Technology

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TECHNOLOGY IN HIGHER EDUCATION OPPORTUNITIES AND THREATS

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Recent technological innovations have the capacity to change completely the education landscape in the next century. Simple desktop computers can now function on the internet as powerful, multi-media, interactive communication centers. New internet tools like bulletin boards, electronic texts, hyper-linked texts and sources, and enhanced computer systems with greater speed and more memory allow viewers to see more information and tune in on discussions, business meetings, theatrical performances, even operas around the world. Such features offer rich opportunities to faculty and students; but they also present some areas of concern, like the possible downsizing of higher education by cutting down the number of full-time faculty and using more and more part-time instructors and technical support; relaxing standards of accrediting cybercourses and ultimately devaluing the university degree; and violating intellectual property rights. Technology offers opportunities for new levels of communication in higher education, but it threatens to commercialize academic discourse and isolate students and faculty in electronic cyberspace.

BACKGROUND

First, it is important to look at some of the forces that have made virtual classrooms a reality so quickly.

ACCESS

Enrollments in schools and colleges are predicted to increase over the next decade, partly as a result of an influx of children of immigrants and the grandchildren of babyboomers. In Southern California about 12 of San Fernando Valley's high schools may each increase by about 1,000 students per year until the year 2007. The Rand Corporation, using California Post Secondary Education Commission (CPEC) statistics, projects that if current trends continue, the total number of students in the state's colleges and universities will increase from the 1997 level of 1.3M to about 2M full-time equivalent (FTE) students by 2015-a 60 percent increase, and twice the projected increase for thenation as a whole ("Breaking the Social Contract," Rand, September 1997, www.rand.org/publications/CAE/CAE100). Demographic data suggest that this increase will not continue but will drop off dramatically by the end of 2008. Given this predicted temporary increase in enrollment demand, some legislators and educators think it is wiser to invest in technology than capital construction.

More and more high school students are going to college. Less than 20 years ago, about 56% of high school seniors attended college; now closer to 67% do. Students and their families are also associating future earning potential with level of education. College enrollments also reflect an increase in older, non-traditional students who desire college degrees to boost income. Data confirms that the disparity in income and opportunity increases each year between those with college degrees and those without.

There has also been an increase in those students eligible to go to college. In 1960, when the Master Plan Guidelines were first formulated, 12.5% of high school students were academically eligible for UC and 33.3% for CSU. In 1990, 18.8% were eligible for UC, but the number increased for CSU only to 34.6% (CPEC, "Eligibility of California's 1996 High School Graduates for Admission to the State's Public Universities," Nov. 1997). Despite an increase in those eligible to attend state colleges and universities, many are unprepared for college level work. In 1994, 16,150 first-time freshman students were tested at CSU to determine their readiness for college-level English. About 67% were not ready and required remedial classes. When upper division transfer students were tested, the percentage of students unprepared increased to 74.9%. Scores for preparedness in mathematics are roughly similar.

COSTS OF HIGHER EDUCATION

State funding for higher education has been decreasing, and many predict that it will continue to do so into the next decade. In many cases, universities and colleges have had to raise tuition and fees to compensate for tighter state funding. The increasing costs of a college education are often cited as a major reason to look into the advantages of technology and online education, but some forces are mitigating those increases. In Oct. 1997, the president of the AAUP, James E. Perley, testified before the National Commission on the Cost of Higher Education in Washington D.C. He stated that the average tuition and fees for the 1997-98 school year at a public four-year college is $3,027. The new federal Hope Scholarship tax credit available in 1998 may bring these costs for each of the first two years down to $1,527 for many students--a significant benefit in that about 80% of all college students are enrolled in public colleges and universities with similar tuition levels.

Faculty salaries are said to contribute to those increasing costs of a college education, with some contending that tenure drives up those costs. In 1996, the average income of doctors was $124,821 and over; lawyers about $70,199; and in 1995-96 the average salary for a full professor at a university or four-year college was $65,440, with lower ranks earning somewhere between $30,000 and $50,000. Tenure is sometimes cited as the reason faculty salaries tend to lag behind compensation in other areas of professional employment; tenure is seen as an economic benefit of lifetime employment that somewhat offsets lower salaries. Following this logic, however, if tenure were removed or professors traded tenure for market driven salaries, the cost of higher education would

increase.

According to an AAUP Report of Committee R, (Nov. 1997), people might think it would be more cost effective to offer courses online, but the cost equation is not all that clear. There may be less of a need for buildings, campus infrastructure, and maintenance, but there will be a need for communication technology infrastructures, support networks, technological support services, and marketing in addition to costs associated with registration, library access, advising, and testing.

Savings may only be realized with larger and larger numbers of students enrolled in any one class. Currently UC faculty who teach large courses, for example in mathematics, use internet tools as a way for TAs to handle student inquiries, post problem sets to electronic bulletin boards, and conduct chatrooms. A different issue will arise in totally online classrooms when the faculty member is replaced by courseware or lectures that are formatted, prerecorded, and delivered over the internet. The cost-saving scenario of a university offering a totally online course to several hundred off-site students with part-time instructors or TAs answering questions and grading tests and papers and increased technical support people available to students raises questions of quality control and assessment issues of testing and grading. Even the cost saving assumption of this scenario would need to be considered carefully.

DOWNSIZING: RISE OF PART-TIME FACULTY

When money is tight, administrators turn to part-time and non-tenure-track appointments as cost-cutting measures. Part-time faculty and lecturers typically receive lower salaries and fewer if any benefits. At UC, in 1995-96 the average salary was $32,050 for a full-time instructor for the academic year, whereas the average for a full-time professor was $70,355, more than twice as much.

Nationwide, the percentages of part time faculty are increasing at a rapid rate. In 1970-71 part-time professors made up 22% of the teaching workforce; in 1982-83 the percentage jumped to 32%; and to 42% in 1992. Current estimates might suggest that the figures have reached close to 45 or 46% or even more in 1997 (Jack Schuster, "Reconfiguring the Professoriate: An Overview," Academe, Jan/Feb. 1998). Professor Schuster discusses what he sees as some of the consequences of this growing "contingent" work force: tenure at risk, weakening faculty loyalty, and the decline in attractiveness of academic careers. Perhaps more serious are the burgeoning uses of distance learning which will encourage the hiring of part-time faculty and "the potentially diminished future role of accreditation as a quality control mechanism that has historically exerted pressure to contain the use of part-time faculty" (p. 52).

Nationally, the numbers of full-time faculty have edged up slightly, about 2.6%, but at UC, there has been a slow but steady decline in the numbers of full-time faculty and increase in part-time teaching faculty.

	UC		UCLA		UCSC		UCB	
Date	full-time	part	full	part	full	part	full	part
1993	6,846	1,424	1,481	349	356	142	1183	274
1994	6,277	1,595	1,381	365	322	155	1084	263
1995	6,270	1,776	1,362	455	317	169	1081	250
1996	6,358	1,844	1,377	476	336	167	1105	280
1997	6,554	1,887	1,431	492	353	186	1131	283

% change full and part time								
1993-97	-4.27%	32.5%	-3.38%	30.99%	-8.43%	31%	-4.4%	3.28%
% change part time								
1997		22.36%		25.6%		34.5%		20%

Among the campuses listed above, the percentage of part-time faculty to the total number is the highest at UCSC and the lowest at UCB; the increase in part-time faculty of about 31% is similar systemwide, except at UCB where the increase is surprisingly low. One of the complaints of the California Faculty Association (CFA), which represents the faculty at CSU, against the California Education Technology Initiative CETI is that it most surely will result in fewer faculty jobs and more reliance on part-time lecturers and other non tenure track academic support.

ACCREDITATION

As more and more courses go online, accreditation may become the major issue. The value and prestige of a degree from one institution over another may in the next decade depend on the accrediting process. In the past, faculty have played an important role in granting credit for courses, but as universities go online and become "student-centered," with fewer and fewer full-time faculty involved in education, the standards of accrediting may change and become more relaxed. The first step might be for universities to give credit for the same course description whether it is taught on campus or online. For example, the Texas Higher Ed.Coordinating Board used to decide whether a computer accessed course would receive college credit. Now, according to House Bill 1404, passed in 1997, if a course receives credit on a campus, it receives credit online.

In Ohio, where online education has been introduced at several colleges, problems have surfaced concerning physical location and credit for a course. The Ohio Board of Regents cannot apply state standards for accreditation to universities and courses which do not have a physical presence in the state. These kinds of physical requirements affect institutions like the University of Phoenix, which maintains no physical campus, attracts students in Ohio to take courses online, but will not submit its courses for accreditation to a board physically located in Ohio. The University of Phoenix, now the largest private

school in the nation, began in 1990. It offers degrees online in business and technical fields to students around the world with no onsite requirements. These same issues of accreditation will affect the Western Governors' University where there are four geographical areas but no single site location. With administrative headquarters in Utah and academic headquarters in Colorado, it is not clear how this virtual university will award credit for online courses or how faculty will collectively guard the accrediting or degree granting process.

UC faculty who presently serve on Senate committees or executive boards that oversee curriculum and accreditation have a special responsibility to be aware of the pressures to relax the process in an increasingly high technology environment.

COPYRIGHT AND INTELLECTUAL PROPERTY ONLINE

This fall, all faculty at UCLA were required to put on the UCLA website their name, office number, phone number, the catalogue course description, date and time of lectures, and the course syllabus or course outline. Anyone, anywhere with a modem could surf this website. Some resisted or felt they couldn't do it and staff technology assistants helped them or put up the information for them. Some UCLA faculty were reluctant to put their syllabi or course outlines on the web for fear that what they put up would be quickly absorbed into the public domain and could be used or adapted by others (like those developing courses for the University of Phoenix, for instance or people in Hawaii surfing the net for good ideas). Other faculty used this new requirement as an opportunity to expand their syllabi and add even more material to their websites. Expanded use of the internet in the university setting raises some major issues about intellectual property. Two UC stories demonstrate the problems that could occur more frequently in the future as course syllabi or problem sets are even more freely available on the web in the public domain.

Several years ago at UCLA a woman asked a professor of psychiatry if she could sit in on his lectures for a popular course. The flattered professor naturally said "yes." Some months thereafter the woman published the notes she took from that course along with other material she had gathered and made many hundreds of thousands of dollars. The woman was Gail Sheehy, the book was Passages (published 1976 by Dutton). The professor alleged plagiarism and copyright infringement and may have won a nominal amount. In such cases a court would find that the professor had never intended to market his lectures and thus suffered no financial loss; the court would attribute greater value to the marketing ingenuity of the woman than to the ideas developed by the professor. The actual infringement would be of little consequence, and an award would probably not even cover legal costs. Easier access to course syllabi on the web will make "borrowing" of this kind even more frequent.

A professor at UCB in the School of Information Mgmt. and Systems wrote an article for an academic journal for which he received no payment (nor expected

any). He contacted the journal several years later for permission to reprint the article in a course reader but was told that the journal wanted a $10 per student fee (LAT, May 29, 1997, E, p. 1).

Intellectual Property law is grounded in Article I, Section 8, Clause 8 of the Constitution which gives Congress the power "To Promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." In particular, a copyright grants the holder the sole right to reproduce or grant permission to others to reproduce the copyrighted works. For works written by an individual created prior to Jan. 1, 1978, copyright protection lasts 75 years from the date of first publication or 100 years from the date of creation of the work, contingent on which date allows the copyright to expire first. For those works created after 1978, protection begins at the creation of the work and lasts 50 years after the death of the author. Copyright permission must be obtained from the copyright holder of the work in which you are interested. This is easier when the name of the copyright holder is contained within a written document. However, notice to others about who holds the copyright is optional for works published on or after March 1, 1989.

If people go ahead and use copyrighted material without permission, they must follow the guidelines of "Fair Use," first established in 1841 when the Supreme Court ruled (Folsom vs. Marsh) that George Washington's private letters could be used without copyright permission. In the Copyright Law of 1976 the principles of fair use were spelled out in more detail; fair use depended on purpose, nature, amount, and effect. In the world of online and multi- media productions, where it might be tempting to add a snip from a video, opera, or audio production or performance, or combine multi- media presentations, the concept of fair use may result in less use as it becomes harder to know who holds the copyright, to contact the holder of the copyright if known, and to make the payments that many copyright holders may begin to expect.

Copyright issues may expand with the classroom and general use of electronic or "e-texts." Some people put on the internet e-texts that are out-of-print but not necessarily out of copyright. Databases of e-texts exist at the University of Virginia (Electronic Text Library at http://etext.lib.virginia. edu); the Online Medieval & Classical Library (http://sunsite. berkeley.edu/OMACL/, which is part of the Berkeley Digital Library, the American Heritage Project, a collaboration of UCB, Stanford, Duke, and UVA, funded in part by the National Endowment for the Humanities (http://sunsite. berkeley.edu/amher/), and CETH (Center for Electronic Texts), a joint project of Rutgers and Princeton Universities (www.ceth.rutgers.edu/CETH/). The ease of acquiring e-texts may influence the desirability of purchasing more scholarly, more accurate recent editions.

Ownership of intellectual property is a source of debate in the university setting. For patents the issue is clearer. The University has long held that all research

performed on campus with campus resources resulting in a patent belongs exclusively to the University. That is, UC owned the patent. That understanding has recently been modified somewhat, thanks to the diligent efforts of UCLA FA member John Edmond, Biological Chemistry, who argued that the inventor (including a faculty member and his/her Department) was entitled to share with the University and the state some of the revenue stream generated from patent royalties. The UC patent policy was formally revised on Oct. 1, 1997, granting 35% to the inventor and 15% to research on the inventor's campus or laboratory, and the rest to a general campus pool.

Attempts to resolve copyright issues have been tabled or delayed at UC because of legal complexity and potential controversy. In the past, copyright-that is, ownership of the expression of one's ideas-has always been understood to be held by the individual faculty member with the University having no interest in it at all. Thus a professor is free to publish material in whatever form he or she chooses and to retain any revenue that may result. There is no doubt that patents and copyright have traditionally been handled differently because the former had obvious commercial value, the latter-especially considering the kind of material faculty members normally publish-had little or none. Now, a faculty member who develops a course that might have commercial value on the internet as a cybercourse or "courseware" might be faced with logic similar to that which has governed patent rights. In the case of a UC faculty member, did the professor develop the cybercourse while employed by the University or using University resources?

Ed Condren, faculty member in the English Department at UCLA, warns the faculty that they should assert their rights to the copyright for their courses and not remain silent about this issue. The profitability of online education and courseware is clearly shown in the MBA program now offered at Duke University, in North Carolina. They now offer an MBA (Fuqua School of Business's Global MBA) which attracts students overseas and in America. It's a 19 month course, 3 classes a semester for 5 semesters, all 15 are required classes. Each semester contains 11-12 weeks of online instruction, 2-3 week reading period, and a 2-week residency in Europe, South America, or Asia; and there is a one semester residency requirement in Durham, NC. The cost is $85,000 for the program. The online MBA at the University of Phoenix costs $20,000 for a 2 1/2 year program, with no onsite requirements. Condren's copyright warning is echoed by the American Association of University Professors whose recommendations in a distance learning context "call for presumption of faculty ownership and control of intellectual property."

POLITICS AND TECHNOLOGY

It appears that the political agenda at the federal and state levels is to invest in technology in the short term with the belief that such investment will save state funds in the long term. In 1996 the Federal Government passed the Telecommunications Act which allotted $2.25B to help schools and libraries

purchase telecommunications services, internet access, and internet networking. State legislators also perceive constrained education budgets as one of the major reasons to support online education and increased technology in education. A few years ago, the western governors decided to pool their resources and create the Western Governors' University, stressing state budget cutting and issues of access as arguments in favor of technology over capital investment in education. The purpose of this university would be to offer all of its courses online.

In California, the state government has sought to increase funding for technology in education. For UC as a whole the 1998 Governor's budget contains $4M "to provide students access to state-of-the-art technology" (quote from UC press release); $32M for instructional computing; and $3M for instituting the California Digital Library. Advised not to participate in the Western Governors' University, Pete Wilson created a California version, the California Virtual University (CVU), which began in April, 1997 by executive order. The Governor's budget gave UC $1M in 1998 for development of courses for the CVU, which lists the online offerings of every accredited college and university in California (see www.california.edu). Currently UC lists over 350 extension courses offered at the 9 campuses, but no regular, core curriculum courses. CSU lists hundreds of traditional, core curriculum courses online for credit on the CVU website. The California Community Colleges advertise online courses at many campuses. For example, Cerro Coso Community College offers 17 online classes in the spring 1998 term leading to associate degrees in Liberal Studies.

State legislators have also been busy proposing legislation to increase technology in K-12. Assemblymember Kerry Mazzoni, chair of the Assembly's Education Committee (K-12), D-San Rafael, sponsored AB 1023 in 1997, which was passed into law. According to this legislation, all beginning teachers in California must have basic competency in the use of computers in the classroom. AB 31, introduced by Fred Aguiar (R-61), declares legislative intent that educational technology be made available to all schools by Dec. 31, 1999 and that student-computer ratio be 4:1 by Dec. 31, 2000 (presently it is estimated to be about 10:1). He also introduced AB 1011 in May of 1997 "Digital High Schools."

RESEARCH ON EDUCATION AND TECHNOLOGY

To date, there is little research available that examines the question of how the internet and high technology actually facilitate learning at any level of education, whether remedial, elementary, or higher education. Technological development has outpaced research. School administrators, especially K-12, and legislators are rushing to gain funding for improved technology without being able to discuss specifically how technology will enhance the learning experience and for which students or subjects. Legislators are often presented with statistics about who has computers at home and who doesn't to encourage greater spending for technology, but generally they are not given research on how those computers

have made a difference in learning skills.

The existing research generally agrees that drill-and-practice forms of computer-assisted instruction are effective in producing achievement gains in students, but more pedagogically complex uses of technology generally show more inconclusive results. The Educational Testing Service (ETS) has found that "Among eleventh graders, writing stories and papers was the most frequently rated computer use at home and school. Among fourth and eighth graders, playing games (presumably at home) was the prevalent computer use ("Computers and Classrooms: The Status of Technology in U.S. Schools," www.ets.org/research/pic/cc.sum.html).

Research projects in progress are attempting to adapt some of the most successful distance learning techniques (audio, video, etc.) to the internet, but results are not yet available. For example, one project at Caltech, in Pasadena, Project Mathematics, will try to convert to computers and the internet some of their most successful distance learning videos (VCR format) designed to teach high school mathematics and physics.

Just as in the lower grades, most of the research available in higher education concerns distance learning (audios, videos, correspondence, etc.) not specifically the internet and computer technology. The evidence available on more traditional distance learning tools indicates that there is no appreciable difference in the grades, test scores, retention, and job performance of students who are taught at a distance and in the traditional classroom. Many researchers believe that future data will support the results of past research: how a course is designed and conducted are more important to the learning process than whether a student is face-to-face with a professor or at a distant location.

Since Stanford has offered corporate and distance education for a long period of time, the results of a three-year study comparing the performance of full-time Stanford students and students obtaining instruction via the live, interactive ITFS system showed that the 16,652 students taking the traditional on campus instruction scored a mean GPA of 3.40, while 1,771 students taking live, interactive video instruction had a mean GPA of 3.39 (N. Whittington,"Is Instructional Television Educationally Effective? A Research Review." The American Journal of Distance Education, 1987, 1, 47-57). In a 1995 doctoral dissertation at East Tennessee State University, S. L. Hodge-Hardin concluded that there was no significant difference in math achievement among those students learning developmental algebra at a distance or in traditional classrooms.

UC AND TECHNOLOGY

At UC, Academic Senate committees preside over curriculum and course credit decisions. At present, there are no online courses that receive university credit. The nonprofit UC Extension Programs are separate from campus governance

rules, and it is primarily through the campus extension programs that UC is trying out online education. For instance, THEN (The Home Education Network), a privately capitalized company whose investors and partners include Sylvan Learning Systems, Inc., the Times Mirror Corporation, and St. Paul Venture Capital, contracts with UCLA Extension to offer courses online in the US and overseas, primarily to adults seeking post-baccalaureate courses and certificate programs. Some faculty believe that UC's leap to online education will first come through agencies like THEN bridging the gap between extension and accredited UC courses offered to overseas students. This decision may pave the way for the next leap: awarding university credit for online courses offered to US students.

Transfer students from CCC and CSU who are awarded college credit for online courses on those campuses may pose another kind of problem to UC in deciding how to transfer the credit, especially given mandates by the state to accept CCC transfer students. The burden of oversight may become onerous in evaluating courses given at these and other institutions in terms of their contribution to a UC degree. This task may result in creating different kinds of degrees, dependent on the source and number of transfer credits. Another solution is to rely on exams to test the level of knowledge, but this solution has been resisted by many because it would almost certainly require a comparison test of those who took such courses onsite at UC. There are also issues of constructing the tests and grading them. Once a university moves into standardized testing to determine levels of achievement or course credit, it loses its ability to award grades on other performance criteria, like discussion, originality, and class participation.

CONCLUSION: REDEFINING MISSION

If the internet is shaking up higher education nationwide, many educators think the parts will fall back together in an entirely different order. The old system, devised by Clark Kerr, former President of UC, sorted institutions according to a continuum, ranging from research at one end to remedial and vocational two-year associate degrees at the other. In California, that taxonomy put UC into the research category, awarding Ph.D. degrees, CSU in the middle, with a concentration on education and BA and BS degrees, and the CCCs as the two-year colleges feeding both UC and CSU.

According to an article appearing in the Chronicle of Higher Education by Chester E. Finn, Jr. (Jan. 9, 1998), the National Center for Postsecondary Improvement, based at Stanford University, has devised a simple, three-part typology that clarifies function in a new way. Robert Zemsky and William Massy and their associates divide institutions into "brand-name," "mass-provider," and "convenience" institutions. Brand-name campuses as prestigious, highly selective, high-status institutions whose market attraction comes from exactly these qualities. They cater mostly to full-time students from traditional age groups and have a high commitment to traditional academic values-a liberal-arts core, publication-minded faculty members, governance by the professoriate-and a reputation for high quality. One might call them the Nieman Marcuses of higher

education. At the other end of the market are the convenience institutions, the community colleges, technical colleges, and private institutions including the University of Phoenix, the largest private university in the US, and Motorola University. Here will fall the distance education and other unconventional providers of education. They are the Costcos and Home Depots of higher education.

In the middle fall the mass providers, where the campuses lack status and many students work and attend part-time. Just as the stores like Sears, Montgomery Ward, and J. C. Penney may have a hard time competing in the retail markets of the next decade, so may mass providers of education, partly because they provide neither the status that will rule one end, nor the speed, economy and convenience that will rule the other. Many mass provider institutions believe in the traditional values of education, and their faculty are encouraged to publish. Costs are also rising at these institutions, especially when students live on campus. In the near future, parents may be reluctant to spend $25,000-$30,000 for a four-year low status private college degree. Finn feels that hope for this large middle sector of higher education lies in improving the quality of education and teaching, the value of the educational experience between student and faculty, not in competing with the Home Depots to offer convenience and speed in earning a low-cost degree.

The technological revolution has happened quickly. It has outpaced research on learning and on the place of traditional academic values in cyberspace. Even the language of education has moved quickly into the business mode which often formulates educational opportunity and technology advances in terms of gas stations (full serve, self serve, and no serve), restaurants (like Chez Maurice, Sizzler/Denny's, and Bob's Burger Pit), and retailers (brand name, mass providers, and convenience stores).

Through the internet someone can now shop, bank, talk sex, play games, read newspapers and magazines, check Wall Street returns, preview real estate offerings in a community, chat, and attend faraway conferences. Taking a class and ultimately receiving a college degree are going to be added to the list of stay-at-home, electronic activities that people can select if they wish to. But not all choices will be alike. The question is how each college and university-faculty and administrators-will position itself in the new educational environment redefined by the rich resources of high technology and the internet.

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CSU and the CALIFORNIA EDUCATIONAL TECHNOLOGY INITIATIVE-CETI

CSU is not the first academic institution to face a decision about whether to join a private consortium in order to finance technology, but the size of the deal

(estimated revenues of about $4B), its length (ten years), and the rapidity with which it surfaced as a proposal have drawn the attention of legislators and colleges and universities across the country as well as faculty Senates and students at CSU. A closer look at what is happening at CSU offers examples to UC and the California Community Colleges as well as other institutions of the issues involved in dramatically increasing technological resources.

CSU is the largest system of state colleges in the country, with 23 campuses, and roughly 255,500 full time equivalent (FTE) students. A headcount total increases the number to 334,135 for the 1996-97 academic year. CSU officials asked the state for increased funding for technology in late 1996 but were told by the Legislative Analyst in February of 1997 that their request lacked cohesiveness and detail. CSU officials then developed a plan, a detailed technology pyramid called the "Integrated Technology Strategy (ITS)" and a commercial proposal to create the bottom layer of this pyramid, asked for bidders, and finally settled on an initiative called CETI-the California Educational Technology Initiative-to "buildout" the technology pyramid.

The CSU ITS strategy completely embraces the digital revolution, including virtual classrooms and online applications as a studied response to the predicted enrollment increases of the next decade, the new corporate mentality that demands higher levels of productivity, and tighter state funding. In short, issues of access, business, and money moved the CSU system into a "student-centered" learning environment and away from a "teacher-centered" one. It is not clear how many CSU faculty and students participated in formulating the mission of ITS, but now that CETI is on the boards, some are asking how that mission was actualized so quickly.

CETI is a proposal for CSU to enter into a ten-year partnership with four private corporations: Microsoft Corp., Hughes Electronics Corp., GTE Corp., and Fujitsu Ltd. CSU would create an entity called the CSU Auxiliary, a nonprofit California corporation. The new limited liability company (LLC) formed by the four private partners and the nonprofit CSU Auxiliary would be called CETI and would administer the entire system's technology infrastructure, overseeing software and hardware purchasing, user "help desks," and other technical issues. The four private partners would raise $300M over three years and install new "backbone technology" at all the CSU campuses, and CSU would transfer the $80-90M state allocation for computing technologies each year to the CETI partnership for ten years. In return, the private partners would be given the right to sell hardware, software, and networking products to students, faculty, and staff at the 23 CSU campuses for ten years. If any of the campuses found better deals elsewhere for the products offered by CETI, and CETI were unwilling to match those prices, these campuses could override purchasing plans and go outside the CETI.

On the surface, CSU would pay between $240M to $270M in three years (they plan to give the CETI the $80-$90M each year they receive for technology from

state funds) to receive $300M over three years from CETI. Looked at this way, in a worse case scenario, all they need at this moment is $60M to make the deal a break even proposition in three years. Entering into a ten-year technology partnership with expected revenues and expenses estimated at $4B because they couldn't raise $60M in three years doesn't seem compelling. That amount and more could easily be generated in a student technology fee. For example, if one assumed that 255,500 students paid a $25 technology fee each semester for three years (estimating three semesters a year, including summer), that would generate $19.2M each year or $57.5M in 3 years, roughly the amount needed. Fund raising could supplement those student funds. The $300M upfront over three years doesn't look like the main draw of CETI.

A breakdown of the proposed CETI revenues and expenses (as of 1/9/98) for ten years also raises some questions: CETI Revenue Projections ($000's) CSU admin. purchases of CETI technology products $945,294 24.8% CSU student, faculty, staff purchases of CETI technology products $1,481,675 38.9% Receipts from other clients for CSU technology/networking overcapacity $1,338,125 36.3% Total $3,765,094 100.0% CETI Expense Projections ($000's) CETI technology products and services sold to CSU admin. $722,463 19% CETI technology products and services sold to CSU students, faculty, staff $945,976 25% Network overcapacity provided to CSU $1,003,563 27% Infrastructure costs (not including initial $300M buildout costs) $305,331 8% other costs and support $252,100 7% interest $128,258 3% taxes $166,372 4% Net Income $241,031 7% Total $3,765,094 100.0%

Expenses for networking overcapacity (called "network co-production" in CETI documents) are about $1B, and the revenue to offset those expenses is projected at $1.34B. The CETI plan promises to fulfill more than just CSU's own technological needs; it includes provisions for CSU to broker technology overcapacity to other customers (K-12, CCC) for profit. The profit would presumable be split among the five companies in CETI. It appears as if this proposed ten-year revenues and expenses do not reveal so much the actual expenses of upgrading technology resources at CSU as the intention of CSU to use the networking resources provided by the for-profit partners to position itself as a major high technology player.

HIGHER EDUCATION IN CALIFORNIA AND CAPITAL NEEDS

Technology and infrastructure costs like laying cables and wires for internet access fall under the category of capital outlay of funds. But technology competes for funding with other capital needs like structural renovations, seismic retrofitting, deferred maintenance, and new construction. The California Postsecondary Education Commission (CPEC) has recently issued an Update (December 1997) on "Funding California's Capacity for Growth," in which they present statistics on costs and revenues for capital outlay at UC, CSU, and CCC. Their projections suggest that higher education in California will require about $10.46B over ten years. Seen in the context of other capital needs in the state,

higher education requires about 20.2%.

Estimated Projections of Capital Needs in CA (billions) Business and Housing $0.2589 0.5% Resources & Envirnmt. Protection $12.3375 14.5% Other $2.2848 4.4% Higher Education $10.4598 20.2% K-12 $22.0000 42.6% Youth/Adult Corrections $9.1611 17.7% Total $51.6566 100.0%

The total amount available ($24.96B) represents only 48.3% of needs totaling $51.66B. That's a capital funding gap of $26.7B over ten years. It's highly unlikely that higher education would be funded at 100% over the capital needs of other state claimants, like corrections, business, and housing. If we estimated that higher ed. would receive 20.2% of the funds available, that would amount to $4.992B, about half of what is needed. In turn, technology would have to compete for those resources with other capital needs in education, like new construction, deferred maintenance, seismic retrofits, and others. These statistics have propelled state institutions of higher education in California to seek funding for technology from sources other than the state.

ECONOMICS: Is a ten-year high technology partnership a good business deal? Current debate centers on whether the high tech and communication markets behave like other sectors. According to economist Brian Arthur from Stanford, "there is no guarantee that the [high tech] market, left to its own devices, will select the best products and maximize benefits to the consumer. Instead...inferior products can beat out superior products merely because of happenstance-by being first to the store shelf, say-and they can remain in a dominant position for a long time. Small events, such as a misleading marketing campaign, can be magnified into big changes in sales. And some firms are likely to establish, through predatory tactics or mere luck, lucrative and lasting monopolies, which stifle the very competition that free-market advocates swear by," (The New Yorker, Jan. 12, 1998, p. 32). These debates have taken center stage lately in the legal proceedings against Microsoft for bundling products to stifle competition. Concern at CSU is that faculty and students, as well as the administration, will be captive markets for the products of the private partners of CETI. These products and services may not be the most advanced on the market in one, two, or three years, nor offered at the best prices available.

New consortia are forming rapidly and offering new products. Compaq Computer Corp, Intel Corp. and Microsoft Corp have teamed up together and with GTE and four of the five baby Bells to create a technology called a digital subscriber line (DSL) that will enable consumers to receive Internet data 30 times faster than current rates, and over ordinary phone lines. A ten-year CETI partnership seems to many to be too long to serve the best interests of CSU, given the speed of new technology advances, new consortia appearing, and new high tech products.

Meanwhile the decision about CETI has been delayed to May. Faculty want more information, but Cal. State Board of Trustees' chairwoman Martha C. Fallgatter

said the new delay stems in part from a request from the private business partners for additional time to address financial questions raised in negotiations. The pressure that the deal might be off unless a decision is reached quickly is just the kind of pressure that universities in the past have resisted.

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