FROM HIGHER EDUCATION

TO

LONGER, FULLER, FURTHER EDUCATION

Globalization, Inform-ation and the Coming Metamorphosis of the University

by

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PROLOGUE

In May 1945, the men chosen by Adolf Hitler to rule Germany after his suicide gathered at a high school in the provincial town of Flensburg near the Danish border following the fall of Berlin. After surrendering to the Allies, they began to prepare for Germany's post-war governance. They drafted a reconstruction plan, and decided to add a "Ministry of Churches" to the cabinet.

> "A government structure began to arise," Armaments Minister Albert Speer wrote in his memoirs, "as a consequence of our having nothing else to do. But, our government was not just impotent; the victors did not even deign to notice it. We wrote memoranda in a vacuum, trying to offset our irrelevance with sham activity" (Speer 1970).

Having consulted with hundreds of clients in every aspect of public and private education over the past 25 years, I found considerable resonance between Albert Speer's characterization of the 1945 rump German regime and a conference that I attended in February 2005, the theme of which was "governing universities of the future." The conference program tacitly assumed the future continuity of the existing institution, reflecting both the casual arrogance of misplaced certainty and a naïve absence of imagination. These two failings – assumed continuity and absence of imagination – manifested by the heirs of the "thousand-year" Reich back in 1945, have also characterized long-range thinking within education – especially higher education – for at least a quarter century. For most of that time, the problem was merely frustrating for futurists and would-be educational reformers. Now, however, those failings could prove fatal to the institution itself.

LOOMING IMPERATIVES FOR CHANGE IN HIGHER EDUCATION

Like previous techno-economic revolutions, *globalization* is a product of complementary social and physical technologies. The *social technology* is the General Agreement on Trade and Tariffs (GATT), the 1948 international treaty that set in motion the long-term elimination of tariffs and the integration of the world's separate national economies into a single global marketplace. The *physical technology* is our new Internet "info-structure" that permits the instant, low-cost worldwide communication and data transmission necessary to make international commercial collaboration routinely practicable on a large scale. With the integration of the telephone and the Internet, two billion people – 1/3 of the world's population and almost all of the world's businesses – will gain access to the World Wide Web in less than 10 years, enabling global enterprise to freely interact and transact in a single electronic marketplace.

Since human resources typically represent 70% or more of average business operating expenses, now that we have installed a global info-structure in a tariff-free environment, we can expect information work to "migrate" from high labor cost countries to low labor cost countries. For the coming generation, most developing nations are looking forward to "importing" their economic future from the matured industrial nations. To provide their young people with productive workplace skills and sensibilities, Third World educators putatively need only to emulate successful industrial era curriculum content and instructional methods. Mature industrial economies, on the other hand, will not only have to create a new generation of high value, technology-based products and services; they will also have to transform their workplace organizations – i.e. invent new social technologies – to permit the creation of millions of new high-value-adding jobs that exploit the productive potential of applied information technology. As this occurs over the next ten years, the basic skills required of information-intensive post-industrial employment will begin to become apparent. This suggests that educators in the industrialized nations today should be developing new curricula in order to prepare their students for a future workplace **that has not yet been invented**.

In the U.S., over the years since the 1984 Carnegie Endowment Report, "A Nation At Risk," a small but growing number of grassroots innovators have promoted scattered successful transformational innovations throughout K-12 education. While system-wide change has not yet begun in public education, the insurmountable problems made apparent by the No Child Left Behind Act is producing a growing consensus that we will have to re-invent our 20th Century schools if we are to provide all young Americans with basic 21st Century skills (Toppo 2005, Despeignes 2003). But higher education's long-term vision of itself as a fountainhead of social and economic progress has remained largely unperturbed by uncertainty or doubt. In their confidence, educators have been aided and abetted by economists, employers,

governments and parents, all of whom have promoted the almost mantric myth of the university as the linchpin to a better future in developed and developing nations alike.

Society's institutionally reinforced belief in the unalloyed value of a college education has made the public demand for post-secondary schooling remarkably *price-elastic*. While average college tuition has risen roughly 300% since 1980 – twice as fast as the Consumer Price Index – a relatively constant 60% of all U.S. high school graduates have continued to stream onto America's campuses, incurring hundreds of billions of dollars in tuition debt (Strauss 2005). The bulk of the recent tuition increases – averaging 5% to 10% per year – have largely been due to sharply-reduced government funding especially from states, which have cut their share of public higher education budgets from 60% to 37% over the past 25 years. During the same time-frame, student tuitions rose from 16% of college operating costs to 25% (Kronholz 2005, Arenson 2003).

As a consequence, by 2000, average college tuition in the U.S. had risen to 65% of the average income for the 1/3 of all households earning less than $25,000 p.a., up from 50% in 1990. For middle-income households (earning $25-$75,000 p.a.) average college tuition has risen from 15% to 20% of annual income. Among the ¼ of U.S. households that earn more than $75,000 p.a., average college tuition has remained unchanged as a share of family income, at 5.6% (Crenshaw 2001). At 2/3 of annual household income, it would not be surprising to find that college tuition had finally exceeded the price-elasticity of poor families. The National Center for Public Policy and Higher Education reported in 2005 that, for the fall enrollment in 2003 (the most recent available data), at least 250,000 eligible post-secondary students were unable to enroll because of high tuition costs or cut backs in admissions due to budget reductions (Strauss Op. Cit.).

To the extent that a college degree has become the minimum entry requirement for access to a middle-income career in the post-industrial world, soaring college tuition represents a substantial barrier to upward economic mobility in America. In fact, over the past thirty years, the U.S. has experienced **both** a decline in social mobility **and** a rapidly widening gap between the poor and the rich (Wessel 2005). Federal Reserve Board Chairman Alan Greenspan believes that this growing income disparity is largely attributable to a lack of high value workplace skills by a large share of the labor pool. In June, 2004, Greenspan told Congress that "this skills mismatch can and must be addressed, because I think that it's creating an increasing concentration of incomes in this country and, for a democratic society, that is not a desirable thing to allow to happen" (Witte 2004). A recent report from researchers at *The Economist* concluded that "America's education system is increasingly stratified by social class," and that the nation's "great universities are increasingly reinforcing rather than reducing these educational inequalities" (Ever 2005).

If, as Mr. Greenspan asserts, a lack of high value-adding skills by millions of Americans is contributing to a concentration of incomes, reducing the cost of

acquiring such skills would appear to pose a compelling national priority. But, although the rising cost of college has prompted considerable editorial hand-wringing, politicians have shown little inclination to restore recent funding cuts to public higher education. And, because they are peeved at the Wall Street scale salaries received by a growing number of university executives, some members of Congress have proposed legislation that would cut all Federal funding to colleges that increase their tuitions faster than the rate of inflation. Barring some sort of artificial "cap," colleges and universities will have little economic incentive to cut their costs so long as the demand for higher education continues to exceed the supply. While not unmindful of the socio-economic consequences of rising tuitions, one University of Ohio economics professor recently said of his colleagues, "No one is pushing for efficiency very hard" (Kronholz Op. Cit.).

OUR COLLEGIO-CENTRIC PARADIGM OF THE FUTURE

Education today is prescribed as a cure for many economic ills, from unemployment, low wages and poor productivity to lagging technical innovation and limited social mobility. Federal Reserve Chairman Alan Greenspan has told Congress more than once that "U.S. workers would benefit more over the long run from enhanced education and job skills than from protectionist measures that restrain international trade" (Henderson 2/21/04). And, the more education, the better! Middle-schoolers are now made familiar with histograms showing long "income" bars for college graduates and short "income" bars for high school drop-outs. For years, Chairman Greenspan has worried (for the record), that "I am hard-pressed to see how we can maintain what is increasingly an intellectual-based output system without a better education system (Schlesinger 1999). "Providing rigorous education and ongoing training to all members of our society is critical for our economic performance overall, and for individuals buffeted by our economy's changing nature" (Henderson 2/21/04). During the 2004 Presidential campaign, President Bush proposed that, in order "to fill the jobs of the 21st Century," federal worker retraining funds should be reallocated from industrial era vocational programs "to help community colleges prepare workers for jobs in industries with identified labor shortages" (Henderson 4/25/04).

In July 2004, the Economic Policy Institute, a centrist Washington think tank, issued a report reviewing nearly 180 studies demonstrating a quantitatively measurable relationship between investment in education and economic development (Schwenk 2004). But a month later, the contrarion cyber-journal, Spiked-online.com (Mullan 2004), published an essay citing research by the World Bank, OECD and Britain's National Institute of Economic and Social Research, seriously challenging the existence of a causal relationship between educational investment and economic performance (Wolf 2002, O'Mahony & DeBoer 2003, 2002, Pritchett 1996). While the author of the essay, Phil Mullan, concedes that a causal link has been demonstrated between specific job skill training and subsequent on-job performance,

no such linkage has yet been proven for the broader enterprise of "education" and the economy. (This does not mean that such a relationship does not exist, Mullan cautions, only that it has not been proven. It is only 'an article of faith.')

In particular, the commonly-cited correlation between increased levels of educational achievement and graduates' earnings, as Mullan shows, could as easily be coincidental as causal (Education 2002, Arrow 1973). A second survey of much of the same literature, published by the Knowledge Works Foundation, a U.S. public education philanthropy, found robust disagreement among the researchers, and no conclusive evidence of a casual link between educational input and economic performance (Weiss 2004). There is also no evidence at to support the supply-side component of collegio-centric economic development theory, which holds that new high-value jobs will be created specifically to employ newly-created supplies of college graduates (Balls 2005). This assumption is also an economic *article of faith*, as is the widely-held assumption that the Information Revolution will inevitably give rise to a new generation of high tech, high value-adding jobs. **Employment forecasts in Europe, North America and Japan currently reflect no future surge of growth in median or upper-income employment!** The same is not the case for growing numbers of developing and redeveloping nations in our globalizing economy.

THE EXTRAPOLATED FUTURE FOR GLOBALIZATION AND HIGHER EDUCATION

Over the past half century, free trade has fostered the accelerating growth of export manufacturing work in the Developing World (Richburg 1996). Concomitantly, globalization plus low-cost Web-based communication has led to the increased off-shoring of commodity knowledge work from the U.S. and Europe (Marsh 2005, Hilsenrath 2004), boosting domestic demand for the graduates of universities in Asia, Eastern Europe and Latin America. These developments, in turn, can be expected to enhance the stature of those universities and the economic value of their outputs. Moreover, the 3rd World's 1980's Baby Boom – one billion of them – will become young adults in the decade ahead, providing the universities of the developing nations with an essentially inexhaustible supply of students whose successful education will be crucial to the future prosperity and political stability of their countries … and the world (Murray 2004, Wolf 2003, Demography 1996).

There is every reason to believe that continued economic globalization will foster the ongoing growth of universities throughout the developing world, as they turn out the professional, managerial and technical cadres required of modern societies (Wolf 2001). The growth of free trade will not, however, work out all that well for the mature industrial economies, or their universities. Future surges in demand for college graduates in Bangalore and Guangzhou are likely to be mirrored by corresponding drops in demand for degreed recruits in the U.S., Europe and Japan (Friedman 2005). Still more high value jobs will be lost by the old industrial

economies as 3rd World manufactured goods increasingly out-compete 1st World products on price and quality (Frost 2004).

Meanwhile, as the Internet becomes the principal marketplace for *information work* in the "global village," economists expect that intense international competition will inexorably drive labor markets worldwide to pay comparable wages for comparable information work (Pearlstein 2004). In the U.S., the income advantage of 4-year college graduates over high school graduates, which rose from 25% to 45% from 1979 to 2001, has fallen to 42% since 2001 (Uchitelle 2005). Unless American programmers, British actuaries and Japanese engineers are able to add value to their services that their 2nd and 3rd World counterparts cannot, their future employment and compensation will increasingly be at risk (Witte Op. Cit.). So, too, ultimately, will the tuitions and faculty salaries at the universities that prepare those employees for the marketplace. At present, the domestic demand for college graduates is not expected to grow significantly in Europe, Japan or North America during the decade ahead.

Current 10-year forecasts of the U.S. job market by the Bureau of Labor Statistics (BLS) suggest that there will be no significant increase in the proportion of domestic jobs requiring post-secondary degrees (Occupational 2004). Roughly 30% to 31% of U.S. jobs currently require a post-secondary degree, and BLS projects that 35% of the 21 million jobs to be created during the coming decade will require an associate, bachelors or graduate degree. (These forecasts do not include the potential effects of off-shoring, which is variously projected to cost the U.S. between 100,000 to 200,000 service jobs lost per year (Armour & Kessler 2003) and 1,000,000 per year (Witte 2004) between now and 2020. A 2005 USA TODAY/PriceWaterhouse- Coopers survey of 106 recent American IT start-ups found that 39% of the new ventures employ professional staff residing in developing countries (Hopkins 2005). Even without considering the potential impact of off-shoring, however, the Labor Department data conclude that ten years from now, just as today, over 2/3 of all U.S. jobs will continue to require only "short" or "moderate-term" workplace experience or training. There is no surge in demand for post-secondary degrees on America's extrapolated 10-year horizon!

Nor, apparently, is there in Europe or Japan, which could be a good thing, since their low birth rates are beginning to produce a diminishing domestic supply of students (U.N. 2003, Lynch 2000). Even in the U.S., because of the low birth rates of the 1980's, immigrants and mature adult students are expected to account for over half of all growth in college enrollments in the decade ahead (Armour 2003, Arensen 2002, Francese 2002). In particular, 1st World graduate schools will be increasingly dependent upon 3rd World students to fill their classes. Since developing nations' student populations will vastly exceed the capacity of their own universities during the decade ahead, the graduate schools of Europe and North America should have no trouble filling their vacant seats with foreigners, so long as they do not price themselves out of the market, or xenophobic immigration rules do not keep 3rd World students out (Pope 2005, Grimes & Alden 2004).

(NOTE: First World universities are also likely to open or expand overseas operations, and to offer a broad array of distant learning degree programs to serve the massive 3rd World markets. By 2015, concludes Hezel Associates, a Syracuse, NY education technology consultant, overseas distance learning is likely to constitute a large share of the projected $70 billion annual worldwide market for on-line higher education (Global 2004). The Hezel assessment assumes – as do most academics and corporate edu-preneurs -- that U.S. higher education is the global "gold standard" for post-secondary degree programs, and that U.S. branded e-learning services will dominate cyber-space the way Coke and Pepsi dominate the World's soft-drink markets. Most U.S. college administrators today understand that, from now on, essentially all universities will be able to compete with each other for international students in a global on-line learning market. However, most U.S. post-secondary faculty and administrators have given little or no serious thought to the fact that they are also likely to find themselves competing on-line for **both** foreign **and** domestic students with Universities in Guadalajara and Madhya Pradesh.)

THE DYNAMIC FUTURE FOR GLOBALIZATION AND HIGHER EDUCATION

The extrapolated future described in the preceding paragraphs suggests that universities – industrial era institutions – are likely to expand and prosper in the neo-industrial economies of the 3rd World, while sustaining themselves in the slower growing domestic markets of the post-industrial 1st World. It is, however, possible to produce more dynamically detailed – if somewhat more speculative – descriptions of the future by integrating reliably extrapolable demographic, economic and technologic trends into a single composite forecast – a "scenario" of the most probable future. Since we got to the new millennium, there has been an unusually large number of book-length scenarios published by think tanks, academics and business consultants, all depicting the projected evolution of commercial enterprise and the workplace in the industrialized nations during the first decades of the 21st Century.

In conjunction with research that I compiled in 2004 for the National Association of Industrial and Office Properties (NAIOP), I summarized 6 different scenarios projecting the world of work and business over the next 10 to 20 years. (These publications are fully cited in an Appendix to this paper.) While the objective of my research was to create a composite forecast of the future market for commercial real estate, the scenarios also provided instrumental insights regarding the future demand for post-secondary graduates (Snyder 2004). Most significantly, although the different scenarios were produced by a variety of institutions using disparate methodologies, all 6 reflected a remarkable consensus regarding the fundamental realities of the future workplace for which educators are currently preparing their students.

The principal features of this consensus future include:

- free-trade and globalized enterprise will continue to expand as a share of the world's GDP;
- growing low-cost foreign competition across the full range of consumer and commercial goods will force producers in mature industrial economies worldwide to continuously cut costs and increase productivity;
- accelerating "inform-ation" -- the automated generation, transmission, integration, retention, retrieval **and application** of data -- will eliminate growing amounts of paperwork and growing numbers of paperworkers in developed and developing economies alike;
- most large, vertically-integrated, hierarchical Industrial Era bureaucracies worldwide will transform themselves into virtually-integrated, distributed "extra-preneurships" – networks of outsourced domestic and foreign suppliers, partners and franchisees – seamlessly coordinated over the Internet;
- the emergence of a single global marketplace will foster the ongoing consolidation of producers and service providers in all mass markets, through mergers and acquisitions;
- employment in North America, Europe and Japan will increasingly be characterized by higher turnover, less job security, diminished benefits and profits-based compensation.

Most strikingly, NONE of the scenarios described any new classes of median or upper-income employment that would replace the millions of high value-adding jobs that all agree the mature economies will continue to lose over the coming decades. In fact, **not one of the 6 scenarios even suggested that a wave of high-tech hiring was to be expected at all**. Three of the scenarios expressed serious concern over the decline of median-income employment in the mature industrial nations, and over the expected continuing abandonment of the Industrial Era social contract between labor and management. Another 3 scenarios assumed (rather casually) that the U.S. and Europe would lose their overwhelming pre-eminence in basic research, applied science and engineering during the next decade or two, as Western scholarship finds itself increasingly competing head-to-head with Chinese and Indian research labs.

A CONVERGENCE OF INEVITABILITIES

With such powerful, inertially-driven forces coercing basic structural and operational changes in all large institutions, it is unreasonable to believe that higher education alone will somehow avoid the trauma of transformative innovation. At the very least, competitive international marketplace pressures on higher education and the firms that employ college graduates will confront costly labor- and capital-intensive universities with the necessity to inform-ate, disaggregate, affiliate and consolidate their operations like other large enterprises, in order to remain economically viable. The expected retirement of 1/3 of all post-secondary faculty and administrators during the next 10 years – at a time when the BLS is projecting an overall 3 to 4 million shortfall in the U.S. labor supply (Occupational 2004) – suggests that colleges and universities will either have to import large numbers of faculty or replace classroom instructors with technology in order to remain operationally viable.

Failure to act quickly will leave traditional colleges and universities increasingly vulnerable to aggressive competition from lower-cost, market savvy for-profit schools like Bradley, DeVry and the University of Phoenix, whose enrollments have increased 10-times faster than public and non-profit higher education over the past decade, and whose share of the total four-year post-secondary market has risen from 3% to 10% since 1990 (Kelly 2001). It is worth noting that both Congress and the current U.S. administration, upset at both public and private colleges for their sustained tuition increases, are reportedly planning to expand the numbers of for-profit schools eligible for federal student-aid programs (Kronholz Op. Cit.).

By contracting out their "non-core" administrative functions – e.g. human resource management, information systems, facilities management, supply and procurement, etc. – today's typical large university could, like big business, expect to achieve a 15% to 20% reduction in total operating costs, and be able to cut its tuitions accordingly, without having to touch the school's core operation: classroom instruction. As regards improving productivity in the classroom, the first generation of computer-aided instruction (CAI) was expensive and counterproductive (Shifting 2003). But, corporate learning officers report that today's e-learning systems cost 15% to 25% less than instructor-based training (Walker 2003), while enabling employees to learn up to 40% faster, and retain lessons 30% more accurately, especially when CAI is "blended" with access to live "mentors" (Nairn 2003). In Beta tests of the **next** generation of e-learning software, avatar instructors with virtual personalities ("veepers") replace the live faculty altogether, and employers report that both learning time and training costs are cut in half (Borzo 2004).

MATURED UNIVERSITIES VS. MATURE IT

Presumably, college faculty could use e-learning systems to teach basic elements of their courses to students in their dorm rooms – or at home or on the job – reducing instructor time and space requirements. Of course, it is commonly asserted that CAI can only impart domain content and cognitive skills, but cannot truly "educate" a student. Education is perceived to transcend memorized content and applied skills, no matter how complex, to include such fundamental personal competencies as reasoning, judgment, articulation, collegiality, inquiry, etc., that are putatively the unique products of a face-to-face "campus experience." Because of this belief, a college education is the principal qualifying standard for nearly all professional, managerial and technical employment worldwide. Indeed, the purposeful link between "college" and "career" is so universally understood throughout society, that academic traditionalists routinely complain that universities have become trade schools, and that, with the wholesale elimination of required core curriculum, the larger purposes of higher education have been lost (Taylor 2001, Honan 1996, Grudin 1995). However, a 2004 survey of 1500 college seniors and recent graduates in the U.S., U.K., France, Germany and Spain, suggests that the products of today's post-secondary education may not even be performing up to trade school expectations.

The survey, commissioned by the human performance division of Accenture, the international business consultancy, found that just 24% of the respondents felt that they possessed the communications skills necessary for the workplace, and only 16% were satisfied that they had the right computer or technical skills. Most important of all, only 20% of those surveyed felt they had "the ability to produce high quality work" or "a strong knowledge of their field." The great majority of the respondents reported that their current career plans involved "finding an employer with a good training program" (Green 2004).

To be fair, such data could simply reflect the feckless mind-set of freshly-minted baccalaureates. After all, it has long been known that half of all college graduates end up in careers that bear no relationship to their academic major. But given the time and money required to acquire a baccalaureate degree -- plus the defacto requirement of post-secondary credentials to gain access to a middle income career track – it is reasonable to expect that the universities' external stakeholders – e.g. employers, students, parents and politicians – will begin to demand quicker, less costly, more utilitarian post-secondary education over the next 5 years. The ensuing debate over the cost and value of "education" vs. "training" will be so polarizing that it is likely forestall purposeful action by most traditional institutions. Such a failure to act will provide an opening for marketplace initiatives by growing numbers of "edu-preneurs," ranging from individual tutors and teacher consortia to publishing houses, the IT and entertainment industries, and venture capitalists (Wyatt 1999).

SELLING HIGHER EDUCATION TO CYBER-SAVVY CONSUMERS IN A WIRELESS ON-LINE MARKETPLACE

While K-12 schooling is a mandated public service, post-secondary education is a discretionary consumer market purchase. In a recent survey of students, Arthur Levine, President of the Teachers College at Columbia University, reported finding that young people today want their relationship with higher education to be "like that with the utility company, supermarket or bank, with an emphasis on convenience, service, quality and affordability" (Levine 2000). If those are the standards against which universities of the future will be judged, traditional academia has little hope of surviving competition with the low-cost local franchise outlets of national for-profit university chains OR with engaging on-line, on-demand instructional avatars.

A voluntary "open-innovation" process has already taken root among K-12 teachers, (http://www.schoolforge.net), modeled on the remarkably successful Open Source Software (OSS) movement (Schoolforge 2002). As of March, 2005, SchoolForge.net reported that there were 91,000 active registered e-learning software projects (Mulgan & Steinberg 2005). A similar movement – sponsored by Utah State University and supported by Rice, MIT and Carnegie Mellon Universities -- can be expected to begin publishing modules of a universal undergraduate curriculum free on-line during the next 24 to 36 months (Open 2005). Meanwhile, between now and 2010, computer games will evolve into learning simulations for every type of skill and competency in every field of application (Shreve 2005, Bulkley 1996).

The Information Revolution has not done much for teachers until recently. During most of the past three decades, educators have been provided with costly, clunky technology that has been ill-suited for classroom use. Most students today, on the other hand, have mastered computers and cellphones, and have grown up in cyber-space (Edwards 2005). In college classrooms today, students routinely use wireless instant messaging on their laptops and palmtops to critique their lectures *while they're being delivered* (Schwartz 2003, Guernsey 2003). Students have also begun to post candid evaluations of faculty on-line -- a more stringent form of feedback than the sort to which college professors have been accustomed (Schwartz 2004, Lewin 2003, McCarthy 2002). And now, free practitioner-developed curricula from open scholarship, plus games-based instruction from Hollywood, are on the way.

Concomitantly, because grades and degrees are such unreliable predictors of a person's subsequent job performance, employers have begun to use computer simulated work assignments, plus attitude and aptitude tests to screen new recruits (Cha 2005, Richtel 2000). While such tests and simulations are costly, they are substantially more accurate than academic credentials at predicting a job candidate's future workplace performance (Hunter, et al 1982, Hunter 1980). Corporate recruiters commonly expect computerized screening of job applicants to become

standard business practice over the next 3 to 5 years, which will almost certainly diminish the marketplace value of expensive university degrees.

A WINDOW OF OPPORTUNE IT!

The computer, like all technologies, is a two-edged sword. It clearly has the potential to either enhance **or** supplant traditional education. Given leadership, there is no reason to believe that universities and their faculties could not use newly available information technology to re-invent themselves to serve post-industrial societies at least as well – and as affordably -- as they have served industrial societies. But the university is an ancient institution, and the professoriate is a time-honored, noble calling. Both the institution and the profession have been inherently resistant to change. Without leadership, traditional higher education is likely to see its markets devoured piecemeal by opportunistic edupreneurial sharks in a sea of technologic change.

At this moment, a technologic window of opportunity for higher education's self-initiated transformation is being provided by *groupware*, a rapidly-evolving family of free "off-the-shelf" software for on-line collaboration (New 2004). Groupware – including Peer-to-Peer (P2P) file-sharing, instant messaging, Web logs and Wiki's – are providing faculty with powerful interactive tools for "blending" their classroom instruction with on-line resources and experiential learning (Snyder & Edwards 2003). With every passing month, scholarly journals and professional publications report growing numbers of genuinely exciting outcomes from practical applications of groupware in post-secondary education (Glogoff 2005, LeBaron & Santos 2005, Lombardi 2004, Betts & Glogoff 2004, Richards 2001). Faculty desiring to undertake such initiatives should be encouraged by their universities and funded to do so. Universities should also work together by forming a common on-line "open curriculum" network to promote collegial innovation, dissemination and feedback.

In the business sector, P2P groupware – especially instant messaging ("IMing") – *has become the fastest-adopted innovation in the history of American enterprise*, in use by 84% of large North American firms four years after introduction (Nasaw 2003). No doubt, this phenomenal growth can be attributed, at least in part, to the fact that all sorts of powerful groupware can be downloaded free off of the Internet. More to the point, peer-to-peer networks operate by utilizing the computing capacities of their participants' personal hardware – desktops or laptops -- without affecting the central processors and servers at the heart of big institutional information systems. Groupware permits an individual Web user to create a remarkable amount of capacity for on-line group activity with a few clicks on the keyboard. An individual employee – or a teacher – can establish a potently equipped on-line collaboration space without having to submit a system change request or queue up for the next available programmer. This ease of use almost certainly accounts for the unprecedented speed

with which IM has penetrated the workplace. Gartner, Inc., the Stamford, Connecticut IT consultancy, estimates that employees imported IM into ¾ of America's large firms *without management's knowledge, or the official blessing of the corporate IT department* (Walker 2004).

At first, most corporate IT departments sought to ban the use of personal IM systems – or "buddy lists" – by employees, since such systems not only by-pass central processors and system servers, but also by-pass corporate computer security protections, especially virus firewalls. But employees uniformly protested the bans. In some cases, professional and technical workers threatened to "strike" if they were prohibited from using IM which, they argued, dramatically improved their productivity. While a few firms continue to bar employee use of IM on the job, the great majority of large North American employers have come to accept the productivity-enhancing power of P2P software, and are providing their employees with commercial groupware that is fully spam-filtered, virus protected, encrypted and archived (Harmon 2003).

Big businesses' rapid adoption of groupware *following the lead of its rank-and-file white collar workers* was a remarkable event – unique in modern times – and it offers the university a promising model for strategic action. Just as in the corporate sector, higher education's "rank-and-file" employees – the faculty – are already taking the lead in using groupware to transform the delivery of their course content *and their roles as teachers*. University administrators should take a lesson from their business brethren, and actively support such transformational innovations, their assessment and their rapid assimilation into a "cyberized" campus learning experience. Certainly, university governance should not seek to ban or restrict the use of groupware by faculty OR students. And installing campus-wide wireless high-speed Web access -- WiFi or Wi-Max -- would create an optimal info-structure for such a "grassroots" educational R&D process. With purposeful support, there is every reason to believe that groupware-empowered open collaborations among faculty, students and alumni shared across thousands of campuses could re-invent post-secondary education on their own over the next few years.

In a pair of alternative scenarios published in 2004, the Dean of IT at Indiana University explored the outlook for such a spontaneous, all volunteer open source approach to developing and sustaining a superior new family of non-proprietary post-secondary instructional software (Wheeler 2004). The author, Brad Wheeler, concludes that without the leadership and substantial support of university administrators, a grass-roots open source e-curriculum movement was likely to fail. But, even if faculty and administration were closely aligned in such an effort, Dr. Wheeler is not sanguine over the prospects for a faculty-created open source family of software for higher e-education, and concludes that academia is likely to be better served by letting the business sector develop the post-classroom college curriculum, in spite of the high costs and rigidity of proprietary software. For-profit enterprises,

Wheeler asserts, are simply more likely to quickly deliver serviceable products than a consortium of volunteers.

On the other hand, a consortium of faculty members would almost certainly develop a system of instructional software whose architecture, content and protocols would preserve a central role for the professoriate. For-profit suppliers of mass-market IT learning products and services – software publishers, IT equipment makers, Internet Service Providers (ISPs), the entertainment media, etc. – have no particular incentive to preserve faculty. In fact, most producers of e-learning technology are looking to sell products and services directly to students, reducing the need for classroom instruction and expensive faculty at a time when mass retirements and a shortage of recruits are expected to confront U.S. higher education with a shortage of qualified instructors.

THE COMING METAMORPHOSIS OF THE UNIVERSITY

A SCENARIO

One way or another, universities and their faculties must begin to mobilize for purposeful action now, because they are in a race with media companies and software houses who are already developing products for the post-secondary learning market. Without their own system of open e-products – and e-standards – by 2010, the world's universities and their faculties will be forced to buy expensive proprietary electronic curricula from a handful of corporate giants and their educational consultants. Moreover, if they do not quickly develop their own collaborative on-line learning systems, universities will lose the opportunity to tap the one resource to which Time-Warner and Microsoft do not have easy access: *their alumni*.

The following 3-dimensional scenario suggests a plausible metamorphosis of the university over the next 10 to 15 years to address its changing demographic, economic and technologic circumstances, modeled on the multiple simultaneous transformations that are already well established in the world of business.

1ST DIMENSION - FROM HIGHER EDUCATION TO LONGER EDUCATION

Teachers since Socrates have expressed frustration at not being able to accompany their students out into adult life to observe how well graduates are served by the education they have received. More recently, legislators, employers and the general public have also begun to express frustration over this problem, not merely from a pedagogical perspective, but from an economic stand-point as well. In the face of our post-dot.bomb/post-Recession austerity, State, Provincial and local governments, in particular, have become increasingly concerned with maximizing the benefits from constrained public resources. Numerous speakers at the March, 2005 Annual Conference of the American Association of Higher Education reported growing

demands by lawmakers and business leaders that colleges be held accountable for preparing their students to do 21st Century work (Suggs 2005).

Because post-secondary institutions have not traditionally followed-up on their students' outcomes in the marketplace, they are unable to provide their stakeholders with evidence of their graduates' performance. But, groupware on the Internet now makes it possible for teachers to maintain a collegial relationship with their alumni following graduation. Not only will the Net make it easy for instructors to solicit – and for graduates and their employers to provide – feedback regarding the quality and utility of their education, it will also enable educators to learn from their former students the elements of "practical intelligence," which Robert Sternberg and his colleagues at Yale University have recently identified as the "learned competencies that are highly correlated with career achievement and success in life" (Persaud 2001).

Sternberg's research team has concluded that the secrets of success are linked to "knowing how to accomplish crucial common tasks" (Sternberg 2001). This knowledge is not formally taught in a classroom, but learned through everyday activities, typically without conscious awareness. "Practical intelligence," as Sternberg calls it, is "tacit;" more often *understood* than *articulated*. But, specific components of practical intelligence in different professional fields or workplace settings can be identified through structured dialogues with successful mature individuals. By maintaining an ongoing collegial relationship with their alumni, faculty and curriculum developers will be able to work with their former students to identify specific examples of practical intelligence to incorporate into their classroom lesson plans. Being the product of life-long collaborations, this will be a curriculum that Hollywood and the software publishers will be ill-equipped to produce.

Over the next 10 to 15 years, as innovation, inform-ation and globalization transform employment and sustain ongoing mid-career terminations and transitions in the mature industrial economies, university alumni will have good reason to maintain a long-term learning relationship with their alma maters (almas mater?). During the 1990's, most universities and 4-year colleges transformed their old placement offices into on-line "career development centers" (Arenson 1996), whose services were later tapped by alumni who lost their jobs following the 2001 Recession. And, since the mid-1990's, a growing number of universities have been offering on-line courses to their alumni (Madden 1996). By 2015, most post-secondary institutions will no longer be primarily engaged in front-loading a lifetime's knowledge on students in their 20's. Instead, they will be engaged in a life-time of mutual learning by both their faculty and their students (Snyder 2001). Higher education will become **longer** education.

2ND DIMENSION - FROM HIGHER EDUCATION TO FULLER EDUCATION

Even as our maturing info-com technologies permit us to transform and improve our traditional educational processes and practices, they will also produce a chaotic efflorescence of new knowledge – ultimately altering the contents of education. As more and more human activities and technical processes are monitored and recorded in real-time, the resulting flood of data will lead to new insights and understandings, necessitating new actions – especially in matters relating to health, the environment and public safety (Weiss 2005, Green 2003, Low-cost 2002). From now on, resolving crucial corporate and public policy issues will require a mix of disciplines and experience, giving rise to a rapidly growing demand for people with combinations of skills – nano-ecologists, isotope hydrologists, forensic accountants, environmental sociologists, etc. – filling in the empty spaces that once separated the distinctly disparate industrial era academic disciplines. Existing university colleges will compete ferociously to host new trans-disciplinary degree programs, just as the Mathematics, Software Engineering and Arts Departments have recently been squabbling on a half-dozen U.S. campuses over who will host new graduate programs in "Interactive Game Design" (High 2005). Overseeing this ongoing rearrangement of our Industrial Era epistemology will be one of the university's primary challenges in the Information Age.

In fact, mathematician Vernor Vinge and techno-futurist, Ray Kurzweil, have concluded that the Information Revolution will be the last in the linear sequence of surges in human progress based on individual technical breakthroughs, starting with the invention of language and the mastery of fire 50,000 years ago. On the assumption that progress in info-tech, bio-tech and nano-tech will continue its exponential acceleration, they calculate that superhuman intelligence will be achieved within 30 years. "When greater-than-human intelligence drives progress," Vinge writes, "progress will become much more rapid. The ongoing feedback-loop of the self-perpetuating expansion of our intelligence and the resulting acceleration in scientific discovery," argue Vinge and Kurzweil, "can be expected to generate technological change so rapid and profound that it will represent a rupture in the fabric of human history; a *technological singularity*" (Technological 2005).

In a different-but-parallel conceptualization, physicist Freeman Dyson and microbial taxonomist Carl Woese recently announced that we have already left the era of "Darwinian evolution" – driven by species competition – and have entered the post-Darwinian era, when the evolution of our terrestrial habitat and all life therein will be an artifact of *human values* (Dyson 2005). Under "cultural evolution," as Dyson calls it, homo sapiens will combine the atoms of different materials and genes of differing plants and animals and microbes to create entirely new materials and life forms – including new kinds of human beings. Either scenario – "cultural evolution" or "technological singularity" – is likely to render obsolete the existing epistemologies around which our traditional scholarly disciplines are organized.

At this transformational moment in history, modern societies need the university to return to its original function as the authority overseeing the compilation, organization, interpretation and dissemination of the rapidly-expanding bodies of knowledge whereby we will guide the human enterprise. To fulfill this role, the universities of the future will have to spin off all of their professional schools – engineering, law, management, medicine, education, accounting, etc. – letting them prosper or fail in the career preparation marketplace on their own merits, in competition with their for-profit counterparts. If humankind is to make purposeful use of the flood of new knowledge with which we are about to be inundated, university scientists and scholars must be able to devote much more time and attention to the continuing discoveries in every discipline – plus the creation of new disciplines – and to incorporating them into post-secondary curriculum content and design.

Specifically, universities worldwide will need to establish universal on-line "open knowledge" system modeled on the highly successful (if controversial) Wikipedia on-line open encyclopedia (Mulgan & Steinberg Op. Cit.). Without such a continuously-updated, ever-expanding "map" of all knowledge to which all scholars or groups of scholars can freely input, existing, textbook-based curriculum will lag further and further behind our increasingly detailed bodies of knowledge and the paradigmatic changes in comprehension that such knowledge will evoke.

The newly-independent professional colleges would retain a "brand" affiliation with their former universities, tap each other's resources and make shared course offerings. The professional schools would also continue to grant advanced degrees, but only universities should be permitted to grant Doctor of Philosophy degrees in the future,. The discipline-specific doctorates awarded by professional schools would appropriately be focused on a deep and detailed knowledge within the specific field in question, while the university would be much more concerned with a mastery of the boundaries, intersects and inter-relationships of the subject matter of a PhD, within the rapidly-expanding larger body of all knowledge, research and speculation. This integrative ethos will restore to PhD's and their dissertations their original crucial function, to expand and fill-in the maps of all knowledge, in much the same way that the early Asian and European explorers expanded and filled-in our maps of the known world. In this context, higher education will necessarily become a **fuller** education.

3RD DIMENSION - FROM HIGHER EDUCATION TO FURTHER EDUCATION

In the Industrial Age, an individual earned a PhD by writing and defending a dissertation to a panel of five knowledgeable scholars. In the Information Age, individuals will earn a PhD by posting and defending a Web log (blog) to the general community of peer scholars. (As growing numbers of doctoral candidates address trans-disciplinary hypotheses, it will become increasingly difficult to assemble

traditional dissertation review panels, in any event.) But, to be able to articulate and successfully defend (or amend) a position or proposition against all comers on the Internet for, say, 90 days . . . . now THAT would be worth a PhD! The 3-months' record of such a "dia-blogue" would, of course, be subject to review and critique by a university-endorsed panel of "fair witnesses" who would attest to the rigor of the discourse and the evolution of the original hypothesis.

Post-industrial universities and their faculties would establish and administer the academic standards for this process. If there were no input to a PhD candidate's blog over 3 months, the dissertation might be judged insufficiently important to contribute to the advancement of human progress, and therefore not merit a doctorate. PhDs might even be required to post and defend updated versions of their dissertations once every 10 years or so in order to maintain the currency of their degree. Expired PhDs would be designated "PhD (Emeritus)."

Meanwhile, in cyber-space, hundreds of new topical affinity groups coalesce every day around clusters of mutual interest and shared knowledge that distill out of the info-sphere – e.g. miniature mules, trauma-induced paralysis, 18th Century Bohemian crystal, genetic migration, bumble bee bats, environmental sociology, patient support groups, apophenia, etc. While post-industrial universities would oversee and validate the awarding of PhDs in such esoteric fields, degree candidates would not need to have attended any formal post-secondary education (or indeed, any formal education at all), having gained mastery of their subject matter through experience, observation, curiosity, disciplined thought and peer dialogue (Sterling 2005).

Opening the PhD degree-granting process to non-academic candidates would be no quixotic egalitarian gesture. It would directly parallel the adoption of "open innovation" policies by a rapidly growing number of corporate giants. Since 2000, firms like Motorola, Proctor & Gamble and Pfizer, etc. have begun putting their R&D requirements out for competing open-market bids from commercial, academic and government laboratories, and licensing new technology from inventors who literally walk in off the street (Engardio & Einhorn 2005).

Innovation today takes place in so complex an environment – filled with burgeoning arrays of cross-impacting new materials, new tools and new rules, plus newly cross-linked fields of knowledge – that in-house R&D programs have become increasingly expensive, while the predictable value of their outputs have become much less certain. As a hedge against this problem, growing numbers of large firms have begun to outsource their R&D; "buying" up to one-half of their innovative products, services and processes in the general marketplace, where a growing array of info-preneurial enterprises and venture capitalists are nurturing hundreds of breakthrough innovations

in bio-tech, systems engineering, software, operations research, etc (Chesbrough 2003).

One by one, over the past 3 years, the world's major pharmaceutical companies have announced their intention to make all of their research freely available to the public (after several industry scandals involving the selective publication of some findings) (Windham 2004). Simultaneously, rising public outrage over the proprietization of research paid for by taxpayer dollars is forcing the public release of most publicly funded research, and leading growing numbers of universities to embrace "open knowledge" policies with respect to sharing their research (MacLeod 2005, Libbenga 2005, Wysocki 2005, Vedantam 2004, Goldberg 2001). The creation of a rigorous open on-line process for announcing, validating and disseminating new knowledge derived from our rapidly expanding data bases will be the central challenge to the post-industrial universities of the world. Disagreements will unavoidably arise among scholars and universities in the course of this process, and the resulting debates among differing "schools of thought" will enhance the intellectual vitality of academic life.

Post-industrial universities would also continue to be home to the arts and humanities, and to most basic, advanced and theoretical research in science, mathematics and engineering. More important, the new universities would host most trans-disciplinary scholarship and learning; cosmologists and artists alike believe that most important new knowledge will be found -- and the most potent applications of that knowledge will be developed – from intersecting fields of study. As they seek to comprehend all new knowledge, from the unconventional to the trans-disciplinary, post-industrial universities will be laying the groundwork for future discoveries, and the need for still **further** education.

THE POST-INDUSTRIAL UNIVERSITY

Once it has outsourced its administrative functions and spun off its professional and career-prep degree programs, the post-industrial university will initially be a much smaller and more purposefully-focused enterprise than today's typical industrial-scale public university. But the mission of the new university will be large, for the new knowledge that it produces will not directly translate itself into human progress. In capitalist economies, new knowledge is made manifest in the marketplace. And, while the contribution of science to economic activity has been acknowledged by all of the great economists of the Industrial Age, the macro-economists of the 20th Century – Keynes, Veblen and Schumpeter – all assigned a crucial role to science as the primary driver of modern economic growth. Indeed, as the late economist, Robert Heilbroner observed near the end of his life, a new vision has appeared as the commonly accepted essence of economics, replacing the vision that has dominated

economic thought for 200 years; "The new vision is Science," he wrote, "the disappearing one is Capitalism" (Heilbroner 1999).

Of course, post-industrial universities won't produce a stream of scientific breakthroughs simply to fuel our economic engines, nor even for the greater good of human progress. The most important consumer of the university's output will be society, as the public are made better aware of the opportunities, imperatives and bounded choices that lie ahead. By shedding their career training programs, post-industrial universities and their faculties will be able to focus on the institution's unique core function: public enlightenment. If university science is to be the fuel for future economic growth and development, a democratic, free-market society must be provided with knowledge and understanding of that science if it is to effectively govern its own destiny.

The organization and governance of the post-industrial university can be expected to evolve in a variety of innovative ways at different institutions. However, as with all other 21st Century enterprises, the institutional integrity of post-industrial universities will be guaranteed by **total transactional transparency** (because secrecy invites malfeasance), while the intellectual integrity of post-industrial universities will be assured by **continuous open review** (because secrecy nurtures incompetence). Since it appears that universities are, in fact, destined to serve as fountainheads of economic and social progress at this time of transformational innovation and change, they must, above all else, be demonstrably competent in their policies, their practices and in the creation of their products.

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APPENDIX

THE OUTLOOK FOR BUSINESS AND EMPLOYMENT

2005 TO 2015

Six Scenarios of the Trans-Millennium

Adapt and Survive – 10-year multifactor scenario of the future US/global business operating environment produced by a "Panel Survey" of 180 expert forecasters; conducted by the Global Futures Forum consultancy; published by GFF, December 2003.

The Future of Work, by Thomas W. Malone – an open-ended multi-factor extrapolation of long-term trends in the organization of work, and the features of employment and job design in the U.S.; published by Harvard Business School Press, 2004.

The 21st Century at Work: Forces Shaping the Future Workforce and Workplace in the United States – a multi-factor scenario produced by the RAND Corporation for the U.S. Department of Labor, describing how the most probable demographic, economic and technologic realities are expected to alter where, how and by whom work will be done in America over the next 15 years; published by the RAND Corporation, 2004.

Working in America: A Blueprint for the New Labor Market, by Paul Osterman, *et al*. – a projection of new institutions that are emerging to compensate for the decline/loss of industrial era social technologies, including labor unions, health insurance and pensions; published by MIT Press, 2001.

The Substance of Style: How the rise of aesthetic value is remaking commerce, culture and consciousness, by Virginia Postrel – an assessment of how IT is reducing the costs and increasing the variety of fabrication and design capabilities and of individually customized products and services – giving rise to rapidly growing employment in aesthetic services, ranging from plastic surgery and cosmetology to architectural and interior design, landscaping, graphics, gaming and film-making, while promoting diversity in food, music and clothing, commercial and residential décor and structural style, and employing millions of people who are being made redundant by automation and globalization; published by Harper Collins, 2004.

The New Division of Labor: How Computers Are Creating the Next Job Market, by Frank Levy, Professor of Urban Economics at MIT, and Richard Murnane, Thompson Professor of Education and Society at Harvard – an open-ended future scenario based on an analysis of trends in job content; identifying classes of employment that are likely to be [1] made redundant by automation/information, [2] lost to foreign competition, [3] off-shored, and [4] retained by the U.S. domestic economy; published by Princeton University Press, 2004.

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