

Adapting the University to the Constraints, Responsibilities, and Opportunities of a New Age

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Glion X Colloquium, 2015

During the years following the Great Depression and World War II, the United States launched a massive effort to provide educational opportunities to all Americans. Returning veterans funded through the GI Bill (Serviceman's Readjustment Act of 1944) tripled college enrollments. The post-WWII research strategy developed by Vannevar Bush transformed our campuses into research universities responsible for most of the nation's basic research (Bush, 1945). The Truman Commission proposed that all Americans should have the opportunity of a college education (Thelin, 2004), and California responded with its Master Plan, which not only provided all Californians with the opportunity of at least a community college education, but simultaneously created the University of California system, perhaps today the leading research university system in the world (Douglass, 2000).

America benefited greatly from these visionary investments in the future aimed at providing both the educational opportunity and new knowledge necessary for economic prosperity, social well-being, and national security. Our nation saw spectacular achievements, such as sending men to the Moon, decoding the human genome, and, of course, creating the Internet and the digital age. Over the past half century, our nation, and, indeed, the world, have benefited greatly from the extraordinary commitments of our parents, the "Greatest Generation", to educational opportunity and the support of university research.

Yet, today, much of this earlier commitment to investment in education and research seems to have waned. Not only the quality of our primary and secondary education, but also the skills of our workforce, lag many other nations. Over the past decade, government support of our public universities has dropped by roughly 35%, putting leading research universities such as U. California, U. Wisconsin, and U. Michigan at risk (Holliday, 2012). After a brief surge during the late 1990s with the doubling of the budget of the National Institutes of Health, both federal and corporate support of basic and applied research have fallen significantly, while fields such as the

social sciences have been savaged by conservative political forces. And perhaps most telling of all, the inequities characterizing educational opportunity in America have become extraordinary. (Haycock, 2010) The unfortunate reality facing young students today can be summarized by observing, "If you are poor and smart, you have only a one-in-ten chance of obtaining a college degree. In contrast, if you are dumb and rich, your odds rise to nine-in-ten!" (Vest, 2005)

More fundamentally, an extraordinary shift has occurred in the public perception of the purpose of American higher education over the past half century. In early decades following World War II, higher education was viewed primarily as a *public good* because of the critical role it played by an educated population and the knowledge generated on our campuses in determining the welfare of our nation merited strong support from public tax revenues. Today, our nation seems to no longer understand that the support of educational opportunity and campus-based research represents *investments* in the future, not burdensome *expenditures* from public resources. Instead, most Americans view a college education primarily as a *private benefit*, which enables students to compete for high-paying jobs, as evidenced in part by the rapidly increasing income differential between those with and without a college degree. Hence, it is not surprising that public policy has shifted to view a college education as something that students should pay for themselves through fees, enabled, in part, through loans and debt.

So, too, as the compelling challenges of the post-World War II economic recovery, the Cold War, and the space race subsided, federal support of the research and development needed for prosperity and security has weakened in the United States. Rather than the "peace dividend" anticipated during the 1990s, the nation's R&D investment relative to the nation's GDP has dropped. Faced with the financial pressures of quarterly earnings that demand corporate priorities shift away from long-term research to product development, great research organizations such as Bell Laboratories have disappeared. Even more seriously, federal policies no longer place a priority on university research and graduate education, as basic research funding has dropped by roughly 20% over the past decade. Most recently, a conservative Congress has adopted rigid constraints, such as a sequestration on all federal expenditures, putting at serious risk not only on basic research but also the capacity and quality of the nation's research universities (Lane, 2014).

Both the irony and tragedy of this situation flows from the realization that today our world has entered a period of rapid and profound economic, social, and political transformation driven by knowledge and innovation. It has become increasingly apparent that the strength, prosperity, and welfare of region or nation in a global

knowledge economy will demand a highly educated citizenry enabled by development of a strong system of education at all levels. It will also require institutions with the ability to discover new knowledge, to develop innovative applications of these discoveries, and transfer them into the marketplace through entrepreneurial activities. Hence, current American higher education policy represents a dramatic disinvestment in its future.

Throughout most of our history, education in America has been particularly responsive to the changing needs of society during early periods of major transformation, e.g., the transition from a frontier to an agrarian society, then to an industrial society, through the Cold War tensions, and to today's global, knowledge-driven economy. As our society changed, so too did the necessary skills and knowledge of our citizens: from growing to making, from making to serving, from serving to creating, and today from creating to innovating. With each social transformation, an increasingly sophisticated world required a higher level of cognitive ability, from manual skills to knowledge management, analysis to synthesis, reductionism to the integration of knowledge, invention to research, and, today, innovation and entrepreneurship. Our nation's challenge today is to understand that once again it is time to challenge current public policy and make new commitments to education to enable our nation to achieve prosperity, health, and security.

More generally, it is clear that as the pace of change continues to accelerate, our schools, colleges, and universities will need to become more adaptive if they are to survive. It is not enough to simply build upon the status quo. Instead, it is important that we consider more expansive visions that allow for truly over-the-horizon challenges and opportunities, game changers that dramatically change the environment in which our institutions must function.

To illustrate, let me suggest two intellectual trends that are likely to become increasingly important to our society over the next several decades and should intensify the public good character of higher education.

An Old Theme for a New Generation: *Renaissance*

Our world is changing rapidly, driven by the role played by educated people, new knowledge, creativity, innovation, and entrepreneurial zeal. The professions that have dominated the late 20th Century—and to some degree, the contemporary university—have been those which manipulate and rearrange knowledge and wealth rather than create it, professions such as law, business, accounting, and politics. Yet, it is

becoming increasingly clear that the driving intellectual activity of the 21st Century will be the act of creation itself, as suggested by Jacques Attali in his provocative forecasts for the 21st Century at the turn of the Millennium: "The winners of this new era will be creators, and it is to them that power and wealth will flow. The need to shape, to invent, and to create will blur the border between production and consumption. Creation will not be a form of consumption anymore, but will become work itself, work that will be rewarded handsomely. The creator who turns dreams into reality will be considered as workers who deserve prestige and society's gratitude and remuneration." (Attali, 1991)

The tools of creation are expanding rapidly in both scope and power. Today, we can create objects literally atom by atom. We are developing the capacity to create new life-forms through the tools of molecular biology and genetic engineering. We are now creating new intellectual life-forms through artificial intelligence and virtual reality. Already we are seeing the spontaneous emergence of new forms of creative activities, e.g., the "maker" fairs providing opportunities to showcase forms of artistic, recreational, and commercial activity; the use of "additive manufacturing" or 3-D printing to build new products and processes atomic layer by atomic layer; and the growing use of the "app" culture to empower an immense marketplace of small software development companies. In fact, some suggest that our civilization may experience a renaissance-like awakening of creative activities in the 21st century similar to that occurring in 16th century Europe.

A determining characteristic of the university of the 21st Century may be a shift in intellectual focus, from the preservation or transmission of knowledge, to the process of creativity itself. If so, then vision for the university of the early 21st century should stress characteristics such as creativity, innovation, ingenuity and invention, and entrepreneurial zeal. But here lies a great challenge. While universities are experienced in teaching the skills of analysis, we have far less understanding of the intellectual activities associated with creativity. In fact, the current disciplinary culture of our campuses sometimes discriminates against those who are truly creative and do not fit well into our stereotypes of students and faculty.

The university may need to reorganize itself quite differently, stressing forms of pedagogy and extracurricular experiences to nurture and teach the art and skill of creativity and innovation. This would probably imply a shift away from highly specialized disciplines and degree programs to programs placing more emphasis on integrating knowledge. There is clearly a need to better integrate the educational missions of the university with the research and service activities of the faculty by ripping instruction out of the classroom—or at least the lecture hall—and placing it instead

in the discovery and tinkering environment of studios or workshops or even “hacker havens”.

Actually, as John Seely Brown suggests, today’s students are already using technology to function much like artists – disciplined, focused, pushing boundaries, challenging assumptions and creating meaning (Brown, 2009). They are willing to engage with multiple viewpoints before synthesizing their own. They are engaged, first and foremost, in fostering what might be called the creative class, desiring not only to create for themselves but also seeking others to build on their creations. The platforms they use are mostly digital, e.g., social networking, cloud-based data repositories, open source and open content technologies, and remixing the work of others through rich media capable of expressing complex ideas.

As Brown warns, in a rapidly changing world, innovation no longer depends only upon the explicit dimension characterizing conventional content-focused pedagogy focused on “learning to know”. Rather, one needs to enable an integration of tacit knowledge with explicit knowledge to facilitate “learning to do”, “learning to create”, and “learning to be” tools already embraced by the young, if not yet, by the academy. Particularly key in this effort is the earlier goal of diversity. As Tom Friedman noted in a recent New York Times column, “The sheer creative energy that comes when you mix all our diverse people and cultures together. We live in an age when the most valuable asset any economy can have is the ability to be creative—to spark and imagine new ideas, be they Broadway tunes, great books, iPads, or new cancer drugs. And where does creativity come from?” As *Newsweek* described it, “To be creative requires divergent thinking (generating many unique ideas) and then convergent thinking (combining those ideas into the best result).” And where does divergent thinking come from? It comes from being exposed to divergent ideas and cultures and people and intellectual disciplines (Friedman, 2010).

An Old Theme for a New Era: *Enlightenment*

Today, a rapidly changing world demands a new level of knowledge, skills, and abilities on the part of our citizens. Just as in earlier critical moments in history when our prosperity and security was achieved through broadening and enhancing educational opportunity, it is time once again to seek a bold expansion of educational opportunity. But this time we should set as the goal providing all citizens with universal access to lifelong learning opportunities, thereby enabling participation in a world both illuminated and driven by knowledge and learning.

The challenge facing us today is to recognize and accept our responsibilities to provide all of our citizens with the educational, learning, and training opportunities they need and deserve, throughout their lives, thereby enabling both individuals and the nations to prosper in an ever more competitive global economy. While the ability to take advantage of educational opportunity will always depend on the need, aptitude, aspirations, and motivation of the student, it should not depend on one's socioeconomic status. Access to lifelong learning opportunities should be *a right for all rather than a privilege for the few* if a society is to achieve prosperity, security, and social well being in the global, knowledge- and value-based economy of the 21st century (Miller, 2006).

So, how might we achieve such a goal in the face of the array of financial, social, and political constraints faced by contemporary universities? Any vision proposing a future of the university must consider the extraordinary changes and uncertainties of a future driven by exponentially evolving information and communications technology. The extraordinary connectivity provided by the Internet already links together the majority of the world's population. To this, one can add the emerging capacity to capture and distribute the accumulated knowledge of our civilization in digital form and provide opportunities for learning through new paradigms such as MOOCs and cognitive tutors. This suggests the possible emergence of a new global society no longer constrained by space, time, monopoly, or archaic laws and instead even more dependent upon the generation of new knowledge and the education of world citizens.

Today, the rapid evolution of information and communications technologies and the new paradigms they support, such as crowd sourcing, digital archives, and data mining, suggest a new learning ecosystem symbolized by the diagram of three elements: Wikipedia, Google, and Watson. Imagine a triangle, with Wikipedia on the top vertex, Google on the lower right, and Watson on the lower left. So, what is this puzzle?

Interestingly enough, each of these elements addresses a key core competency of the university:

- *Wikipedia* represents the capability to create enormous learning communities with a collective ability to digest and analyze information, self-correcting and evolving very rapidly through crowd sourcing as an emergent phenomenon.
- *Google* represents a future in which all knowledge is available in the cloud, digitized, accessible, searchable—everything ever printed,

measured, sensed, or created—big data to the extreme.

- *Watson* (the IBM computer that used artificial intelligence to beat the champions of the game-show *Jeopardy*, and more recently used to perform medical diagnosis) represents the capacity to use data mining and artificial intelligence to analyze information, trillions of transactions per second, identifying correlations, curating information, authenticating knowledge, certifying learning, and providing ubiquitous access.

So, what does this diagram represent? A new epistemology for the 21st century? Or perhaps it is a new form of a university capable of being extrapolated to serve the learning needs of all of humanity. Or perhaps it provides a contemporary path to a second great historical theme: the Enlightenment of the 18th and 19th centuries that swept aside the divine authority of kings and clerics by educating and empowering the public, stimulating revolution, and creating the liberal democracies that now characterize most developed nations. Clearly our world needs once again the “illumination” provided by distributing “the light of learning and knowledge” to counter the ignorance (e.g., today’s “denier” culture) and address the challenges of our times, informed by the rigor of scholarly inquiry rather than data-mined correlations.

More generally, the goals of the Enlightenment of 18th Century Europe were to provide for a rational distribution of freedom, universal access to knowledge, and the formation of learning communities. Rational and critical thought was regarded as central to freedom and democracy. Knowledge and learning were regarded as public goods, to be made available through communities such as salons, seminars, and academies. These dreams of the universal and the collective, *Liberte, Egalite, and Fraternite* for the French Revolution—or perhaps better articulated by Jefferson’s opening words from our own Declaration of Independence: “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.” remain as important today as they were three centuries ago.

Today, the educational institution most capable of launching a new “age of Enlightenment” is the “university”, with its dual missions of creating “unions” of scholars and learners and providing “universal” access to knowledge. In a sense, the word “university” itself conveys the elements of this vision: both the sense of a “union” or community of learners (i.e., *universitas magistrorum et scholarium*) and the “universality”

or totality of knowledge and learning as the key to social well-being in an age of knowledge. Furthermore, since these have been regarded as *public* goods, one might even suggest that the *public* universities have a particular responsibility in providing these.

But while the Enlightenment of the 18th century was concerned with “celebrating the luminosity of knowledge shining through the written word”, today, knowledge comes in many forms—words, images, immersive environments, “sim-stim”. And learning communities are no longer constrained by space and time but rather propagated instantaneously by rapidly evolving technologies (e.g., cyberinfrastructure) and practices (e.g., open source, open knowledge). The ancient vision of the Library of Alexandria to collect all of the books of the world in one place is rapidly becoming true—except the “place” has now become a cloud in cyberspace (e.g., the HathiTrust and Google Books). Learning communities are evolving into knowledge generating communities—wikis, crowd sourcing, hive cultures that span the globe.

William Germano suggests yet another argument for such a theme as the possible next stage in speculating about the evolution of the “book”, from the invention of writing to the codex to the printed volume to the digital revolution. As he explains:

“Right now we are walking through two great dreams that are shaping the future of scholarship, even the very idea of scholarship and the role “the book” should play within it. Great Dream No. 1 is universal access to knowledge. This dream means many things to many people, but for knowledge workers it means that scholarly books and journals can, and therefore should, be made available to all users. New technologies make that possible for the first time in human history, and as the argument goes, the existence of such possibilities obligates us to use them. Great Dream No. 2 is the ideal of knowledge building as a self-correcting, collective exercise. Twenty years ago, nobody had Wikipedia, but when it arrived, it took over the hearts and laptops for undergraduates and then of everyone else in the education business. Professional academic life would be poorer, or at least much slower, without it. The central premise of Wikipedia isn’t speed but infinite self-correction, perpetually fine-tuning what we know. In our second dream, we expand our aggregated knowledge quantitatively and qualitatively.” (Germano, 2010)

The University as an Emergent Civilization

So, what might we anticipate over the longer term as possible future forms of the

university? The monastic character of the ivory tower is certainly lost forever. Although there are many important features of the campus environment that suggest that most universities will continue to exist as a place, at least for the near term, as digital technology makes it increasingly possible to emulate human interaction in all the senses with arbitrarily high fidelity, perhaps we should not bind teaching and scholarship too tightly to buildings and grounds. Certainly, both learning and scholarship will continue to depend heavily upon the existence of communities, since they are, after all, highly social enterprises. Yet, as these communities are increasingly global in extent, detached from the constraints of space and time, we should not assume that the scholarly communities of our times would necessarily dictate the future of our universities. For the longer term, who can predict the impact of exponentiating technologies on social institutions such as universities, corporations, or governments, as they continue to multiply in power a thousand-, a million-, and a billion-fold?

But there is a possibility even beyond these. Imagine what might be possible if all of these elements are merged, i.e., Internet-based access to all recorded (and then digitized) human knowledge augmented by powerful search engines and AI-based software agents; open source software, open learning resources, and open learning institutions (open universities); new collaboratively developed tools (Wikipedia II, Web 2.0, the “Internet of Things”); and ubiquitous information and communications technology (e.g., inexpensive network appliances such as iPhones, iPads, or smart watches). In the near future, it could be possible that anyone with even a modest Internet or cellular phone connection will have access to the recorded knowledge of our civilization along with ubiquitous learning opportunities and access to network-based communities throughout the world.

Imagine still further the linking together of billions of people with limitless access to knowledge and learning tools enabled by a rapidly evolving scaffolding of cyberinfrastructure, which increases in power one-hundred to one thousand-fold every decade. This hive-like culture will not only challenge existing social institutions—corporations, universities, nation states, that have depended upon the constraints of space, time, laws, and monopoly. But it will enable the spontaneous emergence of new social structures as yet unimagined—just think of the early denizens of the Internet such as Google, Facebook, Wikipedia, ...and, unfortunately, Al Qaeda. In fact, we may be on the threshold of the emergence of a new form of civilization, as billions of world citizens interact together, unconstrained by today’s monopolies on knowledge or learning opportunities.

Perhaps this, then, is the most exciting vision (albeit threatening to some) for the

future of knowledge and learning organizations such as the university, no longer constrained by space, time, monopoly, or archaic laws, but rather responsive to the needs of a global, knowledge society and unleashed by technology to empower and serve all of humankind. And all of this is likely to happen during the lives of today's students. These possibilities must inform and shape the manner in which we view, support, and lead higher education. Now is not the time to back into the future.

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