Big Change on Campus: A Futurist Looks at Trends in Higher Education

by David Pearce Snyder

Ye been in the forecasting business since the 1950s. And when you listen to a futurist, you want to listen to an old futurist. Old futurists are humble. We've had a chance to make 20-year forecasts and then live up to the end of them and see that, "Oh-oh, that didn't work out the way I thought it would; let me try this again." I'm on my third generation of 20-year forecasts and, like anything else, if you do something often enough, you're going to get better at it. After nearly 50 years, I've become a pretty good futurist.

And today I'm here to talk about the future of higher education. Not about the institution itself, but rather the powerful forces in its operating environment. What's going to happen in the demographics leading into higher education? And what's going to happen with the technology? Are we in a technological revolution, or not? After all, it's been over 60 years since the first computer was switched on. Over half a century since Tony Weiner said that we would have paperless offices and John Diebold said that we would have a cashless society. Now there's a joke.

What was the last thing you all did when you left home to come to this meeting? You went to the ATM and you got a wad of 20s. And since then you've spent a lot of time trying to get change for your 20 dollar bills from people who also have

David Pearce Snyder is a consulting forecaster and contributing editor for The Futurist and is based in Bethesda, Maryland; he can be reached at david@thefuturist.com. This article, his first for Facilities Manager, is adapted from his keynote address presented at APPA's 2005 Educational Facilities Leadership Forum in Orlando, Florida. Many thanks to Siemens Building Technologies for sponsoring this keynote address. pockets full of 20s, right? They've installed 450,000 ATMs all over the country, and what do we use them for? To get cash. We've certainly not become a cashless society. And how many of you are in paperless offices? Let me see your hands.

So there's been a big noise at the top of the stairs, but nothing has come down yet. Certainly no "revolution." That is particularly the way that people in postsecondary education see this moment, because the university has great continuity. It is one of the oldest institutions in Western civilization; it's older than Christianity. The first universities were invented by the Sumerians in 2500 BCE. The schools themselves were called "houses of wisdom," and the standard curriculum of the University of ancient Sumer included linguistics, theology, astronomy, mathematics, and something they called "medicine and the other magic arts."

So it has been 4500 years since the first university was established. Professional graduate schools were invented by the Egyptians about 200 years later, in 2300 BCE. The first public universities were started in Rome around 75 CE. And finally, the Brits invented fraternities early in the 18th century. Since then, not much has changed on the world's college campuses except—of course—that they have grown in size and multiplied mightily in number. Small wonder that academics tend to regard their institution, the university, as a timeless institution—an essential enterprise that has been a part of Western civilization almost since its beginning.

Indeed, because of its great antiquity, academics are disinclined to think that the university needs to change. It hasn't changed so far, so why change now? As a consequence, this institution, whose timeless purpose is to compile information and disseminate human knowledge, remains rooted in its 4500-year-old classroom-based, teacher-mediated instruction-



Snyder

al paradigm in the face of a cornucopia of powerful new information technologies (IT), and a growing torrent of new knowledge. And this poses a problem, not just for the university, but for society itself.

At a time when there is universal agreement that postsecondary education

will be crucial both to personal success and national prosperity, our labor-intensive, capital-intensive colleges and universities have experienced a 300% rise in tuition over the last 25 years; twice the rate of inflation! Average college tuition today now amounts to two-thirds of the average annual income of the one-third of all U.S. households that earn less than \$25,000 a year. As a result, a growing number of observers, including the Federal Reserve's recently retired Alan Greenspan in testimony before the U.S. Congress, have asserted that there is a growing gap between the haves and the have-nots-the rich and the poor-in the United States. In particular, the increasing concentration of income in the hands of the top 20% of all households is widely attributed to the soaring costs of college tuition. If Mr. Greenspan and likeminded economists are right, higher education has now become a reinforcer of economic class disparity in America, rather than, as it once was, the source of upward mobility in our society.

This perception has led some in Congress to demand that a cap be applied to restrict annual tuition increases to no more than the average national rate of inflation. Meanwhile, market-savvy for-profit postsecondary schools, using low-cost part-time faculty and conveniently-sited commercial buildings, have been capturing a growing share of the higher education market. From 1991 until 2001, the number of forprofit, two-year campuses in America went from 271 to 483, a 78% increase. By comparison, the number of public and nonprofit two-year schools rose from 986 to 1075, a 9% growth rate.

The number of four-year, for-profit schools in America rose from 79 to 194 during the 1990s; that's a 266% increase in ten years! The number of public and nonprofit four-year institutions rose from 595 to 613 institutions during the same period; an increase of only 3%. Degree program enrollees in all for-profit higher education rose from 230,000 students in 1991 to 366,000 students in 2001, a growth of 59 %. The number of degree program enrollees in all public and nonprofit higher education rose from 10.5 million to 11.2 million, a growth of 6%. And the for-profit share of the twoyear associate degree market went from 19% to 29%.

Most strikingly, among all four-year degree students, the market share of for-profit schools rose from 3% to 10%. Since 2001, it has risen to 12%. So there are aggressive competitors

out there—for-profit schools—that are going after a market that has traditionally been served by public and nonprofit universities and colleges.

Demography is Destiny

Higher education will also be confronted with several problematic demographic realities during the next 10 or 15 years. To begin with, as the Baby Boomers enter the *exit level labor pool*—workers over 55 years old—more than one-third of all postsecondary faculty and administrators are expected to retire in the decade ahead. In addition to that, one-third of all janitors, building maintenance workers and grounds keepers will also retire over the next ten years.

At the same time, the *entry level labor pool*, those 19 to 29, will grow very slowly because they will be drawn from the last half of the "Baby Bust" generation—those who were born during the low birthrate years between 1965 and 1984. As a consequence, the Bureau of Labor Statistics (BLS) forecasts that there will be a general labor shortfall in America of between 3 and 4 million warm bodies by the time we get to 2015.

Meanwhile, the Baby boom "echo"—the children of the Boomers, born from 1985 to 2002—will be entering college and swelling enrollments. The forecast is for a 2.5 million increase in students and a 600,000 increase in the number of new postsecondary faculty and administrative staff between now and 2015. You are in a growth industry. But in such a tight labor market, America's labor-intensive institutions of higher education will either have to import hundreds of thousands of new faculty over the next ten years, or replace their retiring faculty with some kind of instructional technology.

We commonly talk about how dependent the United States is on foreign oil, and worry that two-thirds of our petroleum is imported. Are you aware that one-half of all new hires in America during the last 15 years were foreign born? We have imported half of our workforce growth since 1990! So we are dependent on immigration. But since the September 11, 2001 attacks, the United States has instituted a number of visa restrictions. As a consequence, there has been a 25% decline in the number of foreign student visa requests since 2002. And that could be a problem for American higher education, because we are already heavily dependent on foreign graduates for faculty—especially in the sciences, engineering and mathematics.

Now, while the demographers tell us that there is going to be a labor shortfall, most of us have read reports saying that the baby boomers don't plan to retire any time soon. AARP has surveyed its membership—folks in the workforce over the age of 50—and asked when they planned to retire. And twothirds of the boomers told them, "What, retire?" Half of them said they intended to keep on working until their 70s, and a quarter of them said that they intended to keep working into their 80s. "And by the way," many asked, "why have you made me a member of the American Association of Retired Persons, since I'm not retired?" (This explains why the Association recently changed its official name to *AARP*.)

So yes, the evidence indicates that the boomers are planning to "age on the job." And, as a consequence, we'll see that the average age of retirement will rise sharply. The average age at retirement in 1985 for the United States was 58. The average age at retirement today is 61. And the current projection from the BLS suggest that by 2015, the average American will retire at 67. So we're all going to work longer, and that's all right. Because we are not only living longer, we're living healthier. Our morbidity rates are down, as well as our mortality rates.

On the other hand, we also understand that the warranty will ultimately expire on the our parts and that the Boomerfaculty will eventually retire. At that point the issue of replacing them will become pressing. Now, as I say, we could import replacements, although the prospects for importing large numbers of graduate students have become problematic. The other alternative would be to use technology to improve the efficiency of higher education. In that manner, we might also be able to reduce tuition and make it possible for more Americans to afford a college education.

Coming Soon, To a Future Near You

There are numerous new, off-the-shelf technologies available to us at this moment. The fact of the matter is that the reason we aren't cashless and paperless yet is that technological revolutions simply take a long time. Historians tell us that it takes about 75 years between the invention of a new technology and its complete assimilation into a nation's economy. And during its first 50 years, a new technology has little positive impact on economic performance. In fact, a new technology actually serves as a drag on an economy's performance until it is mature.

New technologies typically mature in about 50 years, and we saw that happen with computers—right on schedule! Productivity improvement rates in the United States slowed between 1973 and 1995. And as a result of that, the actual compensation rates in America —average U.S. wages—fell 15% from 1971 to 1995. But the computer turned 50 in 1996, and U.S. productivity improvement rates doubled in one year. By 2002, productivity had doubled again and wages had risen sharply. Between 1970 and 1995, U.S. economic productivity rose an average of 1.3% annually. Today, we are running at over 4% a year productivity improvement—nearly a threefold increase. This is a tip-off that tells us, "Aha!" Information technology has now reached maturity, and from now on we will experience high productivity-improvement rates and cor-

Software for the INFORMED Professional

Our Cleaning Management Software calculates custodial staffing needs using nationally recognized models such as APPA's *Custodial Staffing Guidelines*¹ and ISSA's 358 *Cleaning Times*². It's packed with tools that help you understand and manage every aspect of your cleaning operation.

Pocket PC based inspection software is included as an integrated part of the package to help you manage and achieve whatever cleanliness level you staff for. We believe the integrated chemical usage calculation engine is the best in the business and our equipment library tools help you optimize your operations within budget constraints.

After eleven years on the market, the software is in use everywhere from small K-12 schools to the largest universities in the nation. We can help you benefit from the software quickly, through training, data migration, and space inventory collection.

Visit our website to learn about our software and obtain a no-charge copy for evaluation. If you have never experienced the power of an easy-to-use, modern workloading package, you owe it to yourself to look at CMS 2004. In a matter of hours you can see where your budget is going and how to significantly improve your cleaning operation.



¹Software developed in consultation with Jack Dudley, P.E., Editor and Co-Author of the First Edition of the *Custodial Staffing Guidelines* and Co-Author of the Second Edition. Mention of APPA does not imply endorsement of the product.

²ISSA Cleaning Times used by permission of ISSA, Lincolnwood, IL., www.issa.com

INFORMED LLC Telephone: 845.548.6736

www.contractron.com E-mail: Earthmark@att.net respondingly large structural job losses as we get better and better at using IT to replace people. Let me just give you some examples of what I'm talking about.

Frictionless transactions-We know that when we make a transaction over the Internet, it has an overhead processing cost of 1 cent. The same transaction in the form of a check has an overhead cost of \$1.07. This means that every transaction that you switch from a check to the Net saves you a dollar's worth of handling and overhead. And we know that the banks intend to do just that, because they got Congress to approve something called the "Check 21" rule. Check 21 went into effect in October 2004, and permits banks to eliminate returning your cancelled checks as soon as their regional electronic bank clearinghouse is able to handle the work flow. Indeed, many major banks have already done this, suddenly and with little notice. Instead of getting your cancelled checks, you now get a sheet of paper with rows of tiny photocopies of the checks.

We are also moving to make more transactions cashless. Within 24 months, both MasterCard and Visa will introduce a service that permits you to put your credit card number on **your cell phone.** You will then be able to use your phone properly equipped with Bluetooth wireless technology—to communicate with cash registers and points of sale. You won't have to pull out your credit card. You just key in a special code, your credit card number appears in the window of your cell phone, you hit the right cell phone key, and the transaction is complete with no paper, no plastic, no signature. They are going to call these phones "electronic wallets" or "e-cash." This will be useful and productive because *e*-cash will eventually be used for all toll booths, vending machines and parking meters. It's already done that way in Japan and Europe where they have had electronic wallets for years. This will reduce the cost of any kind of coin-metered activity. You won't have to collect money from the parking meter, the Laundromat, or the coin-in-the-slot timer that controls the lights on the tennis courts. Everything will be electronic. (The government of Singapore has announced plans to make the entire nation cashless by 2008.)

Debit cards instead of paychecks—A growing number of employers, especially public institutions, are paying their staff with debit cards rather than checks, because it costs much less to issue a debit card than it does a check.

We will also see increased use of **biometrics**—fingerprint readers or retina scanners—to pay for meals at the school cafeteria or to check out books from the library. The use of biometrics is going to sweep across college campuses over the next five years, as a growing number of vendors offer cheap systems especially appropriate for serving closed communities—like a student body. These bio-pay operations are very cheap to set up, they cut the transaction costs for both vendors and purchasers, and speed up the transaction time. It's a good move.

Then there is **paperless procurement**. The average overhead cost of a paper purchase order in the private sector is somewhere between \$50 and \$75. The overhead cost of a paper purchase order in the public sector is around \$125. There are online purchasing services specifically targeted at educational institutions that will take over a school's procurement of supplies and equipment. These services can reduce the average overhead cost of a paper purchase order from \$125 to \$25—saving \$100 on each and every acquisition!

There's also **Web telephoning** now, using VoIP, or Voice over Internet Protocol. College campuses have been pioneers in using the Internet for telephony. When Dartmouth installed its Web telephone system, it told its students to call home as much as they want. "We're not going to charge you; the overhead cost of Web telephoning is so low that it would

Continued on page 32



January/February 2006 Facilities Manager

www.appa.org

REVOLUTIONIntroducing FacilityMAXTM



Evolution is inevitable... Revolution is inspired...

Inspired by emerging technologies... FacilityMAX[™] relies on pure Java technology and the latest J2EE specifications to deliver a complete Enterprise Asset Management software solution. Its ultra-lightweight design and open architecture offer true standards-based interoperability, enterprise scalability, and ease of deployment.

Inspired by the way you do business...

FacilityMAX[™] was developed in conjunction with an advisory council of more than 20 of North America's most influential institutions of higher education. The result is a solution that enables higher education facilities officers to more effectively manage, maintain, and extend the life-cycles of mission-critical infrastructure and physical assets.

Inspired by a tradition of success in higher education...

MAXIMUS solutions help more than 1,400 educational institutions throughout North America to improve operations and streamline business processes. Today, more Carnegie Research Universities rely on facilities management software solutions from MAXIMUS than any other vendor in the market.

Inspired to learn more?

Contact a MAXIMUS representative today at (800) 659-9001, or visit us on the Internet at: assetsolutions.maximus.com.

- A 100% J2EE-compliant Enterprise Asset Management software solution.
- Manage operations and maintenance, capital projects, real property, utilities, and much more.
- Maximize asset lifecycles, improve productivity, reduce operating expenses, and streamline maintenance management.
- Integrate CAD, GIS and mobile computing technologies to obtain a complete view of your enterprise.

FacilityMAX

Continued from page 29

cost us more to keep track of your phone calls and bill you than it would be to just let you call home whenever you want, as long as you want, over the Internet." Students and parents love it!

In addition, this means that you don't have to replace your old PBX. In fact, nobody *makes* new PBXs anyway, and the old ones are beginning to wear out. So growing numbers of institutions are switching over to the hardware and software necessary to convert their entire campuses to Web telephony. Now, there is *one* problem with VoIP. As our phones become integrated with the Web, using the Voice over Internet Proto-



col, we will also start to get spam over our cell phones. They call it SPIT—Spam over Internet Telephony. The industry is already working on filters to stop it.

Grid computing—is made possible by free software developed by the National Science Foundation, the same folks who created the Internet. Grid computing software—called the Globus Toolkit—can be downloaded, free of charge, off the Internet at www.globus.org/toolkit. This software permits you to mobilize all of the unused capacity from all of the computers on a single LAN—like a campus—so that excess computing capacity on the network can be used to process a wide array of additional data processing tasks.

> Is there likely to be much spare computing capacity on a typical desktop computer? In the business world, the average computer typically only ever uses somewhere between 20% and 60% of its capacity, including its operating system, its memory, and its software. Grid computing software continuously "polls" all of the computers in a single network to find out how much spare processing time and storage capacity each has. You give the "grid" server tasks, and it automatically organizes uncommitted software, time and disk space to accomplish the assignment, even while people are using their computers for their own purposes. Grid computing doesn't interfere with ongoing operations, and cuts the cost of acquiring additional computing capacity by 30 to 55%.

> Even better is **open source software** (OSS)—chiefly represented by Linux. OSS is available free of charge, whereas the software you get from Sun or Microsoft is proprietary; you lease it, you don't buy it. You pay a licensing fee for it every year. The typical public school system in a big city pays Microsoft \$1 million or more a year for their leasing fees on the software that they use in their computers, while open source software is free. There are no licensing fees. (Amazon.com reports cutting its IT operating costs by nearly 30% simply by switching its computer systems from proprietary to open source software.)

> Open source software was created by a consortium of 300,000 students and practitioners on all seven continents working voluntarily over the Internet—

www.appa.org

free of charge—to create a superior family of software. OSS *is* superior software because it is very reliable, very fast, and very secure. It is very hard to invade OSS with malware or viruses. Last year, approximately 40,000 cases of malware were launched against Microsoft and none were launched against Linux. The open source movement has been growing rapidly, gaining market share every month since it first became widely available in 2000. Over 75 countries, including most of the EU, have adopted OSS for all public sector computing, and Massachusetts has just enacted legislation to standardize OSS for all public institutions—including schools.

The battle between open source and proprietary software will go on for the next five to seven years. When the dust settles at the end of the "SoftWars," most commodity programs—routine repetitive standard use applications—will be open source. Only specialty application software, specifically designed for particular organizations, operations or purposes, will still be proprietary. By the way, there is a center at Utah State University called the Open Sustainable Learning Opportunities Group (OSLO). These folks are certifying open source applications for postsecondary teaching and learning. They have a clearinghouse at http://oslo.usu.edu for all kinds of OSS programs that are already in use by higher education, and for reporting new developments.

"Groupware"-Growing numbers of teachers, from elementary schools through colleges and universities, are using Web logs (blogs) to augment their classroom writing activities. And they are using Wikis, free software that enables students to create dictionaries of terms they have learned. (Wiki is the Hawaiian word meaning "quickly"). Where students are required to learn a lot of new materials, class members can collaborate, using Wikiware to create a glossary of terms that everybody agrees are accurate and understandable. The Wikipedia, a user-created encyclopedia at www.wikipedia.org, went online January 11, 2001. Today, it has over 500,000 entries, the vast majority of which are not only highly accurate, but remarkably up-to-date. For example, if you go to the Encyclopedia Britannica on-line and look up "tsunami," you will get a solid scientific explanation, but it won't say anything about the tsunami that killed a quartermillion people around the Indian Ocean in December, 2004. In contrast, the Wikipedia entry on tsunamis has both a clear technical description of the phenomenon, plus news reports and video-clips of the recent Indian Ocean catastrophe.

Encyclopedias update their entries at a glacial pace, after lengthy reviews by peer scholars; the Wikipedia is updated the minute something newsworthy happens to affect any entry. A growing number of academics—and students—say that this is what they want for their reference systems. They don't want something that is stuck in the past—they want something that is dynamically upgradeable and always up-todate. By the way, Wiki software is also a product of the open source movement, and Wikiware is downloadable free from the Internet.

The evidence is mounting that groupware tools such as peer-to-peer file sharing, instant messaging, Web logs, and Wikis do, in fact, make it possible for instructors to dramatically transform how they teach their students and operate their classrooms. It makes the individual student's use of the computer much more meaningful and much more substantial, because groupware gives faculty, assistants, mentors and advisors an active presence in cyberspace-along with assigned readings and reference sources. Groupware will become the crucial social infrastructure for the classroom, as it has already become the crucial technical "info-structure" for distance learning. Distance learning, in turn, will give local U.S. campuses access to potentially huge foreign markets, while confronting America's colleges and universities with yet another wave of competition, this time from foreign institutions.

Globalization

The General agreement on trade and tariffs (GATT), the political basis of the free trade movement, is not new. It was entered into by the United States and the world's other major countries back in 1948, as an earnest effort to avoid future global conflict. The reasoning was perfectly straightforward: If we all traded with one another, and we all became dependent on each other for specific goods and services that we could not produce ourselves, we would be less inclined to go to war with one another.

Although GATT was put in place in 1948, international trade didn't begin to increase until the early 1960s. It took that long for people-and businesses-to get used to the idea. Over the decades, tariffs have gradually been dropped on varying parts of the world's trade flow, primarily in commodities and manufactured goods. Then, with the advent of the World Wide Web in the mid-1990s, firms from the developing nations could compete for white collar information work projects in Europe and North America. The looming technoeconomic realities are perfectly clear. Now that we're integrating the telephone system with the Internet, over the next five to seven years 2 billion people worldwide-one third of the world's population-will suddenly have access to the Internet; up from about 700 million now. Free trade and globalized enterprise will continue to expand as a share of the world's gross domestic product. Right now, almost one-fifth of the world's gross domestic product is in international trade, and that can be expected to rise to about one-third by 2025.

The emergence of a single electronic global marketplace will foster the ongoing consolidation of goods producers and service providers in all mass markets, and that includes higher education. You know, postsecondary education is not a public service in the U.S. as it is in most of the world. In the U.S., postsecondary education is a discretionary consumer purchase. You are in a competitive marketplace, and over the Internet, there will be burgeoning competition as local colleges and universities offer their products to the world on the Web. Moreover, as barriers drop between the individual economies, there will be a general oligopolization of all mass markets, and that includes education. Huge college and postsecondary enterprises—public and private—will emerge. There will be mergers of smaller colleges, some disappearing, and some becoming franchisees or branches of large national and international consortia of higher education systems. There will also be growing low-cost foreign competition across the entire range of consumer and commercial goods and services—including higher education—forcing all mature industrial era enterprises worldwide to continuously cut costs and increase productivity to remain viable.

Higher education will be under increasing pressure to be more efficient, to reduce the cost of acquiring high value skills, and to improve your ability to compete in the global electronic marketplace. There will be an acceleration of "infomation"—the automated capture, transmission, integration, retention, retrieval, application and disposal of information. This will eliminate mountains of routine paperwork and millions of paper workers from the U.S. workplace over the next 15 years.

Outsourcing the Campus

Speaking of workers, property management is also a pretty labor intensive operation. And, as I mentioned before, onethird of the nation's 6 million janitors and grounds keepers are expecting to retire in the decade ahead. And, what is "Info-mation—the automated capture, transmission, integration, retention, retrieval and application of information will eliminate mountains of paperwork and millions of paperworkers from the U.S. workplace over the next 15 years."

the fastest unionizing employee group in America today? Janitors! Because building and grounds maintenance operations will predictably be faced with growing labor problems, many employers will want to get rid of them. "We're not a union shop, so we don't want to employ union janitors. We'll outsource them to somebody else."

Of course, campuses have increasingly been contracting out their buildings and grounds work in recent years. But there is now a real likelihood that a growing number of college campuses will look at their financial circumstances and decide to sell off the campus and its buildings to a private property management firm or real estate investment trust (REIT), from whom they will lease the property back. In the process, they will be sticking the new owners with the costs and labor headaches—of maintaining and servicing their plant and facilities in the years to come. Corporations have

> been doing this for years, but for a college or university, it's a stunning thought.

> Whether or not they sell off their campuses, colleges and universities of all sizes will surely begin to outsource their administrative services-HR, purchasing, facilities management, etc. Firms that have done this say that they experience a 15% to 2% reduction in their overall operating costs by outsourcing their administrative services. As colleges and universities come under increasing pressure to keep their tuition costs down so that more people can get high value degrees, this is what you will also have to do. And since electronically-mediated instruction is proving to be an increasingly cost-effective way to impart a growing array of skills, campuses will become centers of e-learning.

Post-Industrial Universities

By 2010, most postsecondary institutions will deliver the majority of their course content electronically, either as distant learning material or as an augmentation of the classroom ex-





- Condition Assessments
- Forensic Investigations
- Maintenance Plans and Budgeting
- Design Consultations
- Preparation of Design Documents
- Construction Period Services
- Construction Inspections
- Expert Testimony

Specialized Building Envelope Engineering Services for Educational Facilities Since 1964

Gale Associates, Inc.

1-800-366-1714 ejm@gainc.com www.galeassociates.com perience, as I have just discussed. Those institutions that do not switch over to this more efficient way of teaching and learning will be quickly regarded in the marketplace as old fashioned, and they will cease to be competitive. This will be particularly true for institutions whose faculty do not embrace the learning simulations and games that will flood the market over the next five years.

Life-long learning—Colleges and universities will also be able to use the Internet to maintain lifelong relationships with their alumni, who will increasingly rely on their *almas mater* to maintain, upgrade and alter their career skills in a continuously changing workplace. Now, this will represent a truly transformational breakthrough. Think back to the first teachers; back to Socrates, who expressed great frustration at not being able to follow his students out into life, to see how well he had prepared them for the actual circumstances of adult life. What were the good learning components of a course? What were the lessons that ought to be changed, etc.?

With the Internet, it is now possible for a teacher to maintain a co-learning relationship with his/her students into adult life. And, because we're going to be living through a period of massive workplace innovation and mid-career termination, there will be more and more people who will need to come back to school to get additional skills. And there will be more opportunities for graduates to offer experience-based feedback to their teachers. Most colleges and universities will seek to establish a lifelong learning *and marketing* relationship with their alumni, offering to up-skill them by distance learning or bringing them back to campus for summer refresher courses, etc.

In this respect, *higher education is about to become longer education.* But this is not the only fundamental transformation that higher education will experience over the next 2 decades. Maturing information technology (IT) will not only dramatically alter the delivery of higher education, it will even more dramatically alter its content.

A Technological Singularity

Some technology forecasters have concluded that the Information Revolution will be humankind's last techno-economic transformation *based upon a single technology*. All of the previous technology-based revolutions that have promoted human progress—beginning with the discovery of fire and the mastery of language, right on up to the present—have happened *one-at-a-time*. And each one of these innovations including the steam engine and electricity—has produced a surge in productivity by changing the realities of the economic environment. This sequential historic scenario, some cosmologists believe, is about to "shift gears." Specifically, technophiles believe that once mature IT becomes ubiquitous and pervasive, it will permit us to "lift the veil of ignorance"

Continued on page 55



Big Change on Campus

Continued from page 35

on every frontier of inquiry all at once. There will be an avalanche of new knowledge. There will be a cornucopia of new technology from now on in every field. To coherently assimilate this explosion of discovery, higher education will have to restructure itself. It will have to invent new disciplines, while old disciplines will have to be redefined, as we fill them in with newly-discovered knowledge.

We are now granting more and more joint degrees and we are having to change traditional degree programs. Ultimately, colleges and universities are likely to spin off their current professional schools to be independent institutions, competing in the marketplace with the for-profit sector. (Yes, I am talking about schools of architecture, law, engineering, management, medicine, education, and accounting, etc. They wouldn't have to move off-campus, but they would have to be separate enterprises with separate business plans.) Universities will do this so that they can concentrate on creating new hybrid disciplines, like nano-ecologists, isotope hydrologists, forensic accountants, and environmental sociologists. In this process, higher education will, over the next ten years, also become fuller education, because there will be more and more different kinds of degrees reflecting the explosion of new knowledge.

Finally, the easy—and increasingly free—availability of scientific knowledge, research findings and technical data over the Internet will enable a growing diversity of independent scholars and non-traditional disciplines to flourish and to gain legitimacy. Alternative medicine, noetic sciences, exotic cosmologies will arise, which online open knowledge networks will assess, dismiss, or assimilate into the formal body of human knowledge. As a consequence, getting a PhD in the future will have to be different from today. In the past, PhDs were earned by writing a dissertation and defending it to a panel of five experts. Now that there will be so many exotic and special niche fields, the way to get a PhD will be to post a Blog on the Internet and defend it against all comers for 90 days.

If a scholar can successfully survive such a dialogue, and an oversight committee certifies the defense and any emendations to the original thesis, a PhD would be awarded. And by the way, PhDs almost certainly won't be permanent. Every ten years, you'll have to go back and re-earn your degree, or you'll become a *PhD emeritus*. By expanding its domain to acknowledge skills or knowledges acquired by any combination of experience, study or observation, traditional *higher education will become further education*.

A New Economic Necessity

The three great macro economic theorists of the 20th Century—John Maynard Keynes, Thorstein Veblen, and Joseph Schumpeter—all died in their 50s, while they were still writ-

Higher learning has crucial functions to perform in searching for, certifying, and disseminating new knowledge.

ing their speculations on the post-capitalist economy. And, although we don't know what their detailed descriptions might have been, we do know what all three of them said in general. They all agreed that *capital*, the source of new economic growth during the industrial era, would no longer play that role in the post-industrial future.

The new basis of economic growth and added value from now on, they all believed, would be science and new knowledge. Universities must become the mines that will be the source of new value for post-industrial enterprises. Higher learning has crucial functions to perform in searching for, certifying, and disseminating new knowledge. To fulfill these functions, academia will have to aggressively exploit the productive potential of innovative IT. Universities cannot afford to dissipate their scarce resources and focused attention on simply teaching routine skills, which is why they will have to spin off all that career instruction.

Welcome to Revolutionary Times

We are in the middle of a genuine techno-economic revolution. This is the kind of moment that takes up whole chapters of history books. Fifty to 60 years from now, entire history chips will be devoted to this decade, recounting how well or how badly—the great institutions of the mature industrial economies were able to reinvent themselves for the Information Age. Of all those institutions, the one whose successful reinvention will be most important, is the oldest institution. Older by far than democracy or capitalism, the university and higher education will go through truly revolutionary times over the next 5, 10, 15 years. And in order to succeed in revolutionary times, they will have to be revolutionary themselves.