

**The Future of Higher Education in
the Knowledge-Driven, Global Economy
of the 21st Century**

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The symposium celebrating the 175th anniversary of the founding charter of the University of Toronto addresses the changing nature of higher education in a world increasingly dependent upon knowledge and ever more interdependent. This particular session, devoted to a discussion of higher education in the new global economy, provides the focus for my own remarks.

Clearly we live in a time of very rapid and profound social transformation, a transition from a century in which the dominant human activity was transportation to one in which communications has become paramount, from economies based upon cars, planes, and trains to one dependent upon computers and networks. We are shifting from an emphasis on creating and transporting physical objects such as materials and energy to knowledge itself, from atoms to bits; from societies based upon the geopolitics of the nation-state to those based on diverse cultures and local traditions; and from a dependence on government policy to an increasing confidence in the marketplace to establish public priorities.

Today we are evolving rapidly into a post-industrial, knowledge-based society, a shift in culture and technology as profound as the shift that took place a century ago when our agrarian societies evolved into industrial nations (Drucker, 1994). Industrial production is steadily shifting from material- and labor-intensive products and processes to knowledge-intensive products. A radically new system for creating wealth has evolved that depends upon the creation and application of new knowledge. In a very real sense, we are entering a new age, an age of knowledge, in which the key strategic resource

necessary for prosperity has become knowledge itself—educated people and their ideas (Bloch, 1988). Unlike natural resources, such as iron and oil, that have driven earlier economic transformations, knowledge is inexhaustible. The more it is used, the more it multiplies and expands.

As knowledge can be created, absorbed, and applied only by the educated mind, schools, in general, and universities in particular, will play increasingly important roles as our societies enter this new age. In a sense, knowledge is the medium of the university. Through the activities of discovery, shaping, achieving, transmitting, and applying knowledge, the university serves society in a myriad of ways: educating the young, preserving our cultural heritage, providing the basic research so essential to our security and well-being, training our professionals and certifying their competence, challenging our society and stimulating social change. But the age of knowledge will substantially broaden the roles of higher education. Erich Bloch, former Director of the U.S. National Science Foundation, stated it well when he noted,

“The solution of virtually all the problems with which government is concerned: health, education, environment, energy, urban development, international relationships, economic competitiveness, and defense and national security, all depend on creating new knowledge—and hence upon the health of our universities” (Bloch, 1988).

The Challenges of a Knowledge-Driven, Global Economy to the University

The list of the challenges and opportunities presented by the age of knowledge to higher education could (and did) fill a book (Duderstadt, 2000). Today, however, let me focus only on four themes: i) the skills race, ii) markets, iii) technology, and iv) global sustainability.

The Skills Race

Ask any public leader today about priorities, and you are certain to hear concerns about education and the skills of the workforce. The National Governors' Association of the United States notes that: "The driving force behind the 21st Century economy is knowledge, and developing human capital is the best way to ensure prosperity" (National Governors Association, 2001).

Today, a college degree has become a necessity for most careers, and graduate education becomes desirable for an increasing number. In the United States, a growing population will necessitate some growth in higher education to accommodate the projected increases in the number of traditional college age students (estimated at 14% over the next decade). But even more growth and adaptation will be needed to respond to the educational needs of adults as they seek to adapt to the needs of the high performance workplace. Some estimate this adult need for lifelong learning at the university level will become far larger than that represented by traditional 18- to 22-year old students (Dolence & Norris, 1997).

Our universities face more fundamental educational challenges than simply growth in the demand for higher education. Both young, digital-media savvy students and adult learners will likely demand a major shift in educational methods, away from passive classroom lecture courses packaged into well-defined degree programs, and toward interactive, collaborative learning experiences, provided when and where the student needs the knowledge and skills. The increased blurring of the various stages of learning throughout one's lifetime—K-12, undergraduate, graduate, professional, job training, career shifting, lifelong enrichment—will require a far greater coordination and perhaps even a merger of various elements of our educational infrastructure.

The traditional roles of the university revolve around the core of teaching and scholarship: we educate the young, seek truth and create knowledge, propagate our culture and values from one generation to the next, sustain the academic disciplines and the professions, and constructively criticize our societies. At the core, our activities are characterized by critical thinking, analysis, moral reasoning and judgment. But today, much more is asked of our universities. Around their peripheries, our universities are heavily involved in utilitarian roles such as technology transfer, healthcare, entertainment, national defense, and economic and international development. There is an increasing tendency for society to view the university as an engine for economic growth through the generation and application of new knowledge. There has been a shift in emphasis within the university away

from simply distributing and analyzing knowledge, that is, “teaching” and “scholarship,” to creating and applying knowledge, to activities such as “innovation,” “creativity,” and entrepreneurship.”

The growing and changing nature of the needs for higher education has triggered strong economic forces. Our societies ask us to do ever more, but they are not always increasingly generous in their support of these activities. In many nations there is a declining priority for public support in the face of other social priorities, such as the healthcare needed by an aging population. In the United States, traditional sources of public support for higher education, such as state appropriations or federal support for student financial aid, have simply not kept pace with the growing demand. This imbalance between demand and available resources is aggravated by the increasing costs of higher education, driven as they are by the knowledge- and people-intensive nature of the enterprise as well as by the difficulty educational institutions have in containing costs and increasing productivity. Put another way, the current paradigms for conducting, distributing, and financing higher education may not be able to adapt to the demands and realities of the times.

Markets

Market forces also act on our colleges and universities. Even though we generally think of higher education as public enterprise, shaped by public policy and actions to serve a civic purpose, society seeks services such as education and research; academic institutions must compete for students, faculty, and resources. In the past, most colleges and universities served local

or regional populations. While there was competition among institutions for students, faculty, and resources—at least in the United States—the extent to which institutions controlled the awarding of degrees (credentialing), gave universities an effective monopoly over advanced education. Today, all of these market constraints are being challenged. The growth in the size and complexity of the postsecondary enterprise is creating an expanding array of students and educational providers. Rapidly evolving information and communication technologies are eroding relaxed geographical constraints. New competitive forces such as virtual universities and for-profit education providers enter the marketplace to challenge credentialing.

The weakening influence of traditional regulations and the emergence of new competitive forces, driven by changing societal needs, economic realities, and technology, are likely to drive a massive restructuring of the higher education enterprise. From our experience with other restructured sectors of the economy such as health care, transportation, communications, and energy, we could expect to see a significant reorganization of higher education, complete with the mergers, acquisitions, new competitors, and new products and services that have characterized other economic transformations. More generally, we may well be seeing the early stages of the appearance of a global knowledge and learning industry, in which the activities of traditional academic institutions converge with other knowledge-intensive organizations such as telecommunications, entertainment, and information service companies (Peterson & Dill, 1997).

It is important to remember that most of our institutions were the result of public policy and public investment through actions of governments at the national and regional level (Zemsky, 1997; Zemsky & Wegner, 1998). These policies, programs, and commitments were driven by strong social values and a sense of national and regional priorities. Yet today, in the United States and many other nations, public leaders are increasingly discarding public policy in favor of market forces to determine priorities for social investment. Public higher education can no longer assume that public policies and investment will shield them from market competition.

The market forces driven by increasing demand for higher education and unleashed by technology are very powerful. If allowed to dominate and reshape the higher education enterprise, we could well find ourselves facing a brave, new world in which some of the most important values and traditions of the university fall by the wayside. As we assess these market-driven emerging learning structures, we must bear in mind the importance of preserving the ability of the university to serve a broader public purpose.

Technology

As knowledge-driven organizations, colleges and universities are greatly affected by the rapid advances in information and communications technology. Modern digital technologies such as computers, telecommunications, and networks are reshaping both our society and our social institutions. These technologies have vastly increased our capacity to know and to do things and to communicate and collaborate with others. They

allow us to transmit information quickly, linking distant places and diverse areas of endeavor in productive new ways. They allow us to form and sustain communities for work, play, and learning in ways unimaginable just a decade ago.

While information technology has the capacity to enhance and enrich teaching and scholarship, it also poses certain threats to our colleges and universities. We use powerful computers and networks to deliver educational services to anyone, at anyplace and anytime, no longer confined to the campus or the academic schedule. Technology is creating an open learning environment in which the student has evolved into an active learner and consumer of educational services, stimulating the growth of powerful market forces that could dramatically reshape the higher education enterprise.

Last year our National Academy of Science launched a project to better understand the implications of information technology for the future of the research university (Duderstadt & Wulf, 2002). The premise was a simple one: the rapid evolution of digital technology will present many challenges and opportunities to higher education in general and the research university in particular, yet there is a sense that many of the most significant issues are neither well recognized nor understood either by leaders of our universities or those who support and depend upon their activities.

Three primary conclusions were reached during the early phase of this study, which I have chaired. First, we believe the extraordinary evolutionary pace of information technology will not only continue for the foreseeable

future, but could well accelerate on a superexponential slope. Digital technology is characterized by an exponential pace of evolution in which characteristics such as computing speed, memory, and network transmission speeds for a given price increase by a factor of 100 to 1000 every decade. For planning purposes, one can assume that by the end of the decade we will have available infinite bandwidth and infinite processing power (at least compared to current capabilities). The number of people linked together by digital technology will grow from millions to billions. We will evolve from “e-commerce” and “e-government” and “e-learning” to “e-everything,” since digital devices will increasingly become our primary interfaces not only with our environment but with other people, groups, and social institutions.

Our second conclusion is that the impact of information technology on the university will likely be *profound, rapid, and discontinuous*—just as it has been and will continue to be for the economy, our society, and our social institutions (e.g., corporations, governments, and learning institutions). This is a disruptive technology (Christensen, 1997) that will affect all of the activities of the university (teaching, research, outreach), its organization (academic structure, faculty culture, financing and management), and the broader higher education enterprise. However, at least for the near term—meaning a decade or less—we believe the university will continue to exist in much its present form, although meeting the challenge of emerging competitors in the marketplace will demand significant changes in how we teach, how we conduct scholarship, and how our institutions are financed.

Universities must anticipate these forces, develop appropriate strategies, and make adequate investments if they are to prosper during this period. Hence our third conclusion: Universities should begin the development of their strategies for technology-driven change with a firm understanding of those key values, missions, and roles that should be protected and preserved during a time of transformation. Procrastination and inaction are the most dangerous courses for universities during a time of rapid technological change.

Global Sustainability

Global sustainability seems a particularly appropriate topic in the wake of the United Nations Global Summit on Sustainable Development in Johannesburg. As a scientist, I am convinced that there is compelling evidence that the growing population and invasive activities of humankind are now altering the fragile balance of our planet. The concerns are both multiplying in number and intensifying in severity: the destruction of forests, wetlands, and other natural habitats by human activities leading to the extinction of millions of biological species and the loss of biodiversity; the buildup of greenhouse gases such as carbon dioxide and their possible impact on global climates; the pollution of our air, water, and land.

It could well be that coming to grips with the impact of our species on our planet, learning to live in a sustainable fashion on Spaceship Earth, will become the greatest challenge of all to our generation. We must find new ways to provide for a human society that presently has outstripped the limits of global sustainability. This will be particularly difficult for the United States, a

nation that has difficulty in looking more than a generation ahead, encumbered by a political process that generally functions on an election-by-election basis, as the current debate over global change makes all too apparent. With just 4.5% of the world's people, we control 25% of its wealth and produce 25% to 30% of its pollution. It is remarkable that the richest nation on earth is the lowest per capita donor of international development assistance of any industrialized country.

Ironically, the tragic events of September 11, 2001 might be viewed as a wake-up call, if we view these terrorist attacks not simply as a brief and brutal criminal attack but rather the consequence of more fundamental causes. As the noted biologist Peter Raven put it in a recent address (Raven, 2002, p. 954-958):

“The United States is a small part of a very large, poor, and rapidly changing world, and we, along with everyone else, must do a better job. Sustainability science has a good deal to say about how we can logically approach the challenges that await us, but the social dimensions of our relationships are also of fundamental importance. Globalization appears to have become an irresistible force, but we must make it participatory and humane to alleviate the suffering of the world's poorest people and the effective disenfranchisement of many of its nations. As many have stated in the context of the current world situation, the best defense against terrorism is an educated people. Education, which promises to each individual the opportunity to express their individual talents fully, is fundamental to building a peaceful world.”

There are 30 million people in the world today who are fully qualified to enter a university but for whom no university place is available. Within a decade there will be 100 million university-ready people. Yet, as Sir John Daniels, former head of the British Open University notes, in most of the

world, higher education is mired in a crisis of access, cost, and flexibility (Daniel, 1996). Unless we can address and solve this crisis, billions of people in coming generations will be denied the education so necessary to compete in, and survive in, an age of knowledge.

We must realize that the wealthy nations of the world have a particularly important role to play to assist developing nations in building the educational systems to meet their exploding needs. The university models characterizing most developed nations seem ill-suited to guiding us out of this global education crisis. Our colleges and universities continue to be focused on high-cost, low-technology, residential education and on the outmoded idea that quality in education is linked to exclusivity of access and extravagance of resources. Our current concept of the campus-based university could well deny higher education to nearly all of the billions of young people who will require it in the decades ahead.

Transforming the University to Serve a Global, Knowledge Society

These social, economic, technological, and market forces are far more powerful than many within the higher education establishment realize. They are driving change at an unprecedented pace, perhaps even beyond the capacity of our colleges and universities to adapt. Our current paradigms for higher education, the nature of our academic programs, the organization of our colleges and universities, the way that we finance, conduct, and distribute the services of higher education, may not be able to adapt to the demands and realities of our times.

So how might one approach the challenge of transforming the university to serve a 21st Century world. Typically discussions of change in higher education begin with bread-and-butter issues such as the financing of higher education, technology transfer, or expanding the university's broad array of services to society. From my own experience as a battle-scared veteran of leading change in one of our nation's largest public universities, let me suggest a somewhat different set of issues.

Values

It is important for any effort aimed at institutional transformation to always begin with the basics, to launch a careful reconsideration of the key roles and values of the university that should be protected and preserved during a period of change. For example, how would an institution prioritize among roles such as educating the young (undergraduate education), preserving and transmitting our culture (libraries, visual and performing arts), basic research and scholarship, and serving as a responsible critic of society? What are the most important values to protect? Clearly academic freedom, an openness to new ideas, a commitment to rigorous study, and an aspiration to the achievement of excellence would be on the list for most institutions. But what about values and practices such as shared governance and tenure? Should these be preserved? At what expense?

Diversity

Diversity will become an increasingly important theme in higher education, driven by the dramatic changes occurring in the populations served

by our universities, and affecting all of the characteristics of our institutions: their academic programs, their broader roles in our society, and their aspirations for excellence. In many developed nations, demographic change is first thought of in terms of the aging of our populations. We are already feeling the consequences, as our national priorities increasingly focusing on the concerns of the elderly (e.g., health care) rather than the needs of the young (e.g., education).

On a global basis, however, half of the world's population is under the age of twenty, with over two billion teenagers on planet Earth, most living in Asia, Africa, and Latin America. Their demand for education will be staggering. To sustain even current participation rates for higher education would require creating a major new university every week to serve this growing population of young people in parts of the world with severely limited resources and little experience in higher education (Daniel, 1996).

An equally profound demographic phenomenon is the increasing diversity of many of our nations with respect to race, ethnicity, and nationality. Moreover, women have already become the predominant gender in many of our nations and are rapidly assuming leadership roles in both the public and private sector. The full participation of currently underrepresented minorities and women is crucial to our commitment to equity and social justice, as well as to the future strength and prosperity of our societies. We cannot afford to waste the human talent, the cultural and social richness, represented by those currently underrepresented in our society, yet the

challenge of increasing diversity is complicated by social and economic factors.

As both a leader of society at large and a reflection of that society, the university has a unique responsibility to develop effective models of multicultural, pluralistic communities. We should strive to achieve new levels of understanding, tolerance, and mutual fulfillment for peoples of diverse racial and cultural backgrounds both on our campuses and beyond.

Universities need to shift their attention from simply access to educational opportunity for underserved minority populations to success in achieving educational objectives. It has also become increasingly clear that they must do so within a political context that will require new policies and practices.

Subsidiarity and Autonomy

Although the governance of higher education varies greatly, shaped by traditions and culture, there are several general issues that need to be put on the table. Foremost among these are questions relating to whether our citizens and their governments view the university as a public good benefiting everyone, or instead view education as an individual benefit, benefiting the individuals, the students, that receive it. Do governments view universities as a public investment for the future, or simply another expenditure, such as spending money on roads or buildings? Is the university a government agency or is it a social institution? In all of our societies, government is under increasing pressure to demand accountability, but how they demand

accountability, while perhaps appropriate for the Ministry of Transportation, may not work for universities.

Although many of the policies and practices characterizing the governance of higher education in the United States are unique to our culture, one with broader relevance arises from the belief that universities must have the capacity to control their own destiny, particularly during times of change. By this I mean not simply granting the faculty traditional perquisites such as academic freedom, but allowing universities more control over all aspects of their operations, including academic programs, budgets, student selection, and faculty hiring. Luc Weber, former rector of the University of Geneva, applies the economic term “subsidiarity” to describe this, in the sense that it involves pushing authority and decision making down to the lowest possible level (Weber, 2001). Centralization is a very awkward approach to higher education during a time of change.

At Michigan, this principle is built into our state constitution, which defines the autonomy of the University of Michigan, vested in our governing board, as firmly founded as that characterizing the legislature, governor, and judiciary (Shaw, 1941). The University is, in effect, a “coordinate branch of state government,” with full powers over its designated field of state endeavor, higher education. Of course autonomy is never absolute and must occasionally be defended through judicial tests in what amounts to a growing record of state policies, legislation, and judicial decisions. It has been necessary on occasion to resist attempts by state government to intrude on our independence

through judicial challenge, by occasionally filing suit against our state government, ever so politely but firmly, to protect our constitutional autonomy.

Alliances

The same market forces that drive our colleges and universities to focus on core competencies where they can be competitive also provide strong incentives to build alliances to address the broader, more diverse needs of society. Many of our research universities are under great pressure to expand enrollments to address the expanding populations of college age students or growing educational needs of adults, possibly at the expense of their research and service missions. It might be far more constructive for these institutions to form close alliances with regional colleges and universities to meet these growing demands for educational opportunity with research university faculty developing curriculum and pedagogy while other institutions provide the actual instruction.

International alliances will become increasingly important, whether through student/faculty exchanges programs such as the Erasmus-Socrates programs and agreements such as the Bologna Declaration or virtual constructs such as the collaboratories made possible by advances in information technology. More broadly, alliances should be explored not only among institutions of higher education but also between higher education and the private sector (information technology and telecommunications

companies). Differentiation among institutions should be encouraged, relying upon market forces rather than regulations to discourage duplication.

Experimentation

Many of the forces driving change in higher education are disruptive in nature, leading to quite unpredictable futures. Planning in the face of such uncertainty requires a more experimental approach to university transformation. A personal example may be useful here. During the 1990s we led an effort at the University of Michigan to transform the institution, to reinvent it so that it better served a rapidly changing world. We began with all of the usual steps, restructuring our financing, using total quality improvement methods to improve productivity and accountability, focusing our limited resources on fewer programs selected on the basis of quality and centrality, and so on. Yet with each transformation step we took, with every project we launched, with each objective we achieved, we became increasingly uneasy. We sensed that forces driving change in our society and its institution were far stronger and more profound than we had first thought. Change was occurring far more rapidly than we had anticipated. The future was becoming less certain as the range of possibilities expanded to include more radical options.

We came to the conclusion that in a world of such rapid and profound change, as the future became less certain, the most effective near-term strategy was to explore possible futures of the university through experimentation and discovery. That is, rather than continue to contemplate possibilities for the future through abstract study and debate, it seemed a more productive course

to build several prototypes of future learning institutions as working experiments. In this way we could actively explore possible paths to the future. Several examples illustrate this approach:

- During the 1990s we explored the possible future of becoming a “privately supported but publicly chartered university” by completely restructuring our financing, raising over \$1.4 billion in a major fund-raising campaign, increasing tuition levels (accompanied by a major expansion in need-based student financial aid), dramatically increasing research grants won by our faculty (over \$650 million per year), and increasing our endowment ten-fold (to over \$3 billion). Ironically, the more public (state) support declined as a component of our revenue base (dropping to less than 10% by the late 1990s), the higher our Wall Street credit rating, finally achieving the highest Aaa rating (the first for a public university).
- Through a major strategic effort known as the Michigan Mandate, we altered very significantly the racial diversity of our students and faculty, doubling the population of minority students and faculty (to 25% and 12%, respectively), thereby providing a laboratory for exploring the themes of the “diverse university.”
- We established campuses in Europe, Asia, and Latin America, linking them with robust information technology, to understand better the implications of becoming a “world university.”

- We played leadership roles first in the building and management of the Internet (with IBM and MCI as partners) and more recently Internet2 to explore the “cyberspace university” theme.

Of course, not all of our experiments were successful. Some crashed in flames, in some cases spectacularly! Even in these these cases, however, we learned something (if only our own ineffectiveness in dealing with cosmic forces such as college sports). All of these efforts were driven by the grass-roots interests, abilities, and enthusiasm of faculty and students. While such an exploratory approach was disconcerting to some and frustrating to others, fortunately there were many who viewed this phase as an exciting adventure; all of these initiatives were important in understanding better the possible futures facing our university; all have had influence on the evolution of our university.

Turning Threats into Opportunities

Our experience suggests the importance of attempting to approach issues and decisions concerning university transformation as opportunities rather than threats. The status quo is no longer an option, but once we accept that change is inevitable, we can use it as a strategic opportunity to control our destiny, while preserving the most important of our values and our traditions. Creative, visionary leaders can tap the energy created by threats such as the emerging for-profit marketplace and technology to engage their campuses and to lead their institutions in new directions that will reinforce and enhance their most important roles and values.

The Questions Before Us

As an educator, it seems appropriate to leave the reader with a few questions. First, how should we respond to the diverse educational and intellectual needs of a knowledge-driven, global economy, as human capital becomes more important than physical and financial capital? While the educational needs of the young will continue to be a priority, we will also be challenged to address the sophisticated learning needs of adults in the workplace while providing broader lifetime learning opportunities for all of our populations.

Is higher education a public good, requiring public investment? Or is it a private good, to be funded primarily by the commercial marketplace? The benefits of the university clearly flow to society as a whole, but it is also the case that our public leaders have instead stressed the benefits of education to the individual student. The issues of access and diversity have largely disappeared from the broader debate about the purpose of the university. How do we balance the roles of market forces and public purpose in determining the future of higher education? Can we control market forces through public policy and public investment so that the most valuable traditions and values of the university are preserved? Or will the competitive and commercial pressures of the marketplace sweep over our institutions, leaving behind a higher education enterprise characterized by mediocrity?

What should be the role of the research university within the broader context of the changes likely to occur in the higher education enterprise?

Should it be a leader in change? Or should it simply strive to protect the important traditions and values of the academy during this time of change?

Finally, perhaps the most important question of all: Are we facing in the years ahead a period of evolution, of revolution, or of the possible extinction of the university as we know it today?

These are some of the issues that should frame the debate about the future of the university in the 21st Century. As social institutions, universities reflect the values, needs, and character of the society they serve. These issues of access and opportunity, equality and justice, private economic benefits and public purpose, freedom and accountability, all are part of a broader public debate about the future of our societies and our world. They provide the context for any consideration of the future of the university in a knowledge-driven global economy.

Conclusion

Let me conclude by providing my own answer to the last question. Our institutions, after all, are one of our civilization's most enduring legacies. Clearly, in an age of knowledge, higher education will flourish in the decades ahead. In a knowledge-intensive society the need for advanced education and knowledge will become ever more pressing, both for individuals and for our societies more broadly. Yet, it is also likely that the university as we know it today, or rather the current constellation of diverse institutions that comprise the higher education enterprise, will change in profound ways to serve a

changing world. But of course, this is just as the university has done so many times in the past.

We have entered a period of significant change in higher education as our universities attempt to respond to the challenges, opportunities, and responsibilities before them (Glion Declaration, 1998). Much of this change will be driven by market forces—by a limited resource base, changing societal needs, new technologies, and new competitors. But we also must remember that higher education has a public purpose and a public obligation (Zemsky & Wegner, 1998). It is possible to shape and form the markets that will in turn reshape our institutions with appropriate civic purpose.

From this perspective, it is important to understand that the most critical challenge facing most institutions will be to develop the capacity for change. As noted earlier, universities must seek to remove the constraints that prevent them from responding to the needs of a rapidly changing society. They should strive to challenge, excite, and embolden all members of their academic communities to embark on what should be a great adventure for higher education. Only a concerted effort to understand the important traditions of the past, the challenges of the present, and the possibilities for the future can enable institutions to thrive during a time of such change.

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