opportunities, one must think deeply about five elements that all must reinforce each other: content, pedagogy, technology, support and the market.

It makes very little sense to take existing university content, whether in the form of lectures, syllabi, course notes or other artifacts of site-based teaching, and simply publish them on the Internet (think again of the analogy with early film). Most lectures are very ineffective as learning devices even live and in person; they are not made any better by broadcasting them as postage stamp-sized images at slow speeds on a small screen. Indeed, to overstate a point only slightly: from the learner's perspective, putting these things online is a waste of money and time.

To create courses that work on the Web, one must rethink the structure of the course itself. At Cardean, we rely heavily on problem-based learning, something that lots of teachers think is a good idea, but which most universities are not structured to support. Every one of our courses involves some large, messy problem that the student must figure out and demonstrate a solution for. In the process, the student learns theories and skills that are transferable to other problems.

Online students need a different kind of support and interaction with instructors than do residential students. One must rethink the notions of teaching, coaching, mentoring, etc. We heard yesterday about one professor who has created an immediate, automated response technique so that students get instant feedback. We do the same thing, only with real people. We respond to student assignments and inquiries for many of our courses within 20 minutes, 24x7. Why? Because our goal is to provide support when the students need it, not when it is convenient for the instructor. One of the mistakes we are prone to—and I think most e-learning ventures share—is to think that we are making educational products; that what's on the screen is the goal of our work. Education is a service business. If you don't have service behind the screen, it doesn't matter what you put online.

Finally, all students are not alike. It is absurd to think that any single course will be effective for all potential learners, regardless of their backgrounds, ages, level of motivation, etc. It doesn't work and, if the Internet is used effectively, it isn't necessary. When one loses the homogeneity of student groups that all enter at the same age with roughly the same educational background, one can't assume a common frame of reference for a course. The Internet allows one to constantly tailor courses to meet the needs of students. Failure to do so, once again, underutilizes the power of the medium.

5. The Market is increasingly fragmented.

One of the things businesses like to talk about is "who is your customer?" In the e-learning marketplace, this is not an easy question to answer. If the customer is defined as the consumer of educational services, it's pretty straightforward. If the customer is defined as the buyer of such services, it gets complicated. Most of our buyers are corporate HR departments; some are other universities; some are individuals; some are governments. The motivations of each of these buyers are somewhat different, and one must be prepared to satisfy all of them, in addition to the student, to be successful. Traditional universities rely on well-established feeder systems for students, and tend to

define the terms of the relationship with those students once they are enrolled. In our business we have neither of these luxuries, which means that we must be far more flexible in how we interact and serve our student populations.

I've talked about our origins, our commitments and our motivations. Let me conclude by talking about our aspirations. Success for us is going to be partly measured in dollars because our capital structure will require it. It would be dishonest to say that the founders of the company were not interested in making money. That said, most of the employees of the company are not working for stock options. They are paid competitive salaries and have some hope of sharing in the future financial success of the company. But no one working in the trenches has much hope of getting wealthy, and people are explicitly told that if money is their motivation then they are working at the wrong place. Many people assume that a for-profit environment necessarily creates different motivations, choices and patterns of behavior than in the not-for-profit world. Having now had direct experience on both sides of the fence, I disagree. While it is true that certain of our choices were driven by the bottom line (e.g., the decision to concentrate on business and management curricula), the basic commitment to quality and educational integrity is not different.

There will be other measures of success:

- We will be educationally successful, and able to demonstrate it. We are able to collect large amounts of data on our students and will devote considerable effort to analyzing their experiences. So far, the data are overwhelmingly positive.
- We will achieve a kind of scale that satisfies the ambition to democratize education.
- We will stand alongside other educational institutions and be a respected member of a community of educators. Accreditation is one measure of this, but there are more important ones. For example, I hope that when I'm asked to talk to groups of academics, it won't be billed as a message from "The Dark Side"!
- We will influence the way the Internet is used and help spur innovations in teaching and learning on campuses. As far as I'm concerned this is where we've already had success. Virtually all of the faculty with whom we've worked have told us that their approach to teaching has changed as a result of building a course with us, and many are using our courses in their campus-based teaching. That is the highest form of validation that we can hope to achieve.

Online Education:
The Rise of a New Educational Industry

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/ADiPaolo.html

Andy DiPaolo, Ph.D.
Executive Director, Stanford Center for Professional Development, and
Senior Associate Dean of Engineering, Stanford University

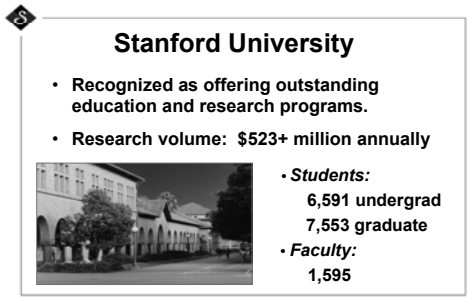
As Stanford is so close to Sand Hill Road in Palo Alto, interesting things occur, with a lot of venture capitalists coming around the campus. One who came last year dropped off a prospectus on e-learning. These are the six bullet points that were in that prospectus, about how they profile education and online learning:

- it's the most fertile new market for investors in many years
- it presents the opportunity for very large-scale activities
- it has many disgruntled current users
- utilization of technology is relatively low
- it has the highest strategic importance of any activity in which this country engages (well, at least until September 11th)
- existing management is sleepy after many years of monopoly

I particularly love that last one, which is probably true.

What I'd like to do in this presentation is to build off of the case of Stanford, which has had a strong reputation for doing distance education for many years.

Slides 2 & 3



Let me first put out a problem: how do you get a small number of faculty with enormous research volume to change behaviors around teaching and learning? Why should they do anything more or different? What are the consequences of doing that? Like most faculty members in research universities, they're extremely busy with research, teaching, service responsibilities, and at Stanford, people are off starting companies and engaging in other activities. So the challenge for Stanford is, how do we take advantage of what faculty

members are already doing, as part of their existing teaching exercise? How do we align what we do with the strategic mission, in this case involved in engineering and science, as well as some management education delivered to the classroom? The key for us is to tie our e-learning, or distance learning, into the school's strategic initiatives in areas such as bioengineering, photonics, and networking.

Slides 4 & 5

Stanford Center for Professional Development

SCPD, in collaboration with Stanford faculty and industry experts,develops and delivers academic and professional education programs online, via video, on campus and on-site to meet the career-long education needs of technical professionals and managers.

4

SCPD Member Companies Top 20

Hewlett Packard	Applied Materials
Sun Microsystems	NASA-Ames
Lockheed Martin	IBM Corporation
Intel Corporation	Altera
Oracle Corporation	LSI Logic
General Motors	Lawrence Livermore Labs
Silicon Graphics, Inc.	KLA-Tencor
Boeing	NorTel
Advanced Micro Devices	United Technologies Corp
Synopsys	Watkins Johnson

Total = 452

5

This is the enterprise that I direct, the Stanford Center for Professional Development, which is integrated into the academic mission. We're not an extension group, stuck outside the main core of the university. We're part of the School of Engineering. Being embedded in the school means that we are very much aligned with what the school is trying to do relative to its own research agenda, its curriculum agenda, and its development activities. We see a great advantage in this attachment to the school's agenda, obviously, because as the school goes forward, we are able to be in alignment with our departments and faculty.

Slides 6 & 7

"**Motorola no longer wants to hire engineers with a four-year degree. Instead, we want our employees to have a 40-year degree.**"

Christopher Galvin
President and CEO of Motorola

6

Academic Programs at a Distance

- **Master of Science degree programs**
- **Academic certificate programs**
- **Credit courses**
- **Research Seminars**

7

Unlike most Research One universities, and certainly unlike the top end schools, we do something that's quite different. We actually offer a complete master's degree at a distance. We have matriculated students who are engaged in the Stanford experience, in and around Silicon Valley, but they also extend throughout the country and around the world. We have students working on master's degrees in Singapore and Barcelona,

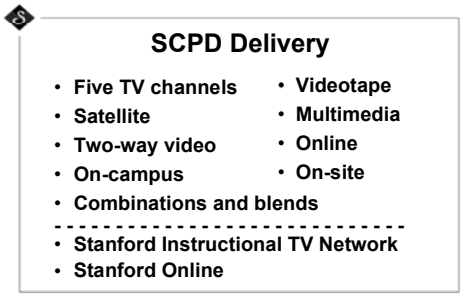
Spain. They're part of the Stanford education community, but they're not present. Right now, about 20-25 percent of all the master's degrees in engineering at Stanford are earned via distance education.

We also offer a full range of academic certificate programs. These are regular Stanford courses, taught by front-line faculty members—not adjunct faculty, not people from industry teaching, but regular Stanford faculty members. They teach the course live to students, and, in turn, we extend that experience, using a number of technologies, so that students interact and engage asynchronously with our faculty members.

Slide 8

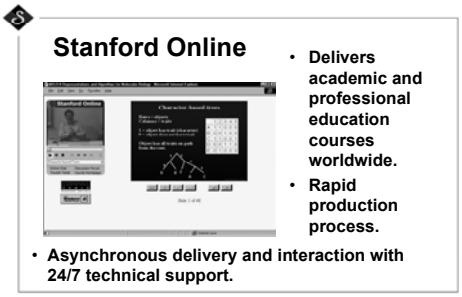
We have also been exploring a range of career-long activities, so that we might track a graduate, wherever he or she may go, and then bring to them a continuous set of Stanford experiences to help them in their career growth—from junior-level entry engineers and scientists, all the way through management, and maybe into the executive level. So we are engaged in both the credit side and also the professional education side. This is more like extension in that it's non-credit. It's an integrated collaboration between faculty members and their industry colleagues, who will bring courses to people and industry. If you want to be engaged in a Stanford master's degree program, from industry, you must first join the center that I described. You become part of Stanford. We have over 450 companies who are part of that. So there's an interaction between what goes on at Stanford and what goes on in the outside world, which in turn connects back to the institution and aligns with Stanford's strategic initiatives.

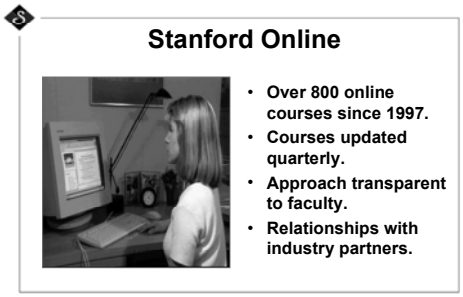
Slide 9



We use a variety of delivery technologies because we've been doing it for 30 years. We came from a television background, in which we broadcast courses to industry.

Slides 10 & 11





Last year we crossed the threshold between television and online, where now most of our classes, or students in our classes, are participating online. So we're seeing television beginning to go away as a traditional medium, and now we're moving very rapidly into online. Eventually we'll close down our television system. It's expensive to run, and when we eliminate that system, it will drive costs down even further.

Slide 12

The portfolio that Stanford delivers every year consists of over 250 graduate level courses, representing about 90 percent of the graduate curriculum in electrical engineering, and about 90 percent of the curriculum in computer science. So, in those two disciplines, most faculty members are engaged in doing some piece of distance learning. It's routine. It's part of the culture of the school. A new faculty member is hired, and they are routinely told, "Oh, you'll be teaching it on television or online; we all do it." This is also an important revenue stream back to the institution. I have to say, though, that I don't have faculty members running to my door, banging on it, and saying, "Please let me teach online." So if we can get from our faculty members a strong neutral, we're delighted.

There are incentives and rewards. However, the main incentive for most faculty is whether or not this counts towards tenure, promotion, and salary increases. It does not. So it's still marginalized. But there are other incentives and rewards that we build in for our faculty members. We provide additional TA support, they generate additional money for teaching online or on television, we put them in very good classrooms, we have extra staff support and service, and so we take the burden off of them.

Let me take a moment to profile the online aspects of what we do. Our friends from Berkeley mentioned yesterday that they are doing some of these same elements. For our faculty members, this is a straightforward piece—teaching in front of a class, interacting and engaging with students, as he or she might normally do. At the same time, it's being transmitted live on television. So if, as a student, you want a live event, you can have that. Or, it's also available asynchronously. The key for us is rapid production; we are not necessarily involved in putting high production values on this. We don't need to. In fact, we don't want to, because these courses change very rapidly. The nature of the courses we offer in engineering and science factors current research into the course, so our product has a very limited shelf life. In effect, each time a course is presented and offered, it is only kept until it's offered again, and then it's totally refreshed. So that's one way we differentiate ourselves, in that we can say to the people we serve, 'you're getting the latest research information as a part of the course.' That's very important to the companies and the students that we serve.

So the rapid production process is a function of the faculty member who teaches the course. We give him or her extra support. We'll give them some front end work if they want to do graphics, or we'll design it for them. Then they will teach the course, and we will take that video product, and drop it into a template. It's indexed by key words and there is a pull down menu, so you can jump to any part of that presentation you wish. It's laid out so that for every course, there are 45 hours of instruction over the entire quarter. Two hours after it's offered on campus, we're able to take the video from the class and make it available online worldwide.

What has been very interesting, though, is the law of unintended consequences. The target for these courses has been the external student, a student elsewhere in North America, or the Pacific Rim, or Europe. They often bring up the question, 'Do the on-campus students have access to this?' The answer is yes. Anyone who has a stanford.edu domain can look at any course that we make available, unless a faculty member says no, and very few say no.

What this means, as you can imagine, is that we have provided the university community with access to e-learning, totally by accident, and we have put the choice into the hands of the student. This, by the way, is only at the graduate level. We are not engaged in these kinds of things at the undergraduate level. The graduate student in residence does things like enrolling in two classes at the same time; they come to one class one day, watch it online another day, and they mix and match. So we're seeing this blending going on. Or, they'll sit in their dorm room with a group of students, watch the material and review it and discuss it, or they'll perhaps do the same thing with teaching assistants.

We're making this portfolio available to the entire community, and seeing some very interesting results. Faculty members are getting an opportunity to see what their colleagues are doing. So there is some actual faculty development going on, by accident. We're providing the community access to all these classes throughout the year, so people are going in to preview classes for the next year and deciding whether or not they want to take that class next year. This also simply gives them an opportunity to experience a number of Stanford classes that they would not otherwise be able to.

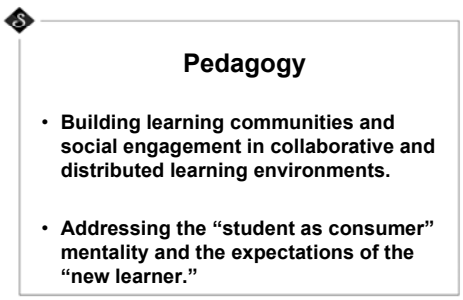
On the matriculated side, or the credit side, it goes forward in this basic fashion. This is the part that is transparent to our faculty members. On the other hand, on the career-long side, which as I mentioned is more like what goes on in extension, there's a higher production value, with more detail, depth, and instructional design.

Slide 13

Stanford has a number of e-learning partnerships. At Stanford, specifically the Graduate School of Business the School of Engineering, we are also engaged with the Harvard Business School, to determine how we might craft our e-learning for executives. Let's just say that we're still in the dating stage; we're close to getting engaged, but we haven't been married yet, so a lot of the planning is still ongoing.

Let me give you about 10 bullet points of things that are, for us, challenges, opportunities, and unknowns. I've grouped them around pedagogy, economics, and organization.

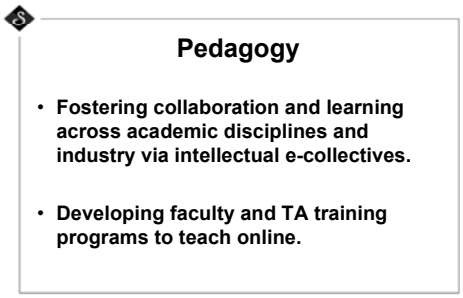
Slide 15



We really struggle with the whole notion of community and social engagement around distributed learners. There are mechanisms to make it happen, but it's very tough to do. How do you engage that student at a distance and make him or her really feel part of the academic exercise? I would contend that there's nothing as effective or as good as face-to-face instruction. So how do we take that face-to-face exchange between a faculty member or an expert and a student, and make it a very rich exchange if that student happens to be 1,000 or 6,000 miles away?

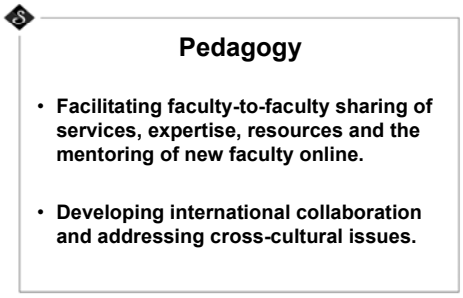
The other challenge is the student-as-consumer mentality, and the expectations of the new learner. This is one we feel a lot, and we see it from the students that we serve. Keep in mind that the audience that we're after are people like ourselves. They're busy professionals who have a lot going on in their lives. They're not the student in residence. So the demand is to make sure we're giving them choice and convenience. They're consumers, and they're beginning to treat us as if they are consumers; in the same way I choose my airline based on certain attributes, I want to choose my university. What are you going to do to serve me, and how will you clone all the things I would expect from a consumer-oriented approach?

Slide 16



Another issue that we're thinking about is how to foster collaboration across disciplines. We're actually seeing some interesting things happen. Where the content is being put into an online approach, we see faculty members who might not typically be observing another discipline now engaging in it. Or they are having their students look at coursework from the medical school, and integrating that material into the engineering curriculum.

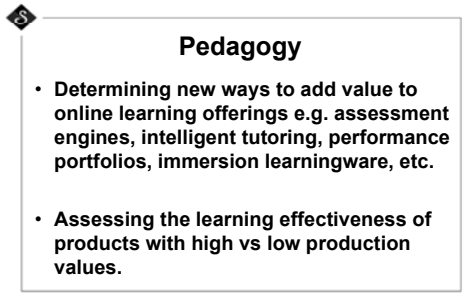
Slide 17



How can we facilitate faculty-to-faculty sharing? We think there's an opportunity to do some faculty mentoring based on the online coursework, for example, saying to a new faculty member, 'I know you're teaching this course, and there's a concept you're trying to present. You might want to see the way Professor X has taught that concept. Take a look at this.'

We do a lot of work internationally, and the real challenge is how to work around cultural issues, language issues, and so forth.

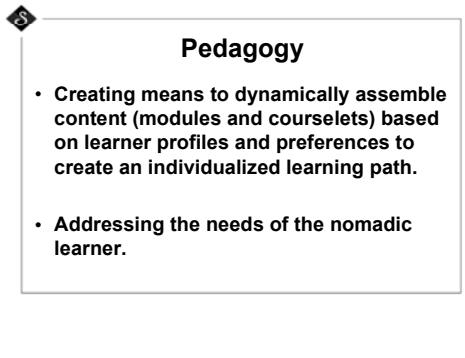
Slide 18



How can we add value to what goes on in the online exercise? This was mentioned here a few minutes ago. It's not simply a question of providing content, but rather it's what to do about engaging the student, and assessing him or her, and building intelligent tutoring, and building portfolios.

Another question involves high versus low production. We're low production; we don't need to do it on the high side, for reasons I've described.

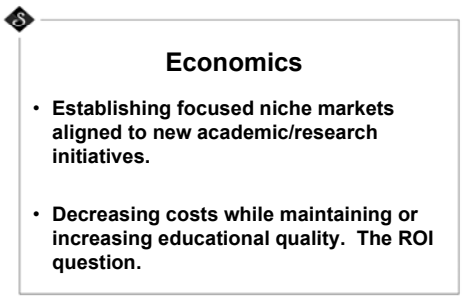
Slide 19



This next issue is one that we're going to play with, and that is, how can we take the body of coursework that's been crafted into an online experience, and now break it down into smaller chunks? Once we tag it, then how might we use a mechanism to profile what a learner needs, and then extract that chunk in some way and build some sort of customized learning portfolio that really matches the need of the learner?

The nomadic learner presents an intriguing problem; where is he or she, and how do we get to them? How do we follow them? How do they get to us?

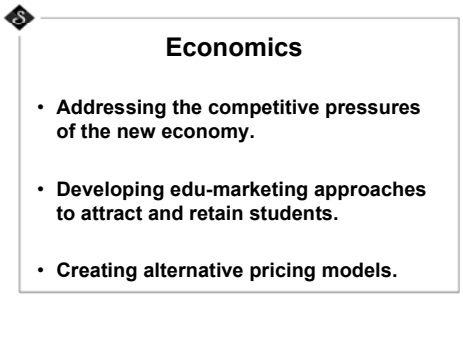
Slide 20



We're a niche marketer—we're not for everybody. So the challenge is making sure that the niches we go after are truly in alignment with what our university is trying to do and with what the School of Engineering is trying to do.

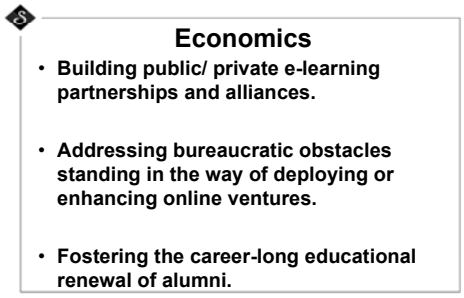
The question of decreasing costs while increasing quality is, of course, the Holy Grail; no one knows that answer yet.

Slide 21



We don't know what's going to happen with the new economy out there. Nobody knows what's going to happen in the market. Stanford does not necessarily have to look for students, since we're over-subscribed, but the student we're trying to go after now is quite different than the student who is already matriculated, one engaged in career-long learning.

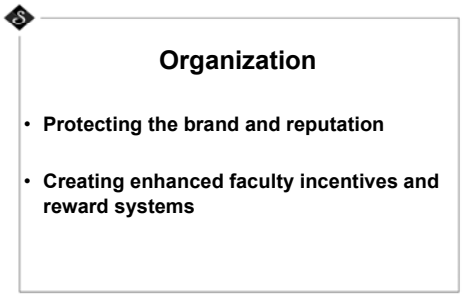
Slide 22

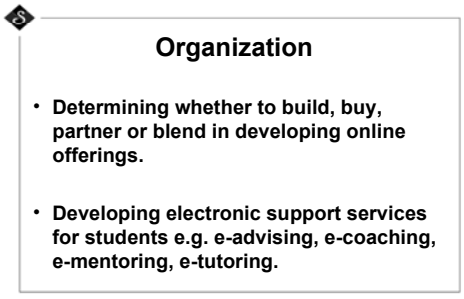


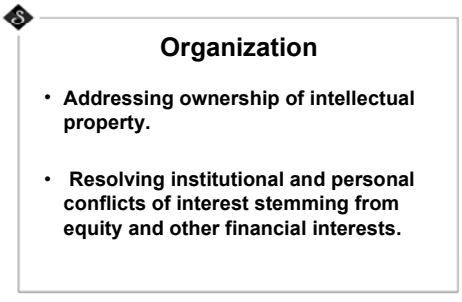
We spend a lot of time thinking about building partnerships, and I have already mentioned some of the e-learning partnerships going on at Stanford. There were a couple of unusual ones on that list, such as Semi-Zone and Integrated Project Systems, which are both niches. Semi-Zone, for example, is for the semiconductor industry, so it tracks very well against what our faculty members are doing and what's going on in our research labs. So these partnerships offer another way to bridge to industry and extend our research.

I'll end my discussion with the career-long educational renewal of alumni, which our friends from MIT talked about. How do we track our colleagues, and use e-learning as a way to build and continue to build institutional loyalty, for all the right reasons? The challenges, opportunities, and unknowns continues with these organizational issues.

Slides 23, 24 & 25







Response

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/JZelmanowitz.html

Julius Zelmanowitz
Vice Provost, Academic Iniatives, University of California Office of the President

As I was listening to my colleagues here, I thought of an experience, an anecdote from my life, when I went to my first meeting with my daughter's teacher in preschool. As I was walking there, I asked myself, "Why am I stressed?" And then it came to me: I was afraid that the teacher was going to tell me that my daughter was the only follower in a class of leaders. As I have been listening here, I realize that I feel like the only consumer in a group of producers. I need the information that's being shared, and the research that's coming out of this meeting, to do my Vice Provost job properly. So I thank you for coming here and for your contributions.

Some of the threads that resonate with me very strongly are the congruence or incongruence of e-learning initiatives with the mission of the university. Hal Abelson's 'commons of the mind' phrase, and the three initiatives that MIT is engaged in, are actually reflected here at the University of California. The outcomes look a little different, but our faculty are essentially moving in similar paths.

The expanding periphery of the University of California as tied to our mission is a very different periphery. We are a land-grant institution. Those of you who know U.S. history, know that really meant that the federal government provided resources. We have an ag extension. We are advising the government on anthrax sources in the ground as we speak. We are advising the government on hoof and mouth disease prevention. So we really, truly, are a land grant institution, which we sometimes forget, especially at some of our campuses more than others. As I understand the history of the land grant, these were institutions that were going to help the states deal with the great problems of the time. At the time of the Morril Act, which is the Land Grant Act, one of the great problems was feeding the country; another great problem was delivery of health care to the population. The land grant universities played a major role, both in developing American agriculture as we know it today, and in the delivery of health care. Certainly, with respect to the former, it's not a problem anymore.

The current problem for the State of California, and probably most of the United States, is the quality of K-12 education. The University of California has been asked to respond, and has responded, by extending its involvement in K-12 issues in a way that faculty of my generation never would have anticipated as being part of our future.

What does this have to do with e-learning? It has to do with the expanding role of the university and how we're going to use e-learning to help address these roles. The push is for the University to expand, consistently with its land grant mission, to deal with the problems of the state.
There's also the pull of changed expectations, such as the expectations of our students that certain kinds of digital services will be delivered to them, primarily because of their

asynchronicity, searchability and other useful features. There is the pull of the expanded educational expectations of the state, of the citizens who know that there are technologies available that could make the University's resources available to them wherever they are. I encountered that very profoundly the other day in Ukiah, California. We are in the center of the state here, and there is a whole half of California north of us. Most of that area lies in five counties at the northern end of the state. The education problems in that part of the state are every bit as severe as they are in the areas that Berkeley is serving so well here in the Bay Area. They are just as accountable as the Oakland, Berkeley, and City of San Francisco schools, to the same accountability standards, with the same state demands being put on their teachers and their principals; and they are expecting help from the University, which is a realistic expectation because of the possibility of distance delivery. So I do see a different, expanding periphery. It's a geographic periphery. It's a periphery that results from our land grant status.

The other thread I wanted to mention is for those of you who aren't terribly familiar with the University of California but are familiar with U.S. history. The University of California's governing system is analogous to the Articles of Confederation rather than the Constitution of the United States; the Articles of Confederation preceded the Constitution. The primary initiatives in the academic sector arise from the faculty, from below. So we don't have, by choice, a systemwide strategy that says that UC Berkeley and UCLA and UC Santa Barbara are all going to be doing this. We don't have that strategy for the extensions of the University, and we don't have that strategy for the faculties on the campuses. If I were a businessman, I would say that this is probably crazy, but what experience has taught us is that this allows for a lot of experiments. Our belief, and this is more theology than strategy, is that out of these experiments will come, in the end, excellent courseware that will be of great use to the University.

California is an incredible laboratory in which to experiment with e-learning delivery and assessment. We've heard from others about the international audience for e-education. As far as I'm concerned, the geographic hurdle to get to Ukiah or parts north is the same one that's being described internationally. We are not serving those communities, nor delivering what we really have to in order to maintain the support of the state in those areas. We've got urban centers, we've got large suburban populations, we've got social stratification, and we've got incredible diversity. We're a tremendous laboratory. You just pick the stratum you want to measure, and we'll provide it for you.

Finally, in response to the comment about state support driving publishers over the cliff, there is another question is, "why are foundations doing things that would drive publishers over the cliff?" I would say that the precedent was set probably over a century ago by the Carnegie Foundation, which established public libraries, free libraries in communities that didn't have them. Prior to that, you had to buy the book. There's a tradition in America of making knowledge available to the people—not just the MIT tradition or the UC tradition, but a foundation tradition. Publishers did fine. People learned to like books, and they bought more than they ever bought before. I think publishers came out okay in the end.

INTERNATIONAL PERSPECTIVES

Internationalization of Higher Education: OECD Perspectives

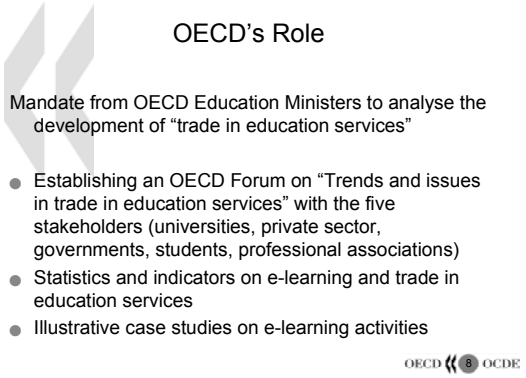
http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/KLarsen_presentation.html

Kurt Larsen
Principal Administrator, Centre for Educational Research and Innovation,
Organization for Economic Co-operation and Development (OECD)

Unlike many of you, I'm not an expert in e-learning. I'm a facilitator, on the international scene, in bringing some of your ideas to the 30 member countries of the OECD. The primary role of the OECD is to serve its member countries with policy advice in areas like education, environment, economy, finance, fiscal policy, etc. It's essentially an international think tank.

I'm from the educational side of the OECD, and the OECD Ministers of Education have asked us to look into the area of internationalization of higher education, especially the 'trade in the education services,' and particularly the e-learning dimension of this, because cross-border e-learning activities, of course, constitute trade.

The trade issue is a very sensitive issue in some member countries of the OECD; they fear that they are unable to set a national agenda for their higher education system. Cultural issues are involved, and the universities—especially the middle range rather than top universities—fear that the trade issue will imply further commercialization of their activities, and probably, in some countries of the OECD, a withdrawal of government funding from higher education. So that is just to set the scene.



What, then, is the role of OECD, and what are we doing? We have a mandate from OECD education ministers to analyze the development of trade in the education services. We are at the moment establishing an OECD forum on trade in the educational service. The idea is to get, on an international level, all the stakeholders together—the universities, private sector, governments, the students, and the professional associations. We have held discussions with the U.S. government, and we have agreed to hold the first such forum in Washington D.C. on May 23rd - 24th of 2002.

On the U.S. government side, the State Department, the Office of U.S. Trade Representative, the Department of Commerce, and the Department of Education are all involved. The World Bank is also involved, and the Bank will provide for some of the major developing countries to be present at that meeting. This is the first Forum. We intend to have further forums, both in Europe and the Asian Pacific area. The whole idea is to set a common agenda, a common understanding between all the stakeholders in the area of trade in educational services.

Roger Geiger talked about the need for more evidence, statistics, and indicators on e-learning and trade in educational services. At the OECD, we're also working on that. I don't think we can get very much more information on existing statistics; we really have to combine the statistics with case studies.

Let me just give you some figures on trade in educational services, the export earnings of a number of OECD countries. Only a very few OECD countries publish statistics on trade in educational services, and it's only based on the incomes of students abroad. So it reflects the traditional forms of providing education across borders, but doesn't contain e-learning, and doesn't contain earnings from commercial presence abroad. For example, if an Australian university were to go to the Asian Pacific area and earn money for providing an educational service, we don't have any figures about those cross-border e-learning activities. We have little evidence. I know that about four percent of the 150,000 foreign students in Australia are taking 100 percent virtual courses, which shows that the cross-border e-learning market is still a small market, but it's probably a fast growing market.

If we put that into relative perspective, measuring the earnings from educational services export compared to the total trade and services, then Australia is doing quite well: 11.6 percent of the export earnings from trade services are coming from education. For the United States, it's 3.8 percent. So Australia is very active in this field. Trade in educational services is the largest export service in Australia, and in the United States it's number five. But again, please note that these figures only take into account the trade value of students studying abroad.

Another way to see what's going on in the international market of education is to look at the data of student flows within the OECD countries. In 1998, there were 1.42 million international students in OECD countries; the United States got about a third of them, the United Kingdom 16 percent, and so forth. Fifty-seven percent of these students were coming from non-OECD countries, mainly China, Japan, and Greece.

Turning to the specific subject of this seminar, I would like to focus a bit on the characteristics of e-learning activities across OECD countries.

Characteristics of post-secondary e-learning activities in OECD countries

	Average PC installed in homes	Used IT in education and training	Development of software	Involvement of government
North America	High	High	High	Low/ Medium
UK/Scandinavia	High	High	Low/ Medium	High
Germany, France	Medium	Medium	Medium	High
South Europe	Low	Low	Low	Medium/ High
Japan	Medium	Medium	Low/ Medium	Medium/ High
Australia	High	High	Medium/ High	Medium/High

OECD 3 OCDE

Some of the data includes the average number of personal computers installed in homes, the actual use of information and communication technology, in education and training, the development of software, and the involvement of the government. You can see that North America is very high in terms of the infrastructural background for actually developing e-learning, and the same is true of Scandinavia, the UK, which I guess would include Ireland, and also Australia. The real difference is in the level of involvement of government, because the private e-learning market is not very active outside the United States, and only active at a low to medium level within the United States.

Characteristics of post-secondary e-learning activities in OECD countries

	Leading post-secondary e-learning institutions	Leading Government initiatives in e-learning
North America	Phoenix University, Regents College, National Technological University, Jones International, NYUOnline	Web-commission, many State initiatives, Technology Innovation Challenge Grants
UK, Scandinavia	Open University, e-University Project, Open Learning Company, Scottish Knowledge	The National Learning Network, Learndirect/University of Industry, e-University project
Germany, France	Centre National de l'Enseignement par Distance (CNED) Virtual University of Hagen	F: Grant to develop public/private partnerships
South Europe	The virtual university of Catalan	
Japan	National Institute of Multimedia Education	Shifting from satelite-based to web-based system
Australia	University of Southern Queensland, Monash University	Australian Flexible Learning Framework, $100 million e-learning developing aid initiative

OECD 5 OCDE

My own subjective idea of what's going on is that the government is, of course, very supportive in the United States, but it finances relatively fewer e-learning activities in education than many other OECD countries. In Australia, for example, they have just launched, together with the World Bank, a $100 million (Australian dollars) project in delivering e-learning material, mainly to the Asian Pacific area. The case is the same in the UK with the e-university. Government is putting in a lot of money because the private market is not very active in these countries. It's only in the United States that I see the

private market as very dynamic. It might be in some difficulty at the moment, but at least there has been a lot of private investment. You don't see that in most other OECD countries.

Characteristics of post-secondary e-learning activities in OECD countries

	Private sector investment	Public/Private Partnership	Quality Assurance off-line/online	Market targets
North America	High	High	Same or Different	Mainly national
UK, Scandinavia	Low/Medium	Low/Medium	Same or Different	Mainly national
Germany, France	Low/Medium	Low/Medium	Same	National
South Europe	Low	Low	Same	National
Japan	Low/Medium	Low	Same	National
Australia	Low/Medium	Low/Medium	Same	National/International

OECD 4 OCDE

It is also interesting that e-learning activities are mainly national. They often don't target the international market. Possibly the only country in which I see a deliberate strategy for an international market is Australia. Perhaps the United States to some extent, but I still think that is mainly a national market. In the coming years, I think we'll see more countries going international with these activities.

In these countries, what are the offline and online quality assurance criteria? Most OECD countries say that whether e-learning activities are provided online or offline, the criteria are the same. Only in the United States and the United Kingdom are there some cases in which different quality assurance criteria for online activities have been developed.

Cross-Border e-learning Challenges

- Trends in cross-border e-learning activities
  - many different providers: media companies, for-profit HE, HEI, professional bodies ⇒ multiple partnerships
  - however, most e-learning activities target national markets
  - global initiatives: Universitas 21, Global University Alliance
  - private universities are being bought by foreign for-profit companies in e.g Latin- and South America and Spain
- Cross-border e-learning and trade in education
  - GATS: No country can bar access to Internet courses originating from a provider operating in another country
  - cross-border e-learning is increasing fast from a low level
  - more cross-border e-learning ⇒ pressure for higher transparency

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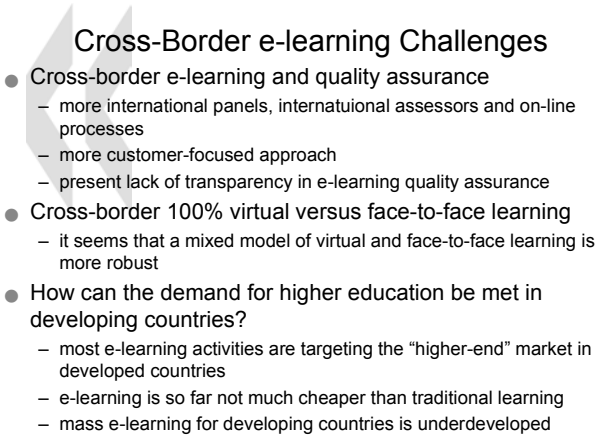
So these are some of the challenges that I see in cross-border e-learning activities. One new and interesting development is the appearance of global initiatives of university partnerships, either to develop e-learning activities, or to develop common quality assurance frameworks. You also see that some private universities are actually bought up by for-profit companies in some parts of the world.

What is really interesting is what is happening in e-learning and trade in education. At the moment, trade in education is discussed at the WTO as part of the trade in services negotiations. There will be a major ministerial meeting in Doha, Quata, in November 2001, where it is hoped that they will set a deadline for a new round of trade negotiations. The U.S. government, at least, hopes that they will set a three-year deadline from now on, because deadlines are extremely important for trade negotiations, as countries are then under pressure to come up with a result after three years.

No country can bar access to Internet courses originating from a provider operating in another country, if they have already committed to education within the general agreement for trade in services. Many countries have actually committed themselves in the area of cross-border supply of education, which is the area of e-learning. New technology can therefore be a factor in increasing liberalization of the whole education market. E-learning is still at a very low-level of cross-border exchange, but increasing very fast on the international level.



Finally, the big issue about trading of higher education courses across borders is the issue of quality assurance. We will see more customer/learner-focused approaches to quality assurance. At the moment, it’s a big mess, and the lack of transparency in quality assurance in cross-border e-learning is really stopping some of the initiatives from going abroad. Some of the issues that have been discussed, in terms of seeing a relationship between quality and price, are linked to this lack of transparency in the market; you don’t know what you’re buying because you don’t know what the qualities are, exactly, of the program you are buying on the Internet. As you look at all the programs, there is very, very little information about this, so it’s an information issue, and a lot will have to happen in this area over the coming years.

I think that the e-learning market so far has been targeting the higher-end market in developed countries; too many e-learning providers have gone into the MBA market. Focusing on mass e-learning activities for developing countries, in collaboration with them, is a big challenge. As Terry Hilsberg said, you need to be present in those countries in order to do that.

Thank you very much.

Universities and the Challenge of E-Learning: What Lessons from the European Open Universities?

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/CCurran.html

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Introduction

University involvement in e-learning is growing apace in most developed countries, as more and more universities move beyond the initial phase of experiment or pilot-projects to operational use. In traditional universities—among them the most venerable and conservative institutions—individual academics are routinely using e-learning to enrich or supplement their traditional teaching. Many universities have gone further, by adopting institutional strategies for teaching and learning that exploit the opportunities presented by the new, powerful, and pervasive e-technologies. Some, alone or in cooperation with other universities, are investing significant time and resources in developing long-term, large-scale e-learning programmes. Others are uniting with publishers, courseware providers, or other 'external institutions' in commercial ventures developed in response to perceived demand or projected market opportunities.

Viewed from the perspective of the sector as a whole, this growth—a very recent phenomenon in the history of the university—still seems uncertain in outcome, uneven in scale, and highly disparate in character. But however chaotic the process may seem, many believe it to be a significant, even seminal, innovation in higher-education: a truly exceptional phenomenon with the potential to induce far-reaching—perhaps fundamental—change in universities. This potential is made all the more potent, they believe, by the other manifold and omnipresent pressures which universities now face.

Not everyone is convinced, and experience of earlier technologies would counsel a degree of caution. None—film, radio, television, nor even computers and CD-ROMs—have had the radical and transformative effect on education predicted by their early adherents. In spite of the undoubted contribution of these technologies to education, their impact on traditional pedagogy in universities has been marginal at best (notwithstanding quite profound and concurrent change in other aspects of academic life). Indeed, some sceptics doubt that technology, however powerful and pervasive, can ever do more than supplement traditional teaching. Rather than provide an effective substitute, they suggest, e-technologies, however effective as a means of communication, are of themselves inadequate to the core mission of higher education. Some say this is so because of the intrinsic nature of university education. Others point to the formidable barriers to radical innovation in higher education itself: the context within which universities operate; a conservative culture and academic mores; a pedagogy based on 'a fairly rigid handicraft technology, in large part self-imposed by custom and tradition' (in Mark Blaug's memorable phrase).

Yet, within the last few decades, we have seen universities readily accommodate significant change, not least with respect to scale of enrollment, expansion of curricula, and a more acute response to the wider world 'outside the walls.' And yet changes of this kind, however transformative in sum, might reasonably be seen as an intensification of processes already in train; truly innovative and radical change is less common.

The Open Universities in Europe, in my view, represent one such innovation. True, these five universities are only a part of the totality of thirty or so open universities which now operate in countries around the world, and seem a smaller part still of the three hundred or so universities currently active in some form of distance or online education in the European Union. Nonetheless, by virtue perhaps of the common characteristics they share with respect to origins, mission and location—however dissimilar in other respects they may be—they can be seen to represent a common and significant innovation in higher education. In this short paper I should like to look briefly at a few key aspects of that innovation and to consider what light that experience may throw on the development and potential role of e-learning in universities.

Origins and mission of the European Open Universities

It is easy to forget just how radical an innovation the open universities seemed at the time of their creation (some three decades ago):

- the virtual absence of traditional on-campus students, and exclusive focus on mature adults studying part-time;
- the core commitment to distance teaching and related re-structuring of the teaching process, with a consequent re-allocation of didactic tasks;
- the extensive use of media, in one form or another, in place of traditional, contiguous teaching;
- the commitment to 'open-entry' to degree studies.

Each of these innovations was a significant departure from the established norms of university practice that collectively served to set the open universities apart from traditional and longer-established universities. This dichotomy was reinforced by the egalitarian character of the open universities' core mission—to provide a 'second-chance' opportunity for access to higher education.

Innovation of this degree was not readily accepted by traditional universities. The open universities initially encountered a high degree of scepticism, even outright hostility, on the part of academics in traditional universities. Lord Perry, the founding vice-chancellor of the UK Open University, has said that the system was initially regarded by the majority of academics with profound suspicion; in his view, it took some five years to achieve academic respectability.

Nor was peer acceptance won cheaply. The departures from established practice outlined above, although radical, were restricted to just a few aspects of higher education; all the open universities were scrupulous in observing the established norms of university practice in other key areas. The academic content of programmes, the qualifications of

staff, the duration of courses, and the commitment to research as an integral element of faculty work, were all consistent with the norms of traditional universities. Also important to peer acceptance was the transparency inherent in the wide dissemination of printed course texts, co-publication of books with leading academic publishers and, in some cases, presentation of programmes on national television—platforms that allowed these universities to demonstrate publicly the academic quality of their courses. This transparency was also facilitated by the use of published texts and course materials, on a formal or informal basis, by teachers and students in other tertiary institutions, and by the familiarity with the work of the open universities that academics in other universities acquired in working as writers, tutors, mentors, and the like.

Moreover, the pedagogy of the Open Universities, although different from that of the traditional universities, was transparently rich and varied. While details of practice varied from one institution to another, in general it involved intensive preparation of high-quality course materials with provision for student support, in some cases involving regular contiguous tutorials, seminars or summer schools; access to local and regional study centres; use of a range of instructional media—specially-written course texts, books, journal articles and other ancillary documentation; and the systematic monitoring of student progress, in some cases with ancillary provision of on-going counselling support. A further important factor was the development of effective administrative systems to support the teaching-learning process. As a consequence any initial fears have long since been laid to rest. Few academics familiar with the work of the open universities now question their ability to deliver academic materials of high-quality to their students and to support them in their learning. This view is most obviously confirmed, perhaps, by the substantial number of traditional universities in Europe now active in on-line or other forms of distance teaching.

Factors of this kind help to explain the pedagogic success of the Open Universities. (It may be worth noting, in this connection, that the United Kingdom Open University was recently ranked tenth, out of more than 120 UK universities, for the quality of its teaching.) This success, moreover, was achieved with substantial student enrollment. Some 29,000 students were enrolled in credit programmes at the Dutch Open University in 1999, and almost 140,000 at UNED in Spain; or, to make the same point another way, more than two million people have studied with the United Kingdom Open University alone since that institution first enrolled students.

Effective pedagogy, no doubt, will prove as important to the success of online learning in universities as it was in the case of the open universities, not least in ensuring a steady flow of new students and in convincing funding-agencies of the wisdom of continuing support. It is important also to the critical challenge of containing student dropout rates—a perennial problem in any type of distance teaching programme leading to university credits and awards. Effective pedagogy serves also to underpin the academic value of awards, so opening opportunities for graduates in the world of work, and facilitating their transfer to post-graduate programmes in traditional universities.

Response to the challenge of e-learning

How have the European open universities responded to the challenge of e-learning? Even a cursory appraisal suggests that these institutions are well placed to exploit the opportunity presented by e-learning. They each have extensive experience and excellent reputation in distance teaching. All have well-established networks (within their own, and other, countries) to support students' learning. Most have research-active departments in disciplines related to e-technology and have invested heavily in computing and tele-communication infrastructures. A number have established specialist institutes, of international standing, to pursue research on the pedagogy and related aspects of e-learning. All have extensive archives of well-tested course materials and potential for marketing economies (virtually all of the institutions already have significant programmes of teaching in other countries).

There are, in addition, some prevailing factors conducive to change. A number of the open universities have, in addition to their egalitarian mission, a responsibility to act as a catalyst for change in the higher education sector as a whole (the Open University of the Netherlands is one such case). Some are subject to changes in demand: rapid growth in access to higher education has, in some cases, reduced the demand for 'second-chance' access. In institutions where a high percentage of students already hold degree-awards, the proportion of students sitting for examinations and staying on to graduate, can be significantly lower than originally envisaged. This has potential implications for the continuance of public funding, a predicament likely to be exacerbated where professional or other degree awards require sustained, part-time study for six, seven or more years. At the same time the demand for work-related programmes has greatly increased. Some institutions have experienced eccentric patterns of demand—in the extreme with 80 percent of students enrolled in 20 percent of the available courses (with obvious implications for the support of a university-wide range of disciplines). All are to some degree potential victims of their own success, with more and more traditional universities offering online or other distance education programmes. At the same time the open universities have been subject to the pressures common to all universities—not least constraints on public funding.

It is hardly surprising, therefore, that the European open universities make extensive use of the new technologies in their programmes. An adequate summary of these activities would require more space than is available here, however a few examples may suffice to convey some idea of the character and scale of e-learning applications. Much on-line activity is focussed on providing information to students or prospective students, and generally facilitating the administration of programmes and the management of courses. For example, by the year 2000, some 75,000 course registrations were made online at the UK Open University. Much online use relates also to facilitating communication between students, their peers, their tutors, and the University administration, also including that relating directly to learning. By the year 2000, some 16,000 conferences were in operation at the UK Open University, with 100,000 students communicating regularly. Last year, the FernUniversitat had 16,000 students working in an area designated the 'virtual university' with four pilot BSc degree programs on-line and more than 200 multimedia courses available. A number of the open universities are training substantial

numbers of teachers, public servants and other occupational and sectoral groups in the use of e-technologies.

The Open University of the Netherlands probably represents the most radical response by the open universities to the challenge of e-learning. The University is re-engineering its approach to distance education, transforming itself into a digital university, to provide 'personalised distance education,' tailor-made to the needs of each student. The university has adopted a 'competence-based' curriculum through which students can receive instructional materials in line with their needs. The approach is open, flexible and demand-driven, based on modular, digitised course materials. To facilitate this process, the University has developed an educational markup language (EML). The development is supported by the University's 'Educational Technology Expertise Centre' (OTEC) and some eighty scientific staff. This strategy, which has been in the works for a few years, is a relatively recent initiative in the development of the University and so it will be some years before it is fully implemented and the outcome can be assessed.

These few examples are a small part of the total response, by the open universities, to the opportunity and challenge of e-learning. Still, while developments overall are impressive in scale and substance, taken as a whole, the response of the open universities to e-learning might be best described as pragmatic rather than radical. Many online activities could be described as essentially ancillary to learning (albeit no less important for that): promoting the institution and its programmes, for example, or fostering a sense of community between staff, students, and alumni. Often where e-learning is used, it is ancillary to core activities; sometimes an add-on component to a course (enhancement rather than substitution), sometimes as an option in a dual system—in which e-learning components run in parallel with traditional distance teaching. Where e-learning is an essential element in teaching, it is often restricted to selected courses.

Why a pragmatic response? One reason perhaps is that for much distance teaching at the university level, older technologies still work well. The strategies developed and tested over three decades, augmented appropriately by the newer technologies, still provide an effective and cost efficient means of delivering course materials, tutoring students, and providing the other facilities able and committed adults need to proceed to graduation. Indeed a common complaint by academics, with experience of distance teaching in open universities, is that colleagues in traditional universities have an unduly sanguine view of what constitutes an effective online pedagogy. Putting lecture slides online, with minimal if any other support, falls woefully short of the rich pedagogy available through more traditional forms of distance teaching (and is unlikely to prove pedagogically effective for the great majority of students).

A second reason is that the cost of converting traditional course materials (for effective on-line learning) can be very high: a task not made easier by the rich, varied, but tightly-integrated courseware in some open universities. The Open University of the Netherlands, with some 350 courses, expects that the transition to a fully digital university will take some eight years to accomplish. Moreover, in those open universities that conform closely to the mores of the traditional universities, the speed and extent of change can depend critically on the support of faculty. Universities with a more centralist structure can respond more directly, and speedily, to the pressure for change.

Most crucial of all, perhaps, the core mission of these universities—to provide universal access—is, for the most part, still a pre-eminent consideration. The paradox of e-learning—the promise of universal access and the reality of partial exclusion—poses a real challenge in this connection. There are additionally some indications of consumer reluctance, if not resistance, among traditional target populations. Even still, only 30 percent of the UKOU course registrations are made online. John Daniels, until recently Vice Chancellor of the UKOU, suggests that the other 70 percent may feel they need some human assistance in making course choices, so it is not as yet evident that a majority of potential students want to see a radical conversion to online programmes.

What light?

What light if any does this experience throw on current developments in e-learning in universities? The first point worth noting, perhaps, is that the experience of the open universities shows it is possible to resolve the conflicting pressures implicit in widening access to higher education, while containing costs and maintaining quality. In particular, the adoption of an alternative approach to teaching allowed the open universities to abstract from many of the long-established norms of traditional teaching (the requirement that each academic engage in a set number of contiguous teaching hours each week, for example, or inflexible staff/student ratios). The significant change in the teaching process allowed these universities to reap significant economies of scale, on which the cost-effectiveness of their activities depended. Similar strategies may be adopted by traditional universities for online learning, provided the conflicting pressures of pedagogy, cost, and scale can be resolved.

A second point worth noting is that significant and successful innovation in higher education is eminently feasible and that any initial scepticism, or hostility, can be overcome. It is important to note also that the open universities' experience relates essentially to a parallel system of higher education, and one aimed at an alternative student population. Radical innovation that directly threatens the ethos, pedagogy and practice of traditional undergraduate teaching is likely to encounter significantly more resistance from traditional academics than even that experienced by the open universities in their early years. This consideration is all the more important where the cost-effectiveness of e-learning applications, by traditional universities, is predicated on synergies between on-campus and distance teaching programmes.

A third point worth noting is that effective teaching of students on credit programmes, to standards equivalent to those of traditional teaching, is a realistic goal in distance teaching. That experience also suggests, however, that a pedagogically rich environment may be required if student drop-out is to be contained at an acceptable level, and a reasonable number of students are to proceed to graduation. The demands of effective pedagogy may be significantly less where short or non-credit programmes are provided, or where courses leading to credit are aimed at niche markets comprising highly motivated students with well developed skills as independent learners (many online post-graduate courses would seem to fall neatly into this category).

Finally, there is a long-established and respected view, widely held among academics (and the continuing focus of a substantive contemporary literature) which holds that a university education is more than the sum of formal instruction, however excellent (a view that applies *a fortiori* with respect to the conveyance of information to students, however advanced and powerful the technology which serves as the conduit). The open universities faced a difficult challenge in this connection, given that the student populations they serve predominantly comprise mature adults, most of whom may be assumed to have other, often pressing, responsibilities apart from their degree studies. A number of the open universities responded to this challenge by adopting innovative strategies, for example by supporting measures to promote a sense of community and collegiality among their students and a feeling of being part of a vibrant university (that otherwise might seem a remote and bureaucratic institution). Traditional universities that provide online programmes for young undergraduate students may face significantly greater demands in this connection.

Conclusion

In summary one might say that given the extent of involvement by universities in e-learning, the intensity of commitment by particular institutions, and the pace of growth of that activity overall, a continuing and significant role for e-learning in universities seems a reasonable conjecture. However, whether e-learning proves to be truly seminal innovation in higher-education, inducing fundamental change in universities, seems likely to depend—as in the case of the European open universities—as least as much on the measures adopted to ensure its pedagogical effectiveness, cost efficiency, and social relevance, as on the powerful and pervasive technologies which make it possible.

THE POSSIBILITIES AND LIMITATIONS OF EMERGING TECHNOLOGICAL INNOVATIONS

Re-engineering Learning Environments

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/LRowe.html

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I've been in the software business for a long time, and I have met people who have actually done offshore development and testing and have used these offshore services quite a bit. They are not nearly as efficient and as effective as some would have you believe. On the other hand, I think we would be naïve if we overlooked the opportunity of using that resource.

So, from my perspective, when I talk to people about doing courseware development, it is a very different process than what happens with conventional course development. By this I mean that people write books more or less by themselves. A faculty member gives a course, they create their lecture materials on sheets of paper, and write it on the board, or maybe they use PowerPoint. But now, with multimedia courseware, you need a lot more people involved. You need course experts, you need authors of various media types; there's a whole new category of people who are educational material content experts. And you need programmers. Whenever I talk to my friends in this business, I say, 'I have these great multimedia artists that want to go to work on educational courseware.' They say, 'Fine, they're a dime a dozen. Give me your programmers.' So the message is that programming services and programmers are the limited resource.

One problem in the software business is that there are only three models for running a software business. First, you can sell a commodity product. Think Microsoft Word. It runs on nearly every platform in existence, and so you can charge a relatively low price for the product and build a fabulously successful business. The second model is to produce and sell what is called enterprise software. That's really just jargon for the fact that companies will pay $50,000-$100,000 for a package. An enterprise software product sells very few copies relative to commodity products. The price charged is what is needed to sustain the business, that is, the development, marketing, sales, and administration to produce and market the product.

These two models, namely commodity and enterprise software, are the two most successful ways to produce and market a software product. There has always been some contract engineering (i.e., a contracting company builds the particular product you specify), but frankly, I am not sure that is going to allow us to get any leverage on the cost of developing educational software, except perhaps in some very specialized cases (e.g., "Introductory Calculus" for all first-year college students).

The third model for producing software that has shown up recently is the open source model. The open source model says that if enough people care to give their labor, free, to work on a product, they might create something that is as good as a commercial product. Now, you might think, 'That's crazy. Could a bunch of hackers produce something as good as what a company would produce?' Well, I think all you have to do is to look at the quality of the products from the companies, to see that the open source developers do

not have that far to go. Seriously, however, the open source model has yet to really prove itself as a viable approach to software development and marketing. This model does have a long tradition in the research community, but it remains to be seen if it will work in an educational content development application.

So the question is, how do you reduce the cost of producing multimedia-rich, interactive educational material? The cost is mostly labor, mostly the programmers. I tried earlier to figure out how much a loaded programmer costs per year. 10-15 years ago, I think it was on the order of $100,000-$150,000. These days it's easily $300,000, or, I should say, these days up until the burst of the Internet boom. Today programmers are more available and much less expensive.

So you think about this and you say, 'How in the world can we reduce the cost of developing software?' Well, one thing you can do is to increase the labor pool, so you build up computer science departments across the country and around the world. The idea is that producing more labor will drive the cost down. This seems to be happening, but it has a long development cycle. Building a high-quality computer science educational program is difficult. Another interesting item from Terry Hilsberg's comments is that China is investing heavily to build-up their computer scientist production capacity, at what look to me like low costs.

Another approach you can pursue to improve productivity of programmers is to improve the tools, but the question is, how do we do it? Well, one way you can improve the tools is to reduce the complexity of doing it yourself. If we had this seminar 20 years ago, we would not have polished presentations projected on the wall. We might have transparencies, but if somebody came in with a polished presentation, it was somebody from a company who had an A/V department that produced pretty slides for professional presentations. Today, we all use PowerPoint or some other presentation generator. These programs have many deficiencies, but in fact they allow you to produce very nice looking slides. Moreover, everyone can use the tools—they do not require a trained technician to use the software. In computer science, we might say that the tool commands are at our fingertips.

In truth, faculty do not always like PowerPoint, largely because teaching is not a formal presentation in the sense that you give a well-crafted, carefully thought out presentation into which you put a lot of time and energy. Teaching is a process of creating some material, going into the lecture and presenting it, and then answering questions and reacting to what's going on in the classroom. Most class lectures are more ad hoc teaching and learning situations, except in the very large introductory courses, where efficiency demands that you invest more time in the production of the material, so that you can actually deliver an acceptable performance to the audience.

So it seems to me that there are several ways to improve the productivity of educational content development. First, we need much better tools. Developing these tools is something we should be doing. It is hard to get research funding to build tools, because the usual response is, 'XYZ Company has product Y. Isn't that the answer to all the world's problems?' It must not be, because a common complaint at meetings like this is that content development is too expensive and too hard to do. I have observed in the computer science community that there are many important tools that get built that would

never have been funded as research, but they get funded because there are groups of frustrated users, and somebody finally says, 'I'll go build something new.' There are many software systems that we can trace back to that sort of development. We may be getting to that point in the informal presentation tools for classrooms. We may be getting there in terms of courseware authoring tools. Consequently, we might, in fact, see some significant breakthroughs in the next couple of years. But it's not going to happen by design; it's kind of a random thing, unless of course a substantial amount of funding is made available to a number of researchers to work on the problem. I suspect several of my colleagues, including me, would work on an informal presentation tool if someone funded it. The problem is that it is very difficult to get funding for one project, let alone the four to six projects that should be funded in order to raise the probability of producing something that works.

Consortia that produce software almost always fail. The nature of the consortium is that you do not have funding for many groups, so you force the researchers to work "by committee" to design and implement the solution. Committee design almost never works when you are developing something novel like a programming language, a really new software application (i.e., a breakthrough like an outline processor rather than yet another word processor), or a novel way to present course material.

The other thing you could do to reduce the cost of producing educational software, besides improving the tools, would be to capture live material, and then edit it for reuse. That is largely what we have done with the lecture webcasting system; in some respects, that's exactly what Andy DiPaolo and the Stanford folks have been doing for so long as well. I would not give up on that approach as being a producer of quality material. I think there are many ways that you could push the capture and edit idea to produce better quality material. Get a group of researchers together, and you'll get 10 or 20 ideas which you could then pass off to specific people to answer. These ideas might be things like being able to easily go back and clip out segments of video. Doing this today would be very time consuming, but tools could be developed to simplify the management and use of audio and video clips with synchronized media (e.g., slides, animations, etc.).

Would such a tool be useful? Well, how many of us, when we're teaching, answer a question from a student in the class, and then get the same question five more times in the next ten days, and five more times in the following six weeks? If there were a way to capture that explanation and the examples you used to illustrate the concepts, and if you had a search mechanism that would allow people to find it, you could leverage those presentations and those ad hoc short presentations. Two years ago someone went on at length in a similar workshop about this topic—they were going to teach a course, they were going to take snippets of their video, and they were going to publish them for people to play. I just shook my head, because I knew that it wasn't going to happen, because the tools are not there.

So that's my first big point, about the availability of tools and the development environment. Chris Curran made what I believe is an important comment about the difficulty of taking material designed for a particular use, extracting it from one course, and packaging it for distribution in others. It may very well be that there is a company to be had in that kind of a business, but it's going to be very difficult to figure out exactly

how to do it and how to take advantage of it. Maybe the right way to leverage existing content is to view all of China as a contract development group or contract authoring group, try to write the specifications, and let them implement the software and hand it back, and then you can say, 'No, that's not it,' and you hand it back to them, and so forth until the solution is right. I guarantee it won't be right the first time, or maybe even the tenth time, but it will likely be acceptable after some number of iterations. The question is whether you'll have a cost savings over using a different development group where the communication is less difficult. Here I mean explaining the requirements, not just speaking to each other. So courseware development is difficult to do, and it is expensive, because labor is expensive, and the tools are inadequate to support the content experts in the authoring process.

The other thing I'll say is that I think that eventually everybody is going to be a programmer. I said this first in a graduation speech about ten years ago, that in 25 or 50 years, fundamentally everybody would be a programmer. My analogy is what happened with the telephone system. If you looked at the growth of telephones in the early part of the 1900's, it was pretty clear that everybody was going to have a telephone, but the limiting resource was the operator. In other words, the person that connected the caller with the receiver using a plug board. At one point AT&T did a study that showed the only way everybody could have a telephone would be if three-quarters of the population were going to be operators. Well, that obviously can't work. So, instead, we figured out a way to make everybody an operator without requiring him or her to use a plug board. We created dial telephones, and that made you the operator. I suspect the same thing's going to happen with programming. It may not look like the programming you think of today, but skills like conditional operations, assignment, looping, procedures, and these sorts of things, will become a natural part of the discourse that people do.

Point number two concerns technology opportunities. What computer scientists do is to try and look ahead and guess what's going to happen in the technology. Some of my colleagues will disagree, but I believe that hardware drives new technology. So you look for a big change in hardware, and then anticipate how that's going to impact the rest of the world. Everybody saw the price of processing declining back in the 1970's, and we knew there would be personal computers eventually, and eventually they came. Some people at Xerox PARC saw the declining cost of memory, and said that would allow everyone to use a bit map display, in fact, color bit map displays. So five to ten years ahead of that change, they started doing research in that area. This research is very expensive because you have to pay a steep price to get access to the simulation of what the technology will be in five to ten years.

So, projecting what significant changes are likely to occur in the hardware arena over the next 10-20 years that we can exploit, I think there are two areas: communication and display technology. In the area of communications, if bandwidth becomes free, which is my mantra, what would you do with it? Well, we would use much higher bandwidth for the things that we do. I fundamentally believe that in 10-20 years, bandwidth is going to be orders of magnitude cheaper than it is today. The other effect that I think we're seeing in the communications arena is mobility, with all the wireless activity. Frankly, the limiting factor to making more use of wireless services in the U.S. is probably moving

over-the-air broadcasting of television to cable or satellite distribution and freeing up the bandwidth for mobile services, but that's a whole different political issue.

So what do we want to do with this communication capacity? Well, the thing that I think is happening is distributed collaboratories. The notion of a collaboratory is that you build a room that has more projection capability, more cameras, and you try to create seamless interaction between people at different places. Andy DiPaolo's picture was absolutely fabulous—he showed today's state-of-the-art for a student participating in a remote class. The student has a nice 17- to 21-inch screen, and an itty bitty little postage stamp-sized video.

In my mode, if communication is free, the video image will be at least a standard definition television image, but it's more likely going to be two or three streams with HDTV on some of them. In fact, the streams will be variable sized-images for many different streams. Again, television delivers a single stream. When you have a lot of bandwidth, you can deliver lots of streams. You want two streams, at least: one for the presentation material and one for the lecturer. In fact, in our classrooms, we are putting five, six, seven, eight cameras, and one of the things we want do is to publish several programs: 1) all of the cameras, for anybody remotely to look at any camera they want, and 2) a moderated feed with fewer streams, what a director would choose as being a good representation of what's going on.

The other thing about the collaboratory is that you can start to exploit the ability to capture everything that happens. Going back and looking at what's going on in collaboration, I think there's a simple problem that people don't really know how to solve yet; I know people have been working on it, but they don't have an answer. Here's the problem: you have a distributed work project team that is at different places geographically, in different time zones, and they want to work continuously around the clock. You want to be able to move seamlessly between synchronous interaction and asynchronous interaction, and communicate with people who were working four hours ago and left you some notes and some other artifacts of what was happening. I think education is going to go much the same way.

The technology basis that I think people ought to be looking at is the Access Grid (http://www.accessgrid.org). It's a set of services on top of the Internet Mbone tools, which is the streaming media technology originally developed on the Internet in the early 1990's. In fact, a lot of people have been pushing aggressively for collaboration. And, again, the model is that processing is already free, memory might as well be free, communication will be free, and we're going to have much bigger display capability. How are you going to use all this? I think distributed collaboration is the thing to explore.

Learning Science R&D: The Learning Federation & Digital Promise Initiatives

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/TKalil.html

Thomas A. Kalil
Assistant to the Chancellor for Science and Technology, UC Berkeley

I just finished eight years working for President Clinton and Vice President Gore at the White House National Economic Council, and I've noticed a few differences in the culture. For example, I've learned that in academia, a vote of 34-to-1 is considered a tie. There are three observations that I would like to make on the subject of e-learning and research and development.

First of all, there is very little R&D in "learning science and technology." The President's Council of Advisors on Science and Technology did a study on this in 1997, and found that of the U.S. total spending on education, less than one-tenth of one percent was actually devoted to R&D. High-tech industries routinely invest 10-20 percent of sales in R&D, and even mature industries devote two to three percent. This reminds me of a Woody Allen joke, in which there are two old women, and one of them says, 'The food here is really terrible.' And the other says, 'Yes, and the portions are small, too.' I think that captures the situation we face in learning science and technology.

There's a clear need for a lot more research, given the importance of education and lifelong learning, in a number of different areas, tackling three broad questions:

- How do people learn? That would involve researchers in areas like cognitive neuroscience and educational psychology, and might also take advantage of advances in functional MRI.

- How can technology best be used to support teaching and learning?

- How can we evaluate the use of technology? Currently, for example, we have very few large-scale studies with an experimental design (e.g. an experimental group, a control group, and random assignment). We don't have many of these that evaluate the use of technology, or in education research as a whole.

My second observation is that there is no federal agency that has the funding and the capacity to manage a sophisticated extramural research program in the area of learning science and technology. I think that's one of the reasons why we see under-investment in this area. The Department of Education doesn't have anything like a DARPA (the Defense Advanced Research Projects Agency, the central research and development organization for the Department of Defense). The NSF has some modest programs. Occasionally, DARPA will put its toe in the water. DARPA had a great program called the Computer-Aided Education and Training Initiative, but this program was short-lived. There is simply not enough fundamental long-term, high-risk research in this area. I

believe that there is a desperate need either to expand research in learning science and technology at an existing agency, such as the NSF or the Department of Education, or to create a National Institute on Learning, or for one of the major foundations to devote major resources to this.

My third observation is that there are a number of areas in education and lifelong learning that clearly have high social rates of return, and low private rates of return. Even though market forces often lead to an efficient allocation of resources, I think there are some areas where there's not a huge incentive for private capital to invest.

I would like to discuss two initiatives that are at least trying to address some of these problems. The first is something called the Learning Federation. The secretariat for this is the Federation of American Scientists. The Learning Federation is a group of major research universities and companies that is developing a roadmap for learning technologies. The roadmap would identify current capabilities and some plausible medium and long-term goals for improving the state-of-the-art of learning technologies.

They are still in fund-raising mode at this point, so they have not begun full-scale operations. But they have already held a number of workshops to try to identify the areas that they think are interesting—everything from supporting the social dimension of learning to simulations that allow students to engage in learning by doing. For example, imagine if medical students could practice complicated surgeries on "digital humans." Haptic feedback would enable the student's sense of touch to actually "feel" making a particular kind of incision, which might significantly reduce medical errors. There are also many opportunities for the integration of research and education. For example, the astronomy community is now developing a national virtual observatory that will be a petabyte database of tens of millions of objects, from stars to quasars, and could really revolutionize the way students learn astronomy.

A lot of research needs to be done in identifying and supporting different student learning styles, measuring student progress towards learning objectives, providing different ways of representing the same information, so that we can make difficult concepts easier to understand. Also, under what circumstances can the technology support higher levels of attentive "time on task"? For example, why are kids spending 50-60 hours a week in these massively multi-player role-playing games? Is there anything that we could learn from game designers in developing compelling and engaging next-generation learning environments?

The second initiative that I want to discuss is called The Digital Promise, proposed by Larry Grossman, the former President of NBC News, and Newt Minow, the former Chair of the FCC during the Kennedy Administration. Minow, as you know, is famous for calling TV 'a vast wasteland.' They have proposed creating an $18 billion Digital Opportunity Investment Trust, financed by revenues from spectrum auctions. The interest from the trust fund would be used to invest in cutting-edge digital content that has a "public interest dimension," such as education, lifelong learning, and the transformation of our civic and cultural organizations.

I believe that this is a worthwhile proposal that's really worth considering, particularly when you consider that we're investing $2.25 billion a year to ensure that our schools and libraries are connected, but we're investing almost nothing in the development of cutting-edge content. The $1 billion a year in income that the trust fund would produce would not be enough to support all of the ideas that educators, libraries, museums, etc., have for taking advantage of these new media. But it would certainly support innovation, experimentation, and proof-of-concept activities that would really "raise the bar" for digital content.

I would like to give you a few examples of the types of projects that the Digital Promise might be able to support:

- Software for adult literacy and adult basic education that approaches the effectiveness of the one-on-one tutor, and runs on inexpensive gaming platforms like the Sony PlayStation2 or the Xbox. Venture capitalists are not terribly interested in this market, but it is a good example of an e-learning application that might have a high social rate of return. Given that there are tens of millions of Americans that are reading at the fifth grade level or below, I think this is a good example of something that would have a high social rate of return.

- Massively multi-player games that would give at-risk youth the skills they need to run their own businesses, rather than teaching them how to kill monsters and take their treasure.

- Online museums with 3-D representations of their works of art, and "virtual docents" that provide background on the artist.

These are just a few of the possibilities of the kinds of projects that The Digital Promise might support. Given that we have made enormous progress on connecting schools and libraries to the Internet, I think we also need to invest in the R&D and digital content that will give students and teachers something worthwhile to connect to.

Thank you.

Response:
Research and Imagination in E-Learning

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/MTrow.html

Martin Trow
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I am speaking at the end of a day that for me has been full of new information, new ideas, and insights. Like some of you, I feel that much of this has been like trying to get a drink out of a fire hydrant. But I was greatly cheered when Larry Rowe told us that bandwidth is free, or effectively free. I will remember that when I pay my DSL bill.

My own professional interest has been in higher education, broadly conceived. I continue to study the institutions of higher education here and abroad, and to try to make sense of the torrent of ideas and educational developments arising out of the astonishing new technologies that now go under the acronym of ICT (Information and Communication Technologies). These developments have persuaded me, along with many others, that whatever the details, the new ICTs and all the developments associated with them currently have and will continue to have a substantial impact on colleges and universities around the world.

I suspected early in my studies that ICT would accelerate certain secular trends in modern societies over the past two centuries, trends that Max Weber and others have spoken of, long-term trends inherent in the fundamental democratization of life in our societies. These trends are marked by the broadening of access to positions of leadership and privilege in all social institutions, including business, government and the professions. In all modern societies, but most markedly in the US, this broader access to institutional leadership is mediated through the broadening of access to elite colleges and universities. The democratization of access to universities has inevitably weakened the authority of academics, and especially the moral authority of academics, who come to be seen, by students and the broader public, as purveyors of information, knowledge and skill.

In the past, attendance at college or university has been seen, at least in part, as directed at the shaping of the student's mind and character, the refinement of sensibility and the cultivation of independence of judgment. The markets for students that we have been talking about today are primarily markets for training in skills, essentially new ways of providing the "higher" vocational training more efficiently, at a distance, and to broader parts of the population. Of course universities have always prepared students for jobs and careers, but, in the United States, alongside and in some kind of balance with liberal and general education. The development and strength of the new ICTs and of the markets they serve have an impact on that balance, and thus have profound impacts on the nature of universities. A handful of elite colleges and universities can muffle that impact by their autonomy and their own sources of funding, but even there we know, from firsthand experience as well as from the literature, that their core functions of liberal studies and character formation tend to be marginalized, gradually subordinated to the overriding

demands of the society and their students for more high level skills and the mastery of technical/professional bodies of knowledge.

But even as I generalize in this way about the broad impacts of the new ICTs on American higher education, I am reminded that to speak usefully on this subject we have to disaggregate the set of institutions that we call colleges and universities in ways that take into account the large differences among them in character and function. ICTs have, for example, quite different roles and functions in the University of California, the California State University campuses, and community colleges, not to mention the variety of for-profit institutions. But beyond that, to understand the differential impact of the new technologies on higher education, we also have to disaggregate by subject and discipline, and by the relative importance for some fields of study of the transfer of skills and information, as compared with the commitment of other academic disciplines to the search for meaning. Disaggregation along these dimensions also properly links our analysis to the search for the niches and niche services that the business people have been talking about.

We also need to disaggregate by the motivations of students. While we are selling an educational product to adults seeking skills, we may forget that a good deal of higher education is not responding to the energetic demands of motivated and working students, but rather is trying to to engender motivations in more weakly motivated late adolescents. And we know, I think, less about that than we do about how to meet the demands of students who think they know what they want. For example, there is reason to believe that the student's motivation to learn affects the effectiveness of different technologies for learning. For highly motivated students, talking heads and a white board may be all they want and need. For less highly motivated students, we may need the electronic bells and whistles that have been developed precisely for the poorly motivated.

The emphasis in a meeting on e-Learning, understandably, is largely on what can be advanced by studies online, where the main interest is in the transfer of skills and information. But if we turn the coin over, we might well ask, in this rather traditional research university: what is the role of direct personal relationships in learning? What, if anything, is the surviving role of personal relationships between students and teachers in the shaping of the student's mind and character, and sensibilities, and in the student's socialization to the norms and values of a profession? Where does education that is charged with feeling and affect survive, and to what ends? And what is the bearing of ICT, and of much of what we've been talking about at this meeting, on that question?

I do not ask that as a rhetorical question, the way some of my humanistic friends might ask it. They know the answer. I'm not so sure, because part of my fascination with what we've been hearing from the leaders on the technological side centers on what developments in the ICTs may do for the creation of communities of learning electronically linked, when memory and bandwidth are really effectively free, and when the technologies have developed their capacities, as they are doing, to link people together in ways that create the illusion that they are in one another's company. I don't really know how powerful that illusion can be or become, nor how that illusion might affect the relations that might flow across broad electronic links in ways that do not just transfer skills and knowledge, but also feelings for others at the ends of those links. Can

virtual communities engender the complex and varied affections between students and teachers that underlie much of the best and the most demanding parts of higher education? That question, it seems to me, is of considerable interest. It points to the need for a sophisticated and research-based social psychology of learning, which encompasses studies of the role of virtual relationships and groups, among other things, in support of the learning of their members, and how all that might be affected by the technologies of the future. We've heard less about the social psychology of learning than I would like to have heard, not because people are motivated to withhold their knowledge from us, but because I suspect that we've really not done much research along those lines yet. And that is perhaps because of the more insistent problems of funding and organization of distance learning, followed by questions of staffing and curriculum and qualifications and the ownership of intellectual property. All of those are central and important questions in a yet largely unexplored terrain, and unlike the physical terrain, one which changes rapidly. How can we study the social psychology of learning through the ICTs when the technology itself changes so rapidly, changing the key variables in the electronic and physical and psychological contexts of learning?

So one big problem for research on the consequences of the new technologies for learning is the rapidity of change in the technologies. Thus, if the first principle is the necessity to disaggregate the world of higher education and its participants, the second principle is that the speed of change of the technologies makes research-based predictions very difficult, and that in turn makes successful medium-term planning almost impossible. Time horizons for planners are made short by the inventions that keep pouring out of the cornucopias that many of the people at this meeting have helped to create. So it seems to me that the difficulties arising out of the speed of change affect our ability to do some kinds of research, because we're always doing our research based on last year's technology. It follows that we are poor at predicting next year's technologies and their effects on learning on the basis of what we have learned this year.

And therefore I'm glad to be told by Larry Rowe that bandwidth is "free." To say that bandwidth is "free" may not free up our pocketbooks, but it does free up our imaginations. In this area, it seems to me that in some respects, for some questions, and for some time ahead, imagination has got to be a good cheap substitute for research.

Response

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/PLyman2.html

Peter Lyman
Associate Dean and Professor, School of Information and Management Systems (SIMS), UC Berkeley

Listening to these discussions of technology from the point of view of a social scientist, I'm very struck by how each of these accounts of technology was associated with an account of the diffusion of technology. Having watched Silicon Valley my entire working life, it's always been striking to me how some great technologies fail to diffuse, to make a difference, to change things, while some horrible technologies prosper. And each of these accounts of technology also gave us a way of thinking about how the technology came to make a difference. I want to parse out some of those arguments to try to learn how e-learning technologies might come to make a difference.

The first is Larry Rowe's argument that technology itself is the driver. I like the argument. One case that supports this argument is that as the cost of storage went down in the 1990's—which was, I think, one of the most dramatic technological and market changes in the 1990's and was associated with the diffusion of the WorldWideWeb as a remarkable new technology—there was fantastic growth in the amount of information in the world. Hal Varian and I did a study to estimate the amount of new information created every year, and we came up with an estimate of 2 exabytes a year, which, if you put onto floppy disks, would go to the moon and back five times. What's interesting about the 2 exabyte estimate is that all of the information created in human history prior to 1999 is estimated to be 10-12 exabytes. So the rate of accumulation of information is increasing dramatically, in part because what we mean by information in this instance is what is recorded, and also because we're able to record almost everything now, given the reduction in the cost of storage. So we have digital video, we have credit card transactions going into databases so our behavior can be studied, our phone calls are going into databases, astronomic data is going into databases, and so on. So it confirms the thought that we have a real change in the way we look at information, given a technology that has made it possible to collect everything.

And yet, a counter argument is that the diffusion of technology into education has been limited by American intellectual property policy. The Digital Millennium Copyright Act does not extend the educational advantages of print to digital works under copyright, namely, Fair Use and the First Sale doctrine. That is to say that the government has built into the diffusion of this technology a bias towards the commodification of knowledge, which Hal Abelson talked about in his discussion of how MIT has put its online education into the public domain. The government has done a very similar thing with patents, in creating process patents, which we mostly hear about in the context of business and genetic technology. But this could extend to learning technologies as well; the processes of learning could be patented, as they are represented in information technology, and thereby privatized.

Therefore technology alone is not a driver. Technology is a driver within the context of, specifically, intellectual property policy. Our intellectual property policy, I would say, has recently become indifferent to education. I think this creates a disincentive for the diffusion of these technologies to address the problems we're talking about, because it increases the cost of innovation. Consider, for example, digital libraries. They're technologically possible. Interestingly enough, we have NSF funding for the technologies. Yet their actual implementation in distance education is held up by the Digital Millennium Copyright Act, which rules that every time you upload or download a document, you must pay a copyright charge. Now, the fact that we ignore that law in practice doesn't mean that it isn't the law, and that there aren't consequences of breaking the law. So I think the technology driver argument is true, but perhaps less true in higher education than in other sectors of the economy, because of our intellectual property policy.

The second argument about the diffusion of technology that struck me has to do with Gordon Freedman's comment that his software is user sensitive. But this argument has come up before, in some of Tom Kalil's work on the relationship between social science and technology development.

I was interested in a conversation that didn't happen. Phil Stark was talking about statistics software, and what a great job we're doing at Berkeley, because we do everything better than everybody else. When asked, "Why aren't you using the Open University software?" Phil replied, "Not invented here," as if that's an argument. So what does "not invented here" mean? And why are we not grappling with the "not invented here" problem? I think it's a key problem in diffusion of technology. For the economists in the crowd, we can phrase this another way. How do markets develop for innovations? And why aren't markets developing for these innovations? Why aren't market mechanisms developing for these innovations in teaching and learning software? As someone asked, why is it that the textbook model of distribution and standardization doesn't work for courseware?

Jack Wilson's observation helps to answer these questions. He said, "Build it and they will come." It reminds us how much research drives innovation in educational technology. The mental disaggregation of teaching and research that we did yesterday, I think, is not really supported by these descriptions of where e-learning technologies come from. Jack's statement also addresses what has been a mystery to me: why it is that the drivers of e-learning are the very institutions that have the least to fear from competition, that is, the ones with the most secure brand niches. It's because these questions about technology and education are essentially research questions. That's really what Phil might have answered, that "not invented here" means that *we're not trying to create products*—that it's a research process, both into the technology and into new pedagogies. But this research orientation leads to problems because it prevents us from standardizing, and having markets that make these things cost-effective, because research creates obsolescence. On the one hand, obsolescence is a horrible economic problem for the development of markets for these innovations. On the other hand, it shows the vitality of the research community. We need to account for not only the technology, but also how that technology is diffused.

CONCLUDING REMARKS

Investing in Educational Technologies: The Challenge of Reconciling Institutional Strategies, Faculty Goals, and Student Expectations

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/DHarley.html

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A version of this paper was accepted in December 2001 for publication in the Journal of Studies in International Education.

Abstract

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/DHarley_abstract.html

The Higher Education in the Digital Age Project (HEDA) is concerned with the policy implications of information and communication technologies (ICTs) for higher education. This paper specifically analyzes some of the ways in which ICTs are being employed as possible solutions to the triad of pressures facing US research universities: (a) holding down costs, (b) providing access to an increasingly diverse demographic, and (c) maintaining quality. It presents a brief review of activities taking place throughout the US, and discusses some of the pressures that US research universities must face as they plan for the future. Challenges include the financing of ICTs, the pace of technological change, academic culture, student expectations and backgrounds, demands of public stakeholders, and the emergence of new competitive markets. This paper arose out of discussions we have held under the umbrella of the HEDA Project. Those discussions, which included a meeting in October 2001, are referenced throughout.

Introduction

Rhetoric suggests that Information and Communication Technologies (ICTs) will be an important solution to the triad of pressures facing colleges and universities: (a) holding down costs, (b) providing access to an increasingly diverse demographic, and (c) maintaining quality. It is in this environment that university leaders are faced with making decisions about internal and external on-line learning markets, but with no clear models to reference. Not only are answers to questions of educational efficacy, revenue streams, and nature of potential markets elusive, but the creation of high quality on-line offerings is expensive, and requires huge capital investments.

Our work at the Higher Education in the Digital Age Project[1] at UC Berkeley confirms that predictions about the future consequences of ICTs for higher education are

[1] Our work is partially supported by the William and Flora Hewlett Foundation and the Andrew W. Mellon Foundation. For a description of our program and associate scholars see http://ishi.lib.berkeley.edu:80/cshe/projects/university/

complicated by both the diversity and rapidly changing character of institutions, student populations, and the technologies themselves. Such diversity and speed of change suggests that predicting the emergence of one, or even a few, US models for flexible learning may be impossible. Many of the ideas in this paper are the result of my ongoing discussions with colleagues in the Higher Education in the Digital Age Project at the Center for Studies in Higher Education, including the meeting in October 2001. Transcripts from that meeting are referenced throughout.

Diversity of Institutions, Systems, and Approaches

The US system of higher education is most accurately described as diversified. The range of institutions includes public and private research university systems, private liberal arts colleges, trade schools, community colleges, "corporate" universities, proprietary schools such as the University of Phoenix and DeVry, as well as other types. Each of these types has specific missions and student bodies. Diversity is enhanced by the fact that we, unlike many other countries, have no federal ministry of education, and higher education is regulated by the states (Eaton, 2001). Predictive exercises are further complicated by the fact that there can be an immense amount of diversity of functions and student bodies within single institutions. This may be particularly true of the public research universities, or multiversities (Kerr, 2001) whose missions include undergraduate and graduate education, high quality research, and public outreach and service.

Trow (1997) points out that the University of California system (and other public research university systems) encompasses elite, mass, and universal forms of education within each campus: elite forms are predominantly represented by the graduate student experience, mass forms by the traditional early undergraduate experience, and universal forms are provided by UC Extension, our continuing education/adult learning arm. The range of applications of ICTs to the teaching and learning enterprise at these institutions reflects their multiple missions and audiences. For example, our extension divisions, long in the business of adult continuing and distance education, have been active in developing programs for on-line, off-site learners, including international audiences.[2] Our professional schools of business, engineering, and law are actively involved in professional education activities for adult learners. Technology enhancements to traditional courses for residential undergraduate students take many forms. They run the gamut from simple course home pages, to sophisticated on-line interactive text-books, to streaming indexed lectures. Most of these enhancements to traditional courses have been fueled by individual faculty effort and enthusiasm – not by centralized strategic planning pathways that envision scaling on-site enhancements for new markets of off-site students. The "cottage industry" nature of these on-site activities therefore makes them somewhat idiosyncratic as to their representation by discipline and their explicit pedagogical goals.

The possibility of coordinating and integrating these oft-times parallel activities into a more cohesive strategic endeavor is becoming more urgent for public research universities as they are faced with new pressures from within and without, and are being asked to do much more with less. For example, in the United States, public and private colleges and universities nationwide expect to enroll more than two million new full-time

[2] See for example UC Berkeley Extension's on-line course offerings at http://learn.berkeley.edu/

students by 2010, a phenomenon referred to as Tidal Wave II (CPEC, 2000). The University of California (UC) ten-campus system faces an increased enrollment of almost 63,000 full-time students – a 43 percent increase (UC News and Communications, 2000).

The anticipated influx of new students over the next decade has prompted UC Berkeley, which enrolls more than 31,000 undergraduate and graduate students, to explore options for serving more students, more cost effectively, without significantly increasing teaching and support staff in large lecture courses. Possible solutions for handling this increased student body include offering classes during the summer, expanding regular enrollments during fall and spring semesters, and making use of technology to expand on- and off-campus learning opportunities. Consequently, there are a number of large-scale experiments taking place within the campus and between campuses that are directly testing the feasibility of the latter strategy.

Digital Chem 1A: A Case Study

One such experiment in the College of Chemistry at UC Berkeley has provided those of us at the Center for Studies in Higher Education with an opportunity to do an in-depth study of different social and economic aspects of technology innovations on the UCB campus. Specifically, we are undertaking a quasi-experimental two-year analysis of the use of technology enhancements in the teaching of Chemistry 1A.[3] A summary of our findings (Harley et al. 2001) from the first year analysis can be found at <http://ishi.lib.berkeley.edu/cshe/projects/university/chem1a/summary.html>

Chemistry 1A is the largest, most visible course at UC Berkeley – nearly 2,000 students, or one half of the freshman class, enroll in Chemistry 1A each year, and approximately 100 teaching and support staff are required to teach and manage the course. In addition to the large number of students and staff involved, the course is a gateway to more advanced study in many disciplines. The College of Chemistry is exploring a number of possible strategies for accommodating more students. To achieve these goals, individuals in the College have developed a course, called *Digital Chemistry 1A*,[4] that includes:

- deployment of on-line quizzes and pre-laboratory assignments;
- conversion of the lecture chalkboard content to PowerPoint slides; and,
- broadcast of video lectures, with synchronized and indexed slides, over the Internet for on-demand replay (Figure 1).

Our study is interested in a series of interrelated questions:

- Are the technology enhancements effective pedagogical tools?
- Do the technology enhancements have the potential to be cost effective?
- How might off-site audiences use the products of this on-campus experiment?

[3] This work is funded by a grant from the A.W. Mellon Foundation's Cost Effective Uses of Technology in Teaching (CEUTT) program initiative, and depends on the contributions of many, including Professors I. Michael Heyman, Lawrence Rowe, Alex Pines, Dr. Mark Kubinec, Dean Gary Matkin, Dr. Flora McMartin, Shannon Lawrence, Jonathan Henke, Marytza Gawlik, among others.

[4] The Digital Chem1A website is at http://www.cchem.berkeley.edu/~chem1a/digitalchem1a/

Our first year of study provides some intriguing preliminary data on both the costs and utility of the current technology enhancements in Chem1A at UC Berkeley.

Potential Cost Savings

- Our observations and cost figures suggest that faculty and GSI (Graduate Student Instructor) time could be reallocated from tasks such as lecture preparation, responding to routine student questions, out-of-class grading, and in-class administration to more time teaching and interacting with students.

- Data indicate that most students in Chem 1A use the on-line lectures primarily as study aids, and the majority (>80%) would not substitute remote viewing for attending lecture. Our preliminary analysis of use of other on-line video lecture archives at UC Berkeley (Rowe et. al., 2001) suggests, however, that some students in other courses have a tendency to opt out of attending some or all of the lectures, thus freeing up seats in the lecture hall.

- The availability of the archived lectures has the potential to allow a larger number of students to be enrolled in the course, without increasing faculty time lecturing. Because the same lecture is given three times per day, staff and facilities costs could be saved if a proportion of students either opted out of attending lectures, or if a lottery system were devised so students were required to view a certain number of lectures per semester on-line.

Student Performance and Attitudes

Given that large lecture courses have a reputation among educators as being poor learning environments (The Boyer Commission on Educating Undergraduates in the Research University, 1999), we were interested in the positive reception of the Chemistry 1A course and its technology enhancements, which we suggest is related to a number of factors:

- The enhancements were minimally disruptive to the teaching style and pedagogy of the teaching staff;
- The enhancements increased convenience for students and faculty;
- The enhancements were "generic" enough that students could use them flexibly and on their own terms (e.g., reviewing lectures on-line for exam study, repetition of difficult sections by non-native English speakers, taking quizzes multiple times);
- The overall quality of this large lecture course is exceptionally high. The faculty in charge are dedicated to providing the best experience possible for students, and are constantly integrating feedback into course improvements.

Scalability, New Audiences, and Faculty Adoption

There is certainly the possibility that several faculty, or even faculty on other UC campuses, might be able to share on-line materials developed for Digital Chemistry 1A. In reality, the sharing of teaching materials among faculty in a research university

environment may be complicated by multiple factors such as faculty idiosyncrasies and the continuity of underlying support structures for technology enhancements. Interviews with other faculty members who taught subsequent semesters of Chemistry 1A suggest that the successful wholesale adoption of technology enhancements from one semester to the next cannot be assumed.

We suspect that any scaling benefits will come either (a) when newly hired faculty, who might be more adroit with new technologies, enter the department; (b) if the course can be "modular" so that faculty can select materials that fit their learning goals, should their learning goals differ from the developers' intentions; and/or (c) if the materials can be made available to off-site student audiences.

Discussion

Since the advent of the Arpanet, colleges and universities have been at the forefront of creating and experimenting with ICTs in their normal work of research and teaching. Most institutions enhance many of their traditional course offerings and/or provide some courses entirely on-line, which means that students and faculty can exercise more choice about the modalities they use for teaching and leaning. A number of findings from our work with the Digital Chem 1A experiments, and other on-going activities throughout UC and other research universities, suggest that the future landscape will depend on how institutions respond to a variety of variables: costs and sustainability, technology, students, public expectations and needs, and the realities versus perceptions of new competitive markets.

Containing Costs and Fostering Sustainability

The degree to which ICTs are cost effective is problematic, and is currently under study by a number of institutions and individual researchers.[5] Most agree that the integration of ICTs into extant or new institutions is expensive, especially if institutions want to be on the leading edge of ICT development and quality. The development and deployment of high quality on-line distance courses, such as those offered by the UK Open University, are expensive and require large numbers of students to break even (Curran, 2001). There is some evidence, however, that the strategic use of on-line resources in large lower division lecture classes at traditional institutions may result in some savings and redistribution of teaching staff time (Twigg, 1999; Massey and Zemsky, 1995). The high costs of educational technology infrastructure (internet accounts for students; staff and faculty; wiring classrooms dorms, and offices; technical support staff), the rapid change in the technologies themselves, and the relative dearth of robust institutional strategies for financing campus technology (Green & Jenkens, 1998) suggest that cost-savings, if they are to be realized, may be in the future.

Goldstein (2000) makes clear that the current high costs of ICTs in education cannot be entirely financed by most institutions' available internal operating budgets. Therefore we are seeing experimentation with a wide variety of new financing arrangements. These new forms of financing may entail creating investment partnerships with private

[5] See for example the CEUTT projects at the A.W. Mellon Foundation website: http://ceutt.org

industries (especially those in media and high technology), dependence on federal and private grants, regional or functional consortia, imposition of student technology fees, and/or venture capital funding (Goldstein, 2001; Matkin, 2001a). Kalil (2001) suggests that activities with high social rates of return and low private rates of return will be in need of large scale federal investment. The Digital Promise Project (www.digitalpromise.org), which has forwarded the idea of a Digital Investment Opportunity Trust, is dedicated to this ambitious goal.

Whatever the arrangement(s) an institution chooses, the Digital Chem 1A experiment suggests that sustaining such activities with the work of core faculty at research universities requires making certain assumptions about how teaching staff, especially faculty, work. Peter Lyman (2001) makes the case that the role of faculty, especially with respect to their intellectual property, is a core consideration when discussing viable markets and the diffusion of innovation in courseware. University planners will need to reconcile the divergent and sometimes competing philosophies of an institution's core teaching role and new roles that require devising cost-effective educational delivery schemes for new markets.

Changing Technologies and Their Effectiveness in Academic Environments

Institutions are continually asked to make expensive choices about on-line education development and delivery strategies (see, for example, Rowe, 2001). The explosion of the Internet and associated technologies in the latter half of the 1990's has made combining production and delivery technologies with interactive communication technologies the rule rather than the exception. ICTs encompass many modalities, and are underpinned by a plethora of new hardware and software that can be combined in an almost infinite number of ways. N-way video streaming, digital library and museum database management, simulations, teleconferencing, telephony, and wireless communications are just some of the standard modalities at the disposal of higher education institutions. Each modality in fact has particular characteristics that contribute to its relative strength or weakness as an effective tool for tried-and-true teaching/learning methods. Contrary to the rhetoric of the constructivist "student-centered" movement, these successful methods usually include a varied mix of lectures, small seminars, laboratories, field work, library research, one-on-one tutoring, and so on. The options available for combining particular pedagogical goals with specific technologies create powerful opportunities for amplifying teaching and learning effectiveness. The array of options also creates environments that can differ as much within disciplines, and institutions, as it does among them.

University planners, however, must consider that significant questions remain concerning whether high quality interactions between student and teacher and among students, the *sine qua non* of a quality educational experience, can be replicated, or even approached, in on-line environments (Phipps & Merisotis, 1999). If one spends any time around computer scientists at a research university, however, one realizes that indeed Internet2 (http://www.internet2.edu/) and the myriad applications it can support (tele-immersion and haptic feedback, to name two examples) have the potential to provide ubiquitous high-quality on-line interactions among individuals in the not too distant future. The nature of the technologies themselves may also allow entirely novel modes of teaching

and learning that we have not yet imagined. And as the technologies and their use evolve in unexpected ways, simpler scaling of traditional teaching to new off-site audiences cannot be discounted.

Student Expectations and Backgrounds

Future planning is confounded by the fact that we simply do not understand enough about the students of the future, who will have been weaned on peer-to-peer file swapping, Google searches, and wireless instant messaging. What expectations will these students have about their learning environments and the nature of scholarship? How will institutions respond to cohorts of students who may have non-traditional concepts of time and space in scholarship? For example, Sally Johnstone (2001) has pointed out the importance of "swirling," a phenomenon where students mix teaching and learning modes by combining traditional courses with on-line courses, sometimes from different institutions.

We do know that many students have new ideas about the nature of coursework. They appear not to use the library in traditional ways, and they cull many more resources from the web (Carlson, 2001). We know from the UC Berkeley Digital Chem 1A experiment and reports from other campuses that, given choices about how they take a course, many students will choose an on-line video lecture component as either a back-up or a substitute for attending lectures. Many students also appreciate the opportunity to do lab preparatory work and quizzing on-line. It is clear that the positive response to the technological enhancements in Digital Chem 1A was because the enhancements increased convenience for students and faculty, and they were "generic" enough that students could use them flexibly and on their own terms.

Moreover, we do not know how many students will eschew traditional liberal arts curricula for the immediate economic benefits that can be derived from management and technology education. It is probably safe to assume that as new on-line education providers proliferate and consolidate, the range of educational choices available to students will increase, and many mature students will forsake a traditional four year residential college experience for certification and part-time degree programs. Students enrolled in traditional programs also might supplement their education with courses from non-traditional providers. For example, Cliff Adelman's work suggests that a huge cohort of international students is forsaking traditional higher education institutions and instead enrolling in IT certification programs (Adelman, 2000).

Public Stakeholders

Public universities in the US are under immense pressure to satisfy the needs of multiple stakeholders and make concrete contributions to the public good. This can be achieved through various means, including economic development activities that derive from research as well as direct outreach to local communities. An emerging issue in the US, particularly in states with large immigrant populations such as California, is how to prepare under-served high school students for productive college careers. Many hopes are being pinned on ICTs to address this particular need. The areas with most promise

include the provision of "advanced placement" courses to urban and rural high schools, or the enhancement of community college curricula to increase the rate of transfer from these two-year "open door" colleges into the research university milieu of the University of California. At the University of California, a number of experiments are underway to address this need. Making Digital Chem 1A and other undergraduate courses available to secondary and community college students is one possibility being explored (e.g., Stark, 2001). Another is the forging of unique technology partnerships among community colleges, the California State University (CSU) system, and UC campuses as embodied in the development of the new UC campus at Merced in the central valley of the state. Of course there are possibilities for scaling these activities to non-California or even non-US populations.

Initiatives such as the MIT OpenCouseware project (Abelson and Kumar, 2001; http://web.mit.edu/ocw/), which are exploring new ways of making some of the educational assets of "branded" US research universities available free to the public, offer tantalizing possibilities for extending the reach of US higher education. Contrary to speculation, however, the posting of on-line course materials such as syllabi and lecture notes will probably not provide a substitute for the "full service" delivery of an entire course on-line by a renowned university professor (Matkin, 2001).

Response to New Competitive Markets

Any academic can verify that ICTs have provided powerful new tools to forge global research networks in higher education and industry. These same tools, combined with the international hunger for technical and professional education, provide opportunities for traditional and nontraditional higher education providers throughout the world to provide anytime, anywhere education across international boundaries, and possibly to make money doing it. It is in this hyper-charged atmosphere of competition that university leaders are being asked to consider whether their own institutions will remain the sole or even primary producers and providers of specialized knowledge. Who among us has not heard the pundits who have suggested that ICTs represent the next high-growth internet industry and provide a possible breach of the former monopoly held by traditional higher education providers (Drucker, 2000; Moe & Blodgett, 2000)?

The emergence in the last few years of a diverse array of on-line education models has been phenomenal (Cunningham et al., 2000; Dirr, 2001; Eaton, 2001; OECD, 2001a). They include for-profit ventures (Fathom.com, NYU Online, University of Phoenix On-line, Onlinelearning.net), equity stakes in external companies (U Chicago, Columbia, UNext.com), university consortia (Universitas 21, Western Governors University, University Alliance for On-line Learning), licensing agreements (Pearson, McGraw Hill), and the MIT OpenCourseWare initiative.[6] Most of the for-profit ventures appear to be

[6] Longitudinal case studies of some of these ventures have been developed by S. Lawrence and D. Harley, and can be found http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/

responses to a perception that global markets for "just-in-time" education are burgeoning, and many are either owned by or partners with "branded" research universities.

The array of models, and their evolving business strategies, suggests that many research universities with investment capital have responded quickly to perceived threats and opportunities, without much hard data to rely on. As one of the largest exporters of education services (Larson, 2001; OECD, 2001b), many segments of the US higher education sector maintain an active role in global, as well as domestic, education markets. The reality of profit potential for many of these ventures, however, has been elusive (Wilson, 2001). For example, despite the huge investments in these ventures it is not known (a) how large or lucrative the emerging global markets for on-line education will be, (b) whether the traditional U.S. higher education sector can dominate the market, or (c) how efforts to enhance traditional university curricula might scale to these new audiences. Some (Collis, 2001; Hilsberg, 2001) predict that the most threatened institutions in the US are those whose primary mission has been the provision of undergraduate curricula to undergraduates.

What might the US landscape look like in the future? That will depend on which institutions one is examining. Choices that make sense for a well-focused proprietary, such as the University of Phoenix, may be entirely different from choices that are realistic for a community college or a small residential four-year institution. Different still will be the choices made by large multiversities, whose missions encompass undergraduate and graduate education, research, and continuing education. Geiger (2001) argues that the boundaries between universities, and community colleges, and distance education, and e-learning, are being contested, and that universities are in fact competing with themselves. The result is that these institutions appear to be "hedging their bets," pursuing and juggling multiple strategies each tailored to specific opportunities and constituencies.

Conclusions

We can safely predict that there will always be a market for residential higher education in the US and the unique socialization and networking roles it serves, both at public and private universities. It is also clear that markets for new ways of accessing higher education are emerging. It may be that small private institutions will be primarily interested in investing in technologies that enhance their regular offerings, perhaps only secondarily (if at all) getting into the distance on-line learning business. Larger public research universities may see the on-line market as an important new source of students and funds, and will thus capitalize heavily in new ventures in order to be at the forefront of the predicted boom in global on-line education.

The structure and function of existing and emerging models will be determined by an equally diverse array of internal and external pressures: differential institutional missions, student demographics, varying perceptions of new markets and competitors, the exigencies of financing technology-mediated learning, and the attendant controversies that accompany a university entering the marketplace. The latter issues include intellectual property, faculty time and incentives, conflicts of interest, and preservation of

quality. Successful models will provide a flexible mixed or hybrid mode that allows for varying proportions of on-line and face-to-face teaching and learning methods. Furthermore, the successful models that emerge for an institution will be the result of careful planning, and reflect a synthetic approach that makes wise use of existing technologies and is customized to the subject matter, to student needs and schedules, to faculty culture, and to the institution's mission, goals, and budgets.

University planners are in need of data and analyses of past and current activities related to the development, implementation, and financing of ICTs in higher education. One of our jobs at the Center for Studies in Higher Education is to try to make sense of this world through research projects and the creation of a network of administrators, technology implementers, and higher education scholars to discuss on-going developments. One of the most pressing problems we have identified is that we are observing a "fast running experiment," which lacks the traditional data sets and methodologies that social science researchers need for analysis (Geiger 2001). As Martin Trow (2001) has succinctly stated it, the shifting nature of the technologies, student audiences, external pressures, and institutional strategies suggests that imagination may be an important tool not only for those whose task is strategic planning, but also for those scholars whose goal is analyzing and describing this emerging landscape.

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APPENDIX

List of Panelists and Participants

http://ishi.lib.berkeley.edu/cshe/projects/university/ebusiness/participants_102701.html

- **Professor Hal Abelson,** Computer Science and Engineering, MIT; Co-Chair, MIT Council on Educational Technology **
- **Mary Beth Almeda,** Assistant Dean, Online and Distance Education, UC Berkeley Extension
- **Malte Beinhauer,** Researcher, Institute for Information Systems, Saarland University, Germany
- **Ulrike Bentlage,** Consultant, The Boston Consulting Group
- **Professor David W. Breneman,** Dean of Curry School of Education, University of Virginia
- **Dr. Michael P. Carter,** Acting Program Director, Alliance for Life-Long Learning
- **Professor David Collis,** Yale School of Management
- **Jon Conhaim,** Director, e-Berkeley, UC Berkeley
- **Dr. Geoffrey M. Cox,** Cardean University President /UNext Vice President for Academic Affairs **
- **Professor Chris Curran,** Founding Director, the National Distance Education Centre, Dublin City University **
- **Dr. Barbara Gross Davis,** Assistant Vice Provost, Undergraduate Education, UC Berkeley
- **Dr. Andy DiPaolo,** Executive Director, Center for Professional Development; Senior Associate Dean Engineering, Stanford University **
- **Dr. Dieter Dohmen,** FiBS, Education and Socio-Economical Research & Consulting, Koeln, Germany
- **Dr. John A. Douglass,** Senior Research Fellow, Center for Studies in Higher Education, UC Berkeley
- **Professor Charles Faulhaber,** Spanish & Portugese; Director, Bancroft Library, UC Berkeley
- **Dr. Saul Fisher,** Program Officer, The Andrew W. Mellon Foundation, New York **
- **Gordon Freedman,** Founder, Knowledge-Base; Director, Strategy & Alliances, Prometheus.com **
- **Marytza Gawlik,** Ph.D. Student in Policy, Organization, Measurement and Evaluation, Graduate School of Education, UC Berkeley
- **Professor Roger Geiger,** Higher Education, Pennsylvania State University **
- **Michael Goldstein,** Member of Dow, Lohnes and Albertson, Washington DC **
- **Diane Harley, Ph.D.,** Director, Higher Education in the Digital Age Project, Center for Studies in Higher Education, UC Berkeley **
- **Professor I. Michael Heyman,** Boalt School of Law; Chancellor Emeritus, UC Berkeley; Director, Center for Studies in Higher Education, UC Berkeley
- **Terry Hilsberg,** Founder and CEO, NextEd Limited **

** Panelists

List of Panelists and Participants, continued…

- **Vice Chancellor James Hyatt,** Budget & Finance; Chief Financial Officer, UC Berkeley
- **Dr. Sally Johnstone,** Executive Director, Western Cooperative for Educational Telecommunications (WICHE), CO **
- **Thomas A. Kalil,** Assistant to the Chancellor for Science and Technology, UC Berkeley **
- **Professor David Kirp,** The Goldman School of Public Policy, UC Berkeley **
- **Dr. M. S. Vijay Kumar,** Assistant Provost and Director of Academic Computing, MIT **
- **Dean Robert Lapiner,** Continuing Education and Extension, UCLA **
- **Kurt Larsen,** Centre for Educational Research and Innovation, Organization for Economic Co-operation and Development (OECD) **
- **Shannon Lawrence,** Assistant Director, Higher Education in the Digital Age Project, Center for Studies in Higher Education, UC Berkeley
- **Steve Lindauer,** Senior Vice President, Strategy & Business Development, eCollege, Denver, CO
- **Professor Peter Lyman,** Associate Dean, School of Information and Management Systems (SIMS), UC Berkeley **
- **Professor Christina Maslach,** Psychology; Vice Provost for Undergraduate Education, UC Berkeley
- **Dean Gary Matkin,** UC Irvine Extension **
- **Associate Vice Chancellor John W. McCredie,** Information Technology (AVC-IT), Chief Information Officer, UC Berkeley
- **Larry Merkley,** Consultant for the Provost and Executive Vice Chancellor on Information Technology, UCSC
- **Thomas I. Nygren,** Program Officer, The Andrew W. Mellon Foundation, New York
- **Professor Sheldon Rothblatt,** History; Director Emeritus, Center for Studies in Higher Education, UC Berkeley
- **Professor Lawrence Rowe,** Computer Science, EECS, UC Berkeley **
- **Professor Philip B. Stark,** Statistics; Faculty Assistant in Education Technology, UC Berkeley **
- **Professor Martin Trow,** Professor, The Goldman School of Public Policy; Director Emeritus, Center for Studies in Higher Education, UC Berkeley **
- **Professor Marijk van der Wende,** Center for Higher Education Policy Studies (CHEPS), Netherlands
- **Professor Hans N. Weiler,** Political Science and Education, Stanford University; Max Planck Institute for Human Development, Berlin **
- **Dr. Jack Wilson,** CEO, UMass Online **
- **Professor Julius Zelmanowitz,** Vice Provost, Academic Initiatives, Office of the President, University of California **

** Panelists