The Third Century

A Roadmap to the University of Michigan's Future

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Preface

There are numerous concerns swirling about higher education these days. Many question whether our colleges and universities are achieving acceptable student learning outcomes (including critical thinking ability, moral reasoning, communication, and quantitative literacy). Rising tuitions raise serious concerns about cost-containment and productivity on our campuses, questioning the relationships among the cost, price, and value of a college education. Some even raise the question as to whether higher education is really worth the cost, portraying our universities as inadequately aligned with the marketplace and unwilling (or unable) to prepare their graduates to meet the needs of employers. Traditional sources of public support for higher education seem increasingly at risk in the face of a three-decade long decline of state support and current threats to federal research funding. There is clear evidence of an increasing stratification of access to (and success in) quality higher education based upon socioeconomic status.

The emergence of disruptive technologies such as computers and networks challenge existing university paradigms by suggesting new approaches to learning such as open educational resources, MOOCs, "flipped" classrooms, and learning analytics, while scholarship and research are changing rapidly due to new resources such as digital libraries, "big data", and data mining. Even more fundamentally, society today is questioning the fundamental public purpose of the university, particularly as its activities have broadened beyond learning and scholarship to include a broad range of market-driven activities such as clinical care in their medical centers, entrepreneurial efforts to create new businesses, international development, and commercial public entertainment (e.g., college sports).

In 2017, the University of Michigan will reach a singular moment in its history, the bicentennial of its founding in 1817, that will provide an important occasion to recall, understand, and honor its rich history. But this milestone will also provide a remarkable opportunity to learn from the University's past, to assess the challenges and opportunities it faces at the present, and to chart a course for its future. Indeed, since Michigan's greatest impact has resulted in part from its capacity to capture and sustain the important elements of its history while developing bold visions for the future, the UM Bicentennial in 2017 should be viewed as a compelling challenge to explore new visions for Michigan's third century.

Interestingly enough, as we begin our third century of service to the state, the nation, and the world, both Anne and I will reach a personal milestone of 50 years of service to the University. We arrived in Ann Arbor with our two daughters in December, 1968, moving on a cold day into married student housing on the North Campus near my new faculty position in the Department of Nuclear Science and Engineering. Although there were doubts during those early years whether we could survive the climatic transition from California to Michigan, we managed to adjust, and for the last five decades have served the University in almost every conceivable way: as a faculty member engaged in teaching and research (and grant hustling and campus politics) and a spouse strongly engaged in University community building through the Faculty Women's Club and similar campus organizations; next in leadership roles as a dean and deanette, provost and provostess, and president and first lady of the University; and finally for the past two decades back on the faculty and engaged in an array of University organizations. In

addition, I have also been heavily involved l in major leadership roles in national and international science and education policy. The latter activities include, for example, serving and chairing numerous organizations such as the National Science Board, the National Academies and National Research Council, various advisory bodies for federal agencies such as NSF, DOE, DOEd, NASA, and the Intelligence Community, private organizations such as the Brookings Institution and various corporate boards, and international efforts such as the National Academies of Science, Engineering, and Medicine's Policy and Global Affairs Division and the Glion Colloquium. These post-presidency activities continue to include traditional faculty roles including teaching, research, and grantsmanship. They have also led to the creation of new programs such as the Science, Technology, and Public Policy program in the Ford School of Public Policy: the Michigan Energy Institute; and, with Anne, a broad range of projects aimed at capturing and disseminating the history of the University (books, websites, databases, and interactive media).

Hence, after serving this institution for roughly one-quarter of its history, it seemed appropriate to offer a few observations about possible futures for the University of Michigan. This document represents that effort, although a few caveats are necessary. First, this is a highly personal perspective of the University's future, although it is informed by 50 years of service to the institution and considerable experience in participating and leading similar efforts at the national and international level. Second, much like Spalding Gray's "Monster-in-a-Box", his book manuscript that seemed to continue to evolve without end, so too does this draft continue to evolve as the world changes and others challenge and help to refine or reshape my views.

Hopefully this is the final version of this document, just in time for the UM Bicentennial year when Michigan begins its third century…and Anne and I complete our 50th year of service to the University!

James J. Duderstadt
Ann Arbor, Michigan
2016

Executive Summary

Today, the University of Michigan approaches a singular moment in its history, its bicentennial year in 2017, which will provide an important occasion to recall, understand, and honor its rich history. But this milestone will also provide a remarkable opportunity to learn from the University's past, to assess the challenges and opportunities it faces at the present, and to chart a course for its future. Indeed, since Michigan's greatest impact has resulted in part from its capacity to capture and sustain the important elements of its history while developing bold visions for the future, the 2017 UM Bicentennial should be viewed as a compelling challenge to develop a new vision for Michigan's third century and a plan to achieve that vision.

The Challenge, Opportunity, and Responsibility Presented by Change

There are numerous concerns swirling about higher education these days. Many question whether our universities are achieving acceptable student learning outcomes (including critical thinking ability, moral reasoning, communication, and quantitative literacy). Rising tuitions raise serious concerns about cost-containment and productivity on our campuses, indeed, questioning the very relationship among the cost, price, and value of a college education. Some even raise the question as to whether higher education is really worth the cost, portraying our universities as inadequately aligned with the marketplace and unwilling (or unable) to prepare their graduates to meet the needs of employers. Traditional sources of public support for higher education seem increasingly at risk in the face of a three-decade long decline of state support and current threats to federal research funding. There is clear evidence of an increasing stratification of access to (and success in) quality higher education based upon socioeconomic status.

The emergence of disruptive technologies such as computers and networks challenge existing university paradigms by suggesting new approaches to learning such as open educational resources, MOOCs, "flipped" classrooms, and learning analytics, while scholarship and research are changing rapidly due to new resources such as digital libraries, "big data", and data mining. Even more fundamentally, society today is questioning the fundamental public purpose of the university, particularly as its activities have broadened beyond learning and scholarship to include a broad range of market-driven activities such as clinical care in their medical, entrepreneurial efforts to create new businesses, international development, and commercial public entertainment (e.g., college sports).

But there are far more profound changes occurring in our world that will challenge us. We live in a time of great change, an increasingly global society, knitted together by pervasive communications and transportation technologies and driven by the exponential growth of new knowledge. It is a time of challenge and contradiction, as an ever-increasing human population threatens global sustainability–indeed, with recent capacity to modify and propagate genetic structures (i.e, CRISPR gene editing and gene drive) even modify the nature of life itself. A global, knowledge-driven economy places a new premium on workforce skills through phenomena such as outsourcing and off-shoring; governments place increasing confidence in market forces to reflect public priorities even as new paradigms such as open-source technologies challenge conventional free-market philosophies; and shifting geopolitical tensions driven by the great disparity in wealth and power about the globe, national security, and terrorism.

More specifically, 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 prosperity, security, and social well-being 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 and develop innovative applications of these discoveries to serve society.

The recurrent theme of this report, and, indeed, throughout the history of the University of Michigan, is the need for change in higher education if our colleges and universities are to serve a rapidly changing world. Of course the university as a social institution has always been quite remarkable in its capacity to change and adapt to serve society. Yet the forces of change upon the contemporary university, driven by profound social change, economic imperatives, and rapidly evolving technology, may be far beyond the adaptive capacity of our current educational paradigms. We may be approaching a point of crisis in higher education when it is necessary to reconstruct the paradigm of learning institutions from its most fundamental elements, perhaps even to reinvent the university itself.

This capacity for change, for renewal, is the key objective that the University of Michigan must strive to achieve in the years ahead—a capacity that will allow it to transform itself once again as it has done so many times in the past, to serve a changing society and a changing world.

The leadership of the University of Michigan has frequently depended upon its unusual combination of quality, size, breadth, innovation, and pioneering spirit. Michigan has long served as a *pathfinder* by identifying new directions for higher education and society, as a *trailblazer* marking these new pathways for others to explore, and as a *pioneer* building the roads that others might follow (although rarely has Michigan prospered as a *settler* by simply attempting to follow the paths of others.) Such visions tend to bubble up from the academic activities of its faculty, students, and staff to be embraced and implemented by its leadership and governance. Through academic innovation, social responsiveness, and its willingness to challenge the status quo, Michigan's history reveals time and time again this pathfinding character. It is this unique heritage that should shape the University's mission, vision, goals, and actions as it approaches its third century.

Strategic Roadmapping

Key to the University of Michigan's impact has been the capacity of its faculty, students, and staff throughout its history to set bold, compelling visions for the future of the institution that engage the University community to develop and execute creative plans, policies, and processes to achieve these visions. Of course, planning for such complex, rapidly changing, and unpredictable futures requires a highly disciplined approach. In this report, we have adapted a planning technique commonly used in those sectors of industry and the federal government characterized by extremely rapid and unpredictable change: *strategic roadmapping*. This approach begins by using panels of experts to propose goals or visions for the organization, then to construct a map of existing resources and perform an analysis to determine the gap between what currently exists and what is needed, and finally to develop a plan or roadmap of possible routes from here to there, from now to the future. Although sometimes confused with jargon such as environmental scans, resource maps, and gap analysis, in reality the roadmapping process is quite simple. It begins by asking *where we are today*, then w*here we wish to be tomorrow*, followed by an assessment of *how far we have to go*, and finally concludes by *developing a roadmap to get from here to there*. The roadmap itself usually consists of a series of recommendations aimed at navigating toward the vision, augmented by more detailed goals, plans, processes, and tactics designed to enable the necessary institutional change.

A Vision for the Third Century

To develop a suitable vision for this planning effort we have begun with the most important values of the institution, for example, quality, leadership, academic priorities, liberal learning, diversity, critical and rational inquiry, caring, commitment, and community. We have also remembered the key characteristics of the University over its history, as framed by descriptors
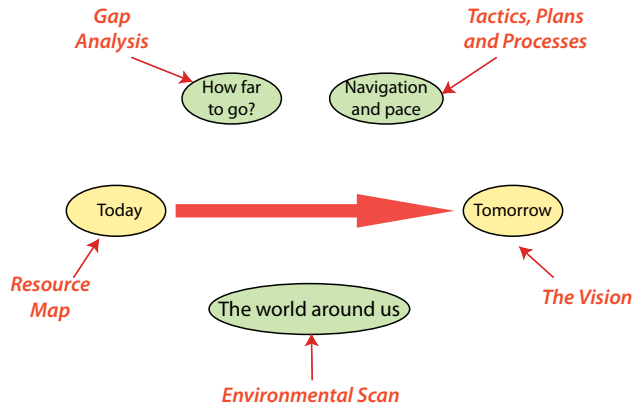
The strategic roadmapping process

such as "the leaders and best", "an uncommon education for the common man", "a broad and liberal spirit", "diverse, yet united in a commitment to academic excellence and public service", "a center of critical inquiry and learning", "an independent critic and servant of society", "a relish for innovation and excitement", "control of our own destiny comparable to private universities", and "freedom with responsibility for students and faculty". Furthermore we have extensively surveyed the powerful forces driving change in our world and higher education and evaluated the position of the University of Michigan within this framework for the decades ahead.

From this process, we have arrived at the following themes that comprise a vision for the University within three different timeframes:

The Vision for Today: *Reflection*

For the near term, from now through the Bicentennial Year 2017, we suggest the University of Michigan would benefit from a period of *reflection* upon its remarkable history and accomplishments. The University community should not simply prepare to celebrate two centuries of leadership in higher education. It first should strive to understand and secure those values and characteristics that have played such an important role throughout its history:

Academic Quality: The reputation of Michigan as one of the world's great universities has been based primarily on the quality of its academic programs.

Academic Priority: Sometimes in the face of the substantial assets and growth characterizing auxiliary activities of the University (e.g., hospitals, housing, athletics), it is all too easy to forget that Michigan's impact on the state, nation, and world is determined primarily by the quality of its academic programs and the achievements of its faculties, students, and staff. Establishing and sustaining the academic core of the University must always be its highest priority.

Diversity: The University has been distinguished by its strong and sustained commitment to providing educational opportunities to underrepresented populations. Despite the challenges it faces, the University simply must renew its commitment to regain this leadership. Failure is not an option.
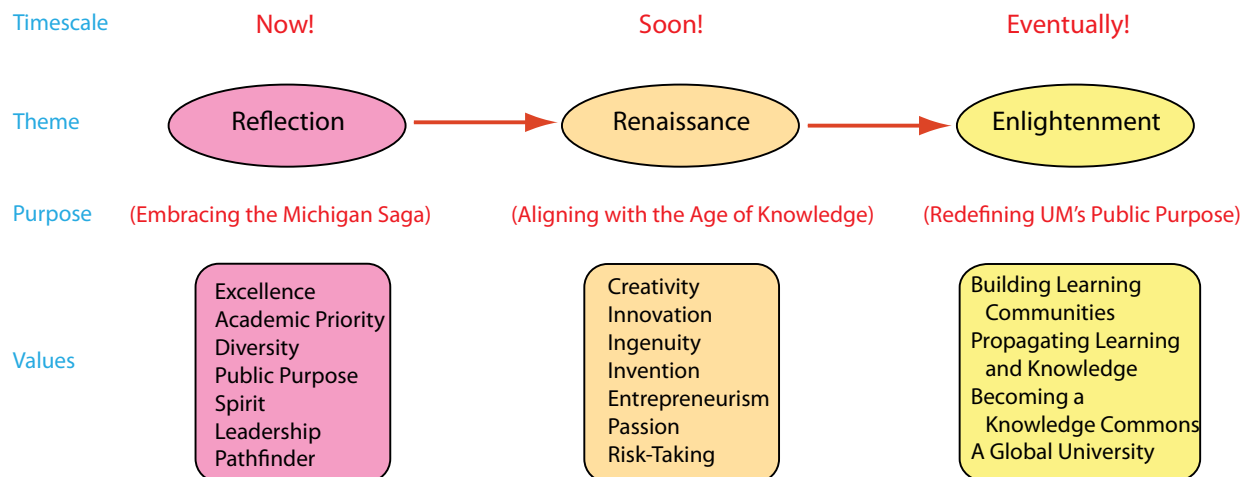
Public Purpose: So too, the University's long-standing commitment to providing "an uncommon education for the common man" demands that it provide educational opportunities for students from all economic circumstances.

Spirit: Michigan's "broad and liberal spirit" has long been an important characteristic of our students, faculty, and staff. This spirit must always be not only respected and tolerated but furthermore encouraged by the University community.

Leadership: The University of Michigan takes pride in its "leaders and best" heritage, seeking both leadership and excellence in its achievements. Key in establishing and sustaining this element of our character is the setting of bold goals where the University not only aspires to excellence but furthermore can have great impact on society, i.e., where it can change the world!

The Michigan Saga: The role of the University in serving as both a pathfinder and trailblazer for all of higher education remains one of its most important roles. To sustain this role requires attracting to the University students, faculty, staff, and leadership of unusual initiative, creativity, and determination.

Renewing our effort (or restoring our commitment, if necessary) to achieve these characteristics may seem obvious, particularly as we prepare for the University's bicentennial by reviewing its history and honoring its heritage and saga. Yet it is nevertheless an important challenge that deserves both greater attention and commitment by the University today.

Timescale	Now!	Soon!	Eventually!
Theme	Reflection →	Renaissance →	Enlightenment
Purpose	(Embracing the Michigan Saga)	(Aligning with the Age of Knowledge)	(Redefining UM's Public Purpose)

Values	Excellence
	Academic Priority
	Diversity
	Public Purpose
	Spirit
	Leadership
	Pathfinder
		Creativity
		Innovation
		Ingenuity
		Invention
		Entrepreneurism
		Passion
		Risk-Taking
			Building Learning
			  Communities
			Propagating Learning
			  and Knowledge
			Becoming a
			  Knowledge Commons
			A Global University

The trilogy of timefames and visions for the University of Michigan's Third Century

The Vision for the Near Term: *Renaissance*

The world is changing rapidly, driven by the role played by educated people, new knowledge, innovation, and entrepreneurial skill. While these forces challenge us and our social institutions, they also contain the elements of what could become a *renaissance* of creativity and innovation in the 21st century. Since universities will play a critical role as the source of these assets of the age of knowledge, our vision for the early 21st century involves stressing similar characteristics among our people and our programs, e.g., creativity, innovation, ingenuity, invention, and entrepreneurial zeal. Put another way, the future university must add to its traditional motto of *lux et veritas*, the learning to *enlighten* society and the scholarship to discover *truth*, the mission of *genius* itself, of the creativity demanded by an ever changing world.

Of course while learning and scholarship have long been viewed as missions of the university, so too has been the creation of new knowledge across all intellectual and professional disciplines. Developing new approaches to scholarship, great works in literature and the arts, ingenious approaches to investigating physical and social phenomenon have long been the goal of our scholars. Not just to preserve and transmit knowledge, but to actually create it.

But today the new tools of creativity are appearing characterized by extraordinary power. We have the capacity to create new objects literally atom by atom. With new methods in molecular biology such as CRISPR and gene drive, we can not only precisely modify the DNA code for a living organism, but actually cause it to propagate through a species to change future generations (a frightening thought when human gene editing is considered). The dramatic pace of evolution of information technology shows no sign of slowing, continuing to advance in power from 100 to 1000 fold a decade, enabling not only new forms of analysis such as augmenting the traditional tools of experiment and theory with the sophisticated tools of data analysis (big data). Indeed, the tools of artificial intelligence not only are rapidly progressing but have stimulated fears of eventual sentient behavior of machines. These tools also have changed the opportunities available in literature, performance, and art, with powerful tools of investigation and display (e.g., the CGI techniques increasingly dominating the film industry.)

But here lies a great challenge, since while we are experienced in teaching the skills of analysis and creativity using traditional tools, we have far less understanding how our intellectual activities associated with creativity will be reshaped by the explosion in the new tools for creation. 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 with these new tools across all fields. This would probably imply a shift away from highly specialized disciplines and degree programs to programs placing more emphasis on the convergence and integration of knowledge.

The Vision for the Third Century: *Enlightenment*

We suggest that the longer term vision for the University's third century should be to assume the role of a forerunner of an emerging civilization characterized by extraordinary connectivity, access to knowledge, and ubiquitous learning opportunities, all enabled by rapidly evolving information and communications technologies. No longer constrained by space, time, monopoly, or archaic laws, the University of Michigan should embrace a vision to address the knowledge and learning needs of a global society as its new public purpose.

In a sense, this vision for the third century of the University combines three themes that might characterize the university of the future: a "*Universitas Magistrorum et Scholarium* in cyberspace", a learning ecology, and the university as a vanguard of an emergent global, knowledge-and-learning dependent, and profoundly connected civilization. Much as the Enlightenment of the 18th century swept aside the divine authority of kings by distributing learning and knowledge to empower citizens, today's knowledge-driven global society is increasingly dependent upon the creation of new knowledge and educating those capable of applying it to meet the needs of society. 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, algorithms, immersive environments, etc. Today's learning communities are no longer constrained by space and time but rather expand rapidly driven by exponentially evolving technologies (e.g., cyberinfrastructure) and practices (e.g., open source, open knowledge). 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. And just as the leaders of the Enlightment stressed that its goals such as "life, liberty, and the pursuit of happiness" were public in nature, requiring the highest level of inclusivity, it will most likely be *public* universities that will be the most prominent in achieving this vision.

This vision for the University of Michigan's third century builds both upon the institution's past and present. Michigan has played a particularly important role in the history of the American university, not only as one of the nation's first experiments in public higher education but, in fact, as the first attempt to build a true "university" in the European sense in the New World. Michigan's guiding themes, "to provide an uncommon education for the common man" and to "create a community of scholars across the full range of disciplines" has continued throughout its history. During the 1980s UM's leadership in network technology enabled it to play a major role in the building and management of the Internet, the technology that today enables not only access to knowledge but supports communities throughout the world. More recently Michigan's leadership of the open knowledge movement involving the massive digitization and access to formerly printed materials through the Google Books project and the HathiTrust represent important steps toward universal access to the knowledge accumulated and produced by our civilization.

Today the University of Michigan is well positioned to participate in a contemporary version of the Enlightenment, accepting as its expanded public purpose the spreading of knowledge and learning throughout the world through rapidly evolving information and communications technologies.

The Roadmap to a Vision for
the University of Michigan's Third Century

We begin the process of developing a strategy to achieve this vision with four simply-stated goals:

Goal 1: *People*: To attract, retain, support, and empower exceptional students, faculty, and staff.

Goal 2: *Resources*: To provide these people with the resources and environment necessary to push to the limits of their abilities and their dreams.

Goal 3: *Culture*: To support a University culture and spirit that values adventure, creativity, excitement, risk-taking, leadership, excellence, diversity, caring, concern, and community.

Goal 4: *The Capacity for Change*: To develop the wisdom, the courage, and the capacity to embrace the changes necessary to serve a changing society and a changing world.

Of course these have long been key to the success of the academy and the university. But in a world of ever more rapid change, we may need to rethink both how we provide the encouragement and support for faculty and students to achieve these goals in new ways. For example, thoughout its history, Michigan's role as a pathfinder has been driven by the unusual creativity and aspirations of its faculty. Its long tradition of developing and selecting leadership from within reinforces this culture of risk taking and taking on big challenges.

To sustain this pathfinding role, the University needs to acquire adequate resources, a challenge at a time when public support is dwindling. Yet this goal also suggests the need to focus resources on the University's most creative people and programs. Michigan will need to acquire greater flexibility in resource allocation to respond to new opportunities and initiatives.

While most people and institutions would agree with the values set out in the third goal of cultural change, many would not have assigned such a high priority to building an environment that encourages adventure, excitement, and risk-taking. However, if the University is to sustain its saga as a pathfinder and trailblazer in defining the nature of higher education in the century ahead, this type of culture will be essential. And this, of course, is just the environment that many of our faculty and students not only seek but came to Michigan to enjoy!

Developing the capacity for change, while an obvious goal, will also be both challenging and controversial. The University will need to discard the status quo as a viable option, challenge existing premises, policies, and mindsets, and empower its best people to drive the evolution—or revolution—of the institution.

These general goals provide the foundation for the specific roadmaps we suggest for each timeframe of the vision for the University of Michigan's third century:

Reflection, Renaissance, and Enlightenment.

The Roadmap to *Reflection*

To move toward the Reflection vision, the following actions have been recommended:

The University's Bicentennial in 2017 provides a marvelous opportunity to develop the historical resources that capture the University of Michigan's remarkable past and more firmly establish the key elements of the University's institutional saga to those on the campus (students, faculty, staff) and beyond. Among the particular challenges are:

Restoring the University's commitment to its founding purpose of providing "an uncommon education to the common man".

Strengthening the University's commitment to diversity and its broader public purpose.

Building a greater sense of pride in, respect for, excitement about, and loyalty to the University

Re-igniting the Michigan "broad and liberal" spirit.

Reaffirming the Michigan Saga as a pathfinder and trailblazer, a spirit that has long enlivened our faculty, students, and staff!

The Roadmap to *Renaissance*

The second phase of the roadmap process is aimed at the Renaissance vision:

Recruiting outstanding and creative students.

Recruiting paradigm-breaking faculty.

Strengthening human resource development.

Enabling intellectual change.

Lowering disciplinary boundaries.

Educating "T" graduates, characterized both by depth in a particular discipline as well as intellectual breadth.

Restructuring the PhD to address both structural problems such as attrition rate and time to degree as well as intellectual themes such as disciplinary convergence.

Giving high priority in both student and faculty

recruiting and resource allocation to areas with the potential for truly transformative learning and scholarship, i.e., breaking the current university paradigms.

Building organizations and programs capable of translational research, i.e., linking fundamental scientific discovery with the use-inspired innovation to serve society.

Building strategic alliances with other universities and knowledge-based institutions in the public and private sector.

Stimulating a greater sense of adventure, excitement, and risk-taking.

Selecting and recruiting next-generation leadership with bold visions, energy, and a sense of adventure.

Developing a more coherent academic program (a "University College") for all undergraduates, reducing the amount of specialization offered in degree programs, and striving to provide instead a more general liberal learning experience.

Taking advantage of the unique character of the University's North Campus, containing the four academic programs most stressing the intellectual activity of creativity, of "making" and "doing": the School of Art and Design, the School of Music, Theater and Dance, the School of Architecture and Urban Planning, and the College of Engineering. Furthermore the students, faculty, and programs of this unique campus, renamed "the Renaissance Campus" by former deans, are knit together by unique integrative facilities such as the high-tech Duderstadt Center, the Walgreen Center for the performing arts, the Pierpont Commons to stimulate community building to stress the intellectual activity of "creating" and "doing") and the Da Vinci Project (the integration of discovery, creativity, innovation, and design).

Establishing "a New University" structure to serve as a laboratory to explore future paradigms for higher education.

The Roadmap to *Enlightenment*

The roadmap for the Enlightenment stage of the Third Century vision is designed to lay the foundation for a new public purpose for the University: to spread the light of knowledge and learning to the world, taking advantage of exponentially evolving technologies (information, communications, bio- and nano-technology). The elements of this roadmap include:

Continuing to provide leadership in capturing and distributing knowledge to the world.

Providing leadership for the open education resources paradigm.

Providing leadership in both the development and application of advanced cyberinfrastructure in academic environments.

Exploring the use of advanced learning environments such as those based on social networking and immersive environments.

Establishing a global footprint through engagement in international higher education.
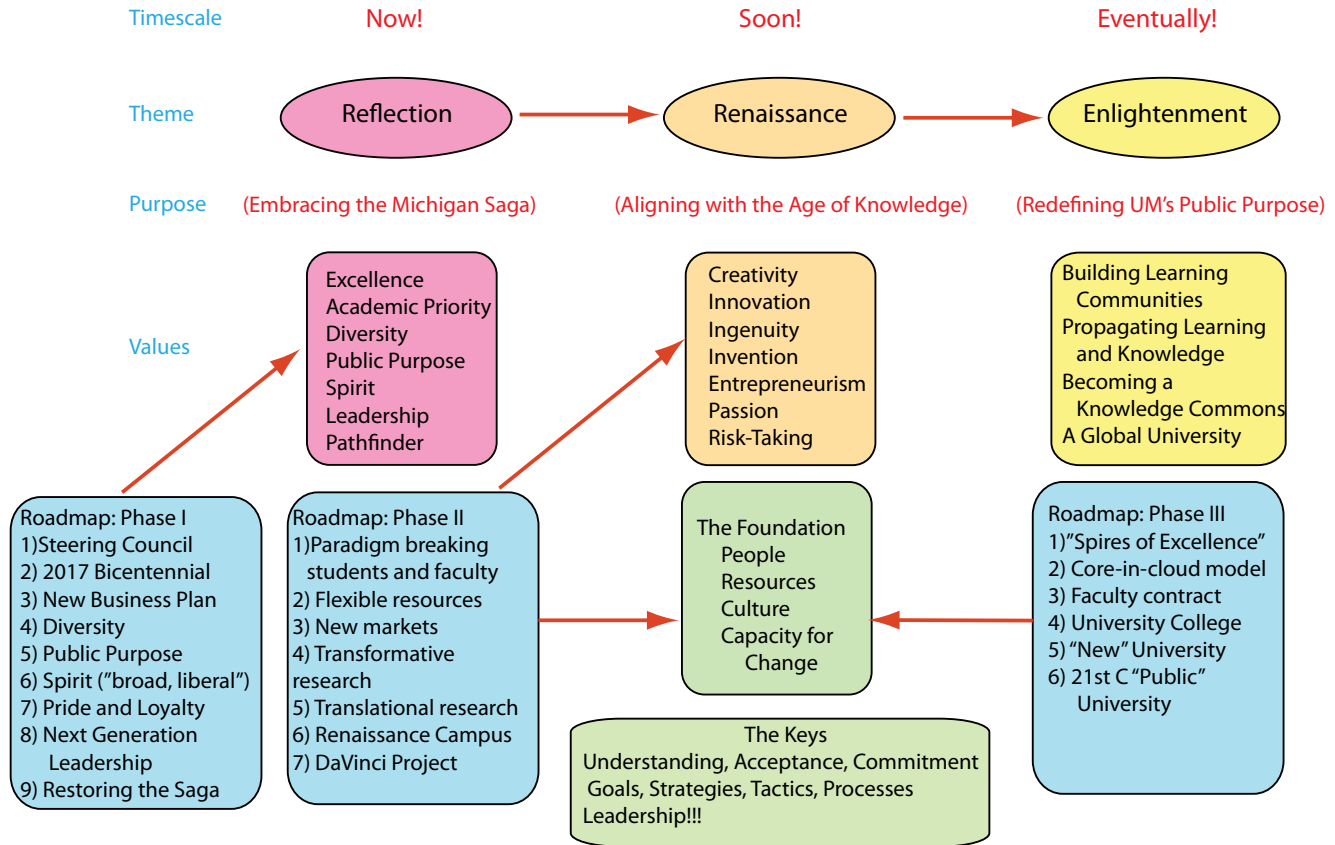
Building the necessary foundation of scholarly activity for a global knowledge and learning enterprise.

Moving the University to year-round operation in an effort to broaden educational opportunity and innovation while achieving greater efficiency in the use of campus facilities.

Plans, Tactics, and Processes

While a vision sets a destination and a roadmap provides direction, institutions and stakeholders require a more definitive and operational strategic plan to embark on these journeys. One begins, of course, encouraging and supporting planning at the unit level, perhaps augmented by occasional initiatives, since it is at the grassroots level where the most ambitious plans and efforts inevitably begin at the University of Michigan.

But it is also critical to give thoughtful attention to the design of institutional processes for planning, supporting, and managing such bottom-up initiatives.. The ability of universities to adapt successfully to the profound changes occurring in our society will depend a great deal on the institution's collective ability to develop and execute appropriate strategies. Key is the recognition that in a rapidly changing environment, it is important to develop a planning process that is not only capable of adapting to changing conditions, but to some

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Theme: Reflection → Renaissance → Enlightenment

Purpose: (Embracing the Michigan Saga) — (Aligning with the Age of Knowledge) — (Redefining UM's Public Purpose)

Values:

Reflection:
Excellence
Academic Priority
Diversity
Public Purpose
Spirit
Leadership
Pathfinder

Renaissance:
Creativity
Innovation
Ingenuity
Invention
Entrepreneurism
Passion
Risk-Taking

Enlightenment:
Building Learning Communities
Propagating Learning and Knowledge
Becoming a Knowledge Commons
A Global University

Roadmap: Phase I
1) Steering Council
2) 2017 Bicentennial
3) New Business Plan
4) Diversity
5) Public Purpose
6) Spirit ("broad, liberal")
7) Pride and Loyalty
8) Next Generation Leadership
9) Restoring the Saga

Roadmap: Phase II
1) Paradigm breaking students and faculty
2) Flexible resources
3) New markets
4) Transformative research
5) Translational research
6) Renaissance Campus
7) DaVinci Project

The Foundation
People
Resources
Culture
Capacity for Change

The Keys
Understanding, Acceptance, Commitment
Goals, Strategies, Tactics, Processes
Leadership!!!

Roadmap: Phase III
1) "Spires of Excellence"
2) Core-in-cloud model
3) Faculty contract
4) University College
5) "New" University
6) 21st C "Public" University

Strategic roadmaps to a vision for the University of Michigan's Third Century.

degree capable of modifying the environment in which the University will find itself in the decades ahead. The University must seek and implement a progressive, flexible, and adaptive process, capable of responding to a dynamic environment and an uncertain—indeed, unknowable—future.

In an institution of Michigan's size, breadth, and complexity, it is usually not appropriate (or possible) to manage centrally many processes or activities. After all, it is the University's current structure as a "loosely coupled adaptive ecosystem" that has enabled it to thrive during periods of rapid environmental challenge and change that have put at risk other institutions. Here the deans of the University play a particularly important role, particularly when their own leadership skills and commitment to the University have been developed within the University's pathfinding culture.

One can, however, establish institutional priorities and goals and institute a process that encourages leadership to move toward these objectives. To achieve institutional goals, processes can be launched throughout the institution aimed at strategic planning consistent with institutional goals, but with management authority residing at the local level. One seeks an approach with accurate central information support and strong strategic direction.

In addition, one requires detailed tactical plans at the operational level in areas such as financial resources, organizational structures, and the launching of appropriate experiments and ventures.

Finally, it is important to recognize that progress toward such bold visions will demand substantial institutional transformation. The challenge, as is so often the case, is neither financial nor organizational. Rather it is the degree of cultural change required. The University must transform a set of rigid habits of thought and organization that are incapable of responding to change rapidly or radically enough.

True faculty participation in the design of the necessary change process is essential, since the

transformation of faculty culture is the biggest challenge of all. Both the creativity and the commitment of the faculty are vital to the achievement of such goals. Policies come and go without perturbing the institution; change happens in the trenches where faculty, students, and statt are engaged in the primary activities of the university, teaching and research, learning and scholarship.

The Challenge and Opportunity

Institutions all too frequently choose a timid course of incremental, reactive evolution because they view a more strategically-driven transformation process as too risky. They are worried about making a mistake, about heading in the wrong direction or failing. While they are aware that this incremental approach can occasionally miss an opportunity, many mature organizations, such as universities, would prefer the risk of missed opportunity to the danger of heading into the unknown.

But, today, incremental change based on traditional, well-understood paradigms may be the most dangerous course of all, because those paradigms may simply not be adequate to adapt to a future of change. If the status quo is no longer an option, if the existing paradigms are no longer viable, then transformation becomes the wisest course.

The forces driving change in higher education, both from within and without, are far more powerful than most realize. The pace and nature of change affecting the higher education enterprise both in America and worldwide are likely to be considerably beyond that which could be accommodated by business-as-usual evolution. While there is certainly a good deal of exaggeration and hype about the changes in higher education over the short term—meaning a decade or less—it is difficult to stress too strongly the profound nature of the changes likely to occur in most of our institutions and in our enterprise over the longer term.

The University of Michigan has a responsibility to help show the way to change, not to react to and follow it. Its voice must be loud, clear, and unified in the public forum. At the same time, it must encourage vigorous debate and experimentation within academia, setting aside narrow self-interest, and accepting without fear the challenges posed by this extraordinary time in its history.

We contend that as the University enters its third century, it should embrace once again its heritage as a pathfinder for higher education, a saga established two centuries ago in the 19th century when the University
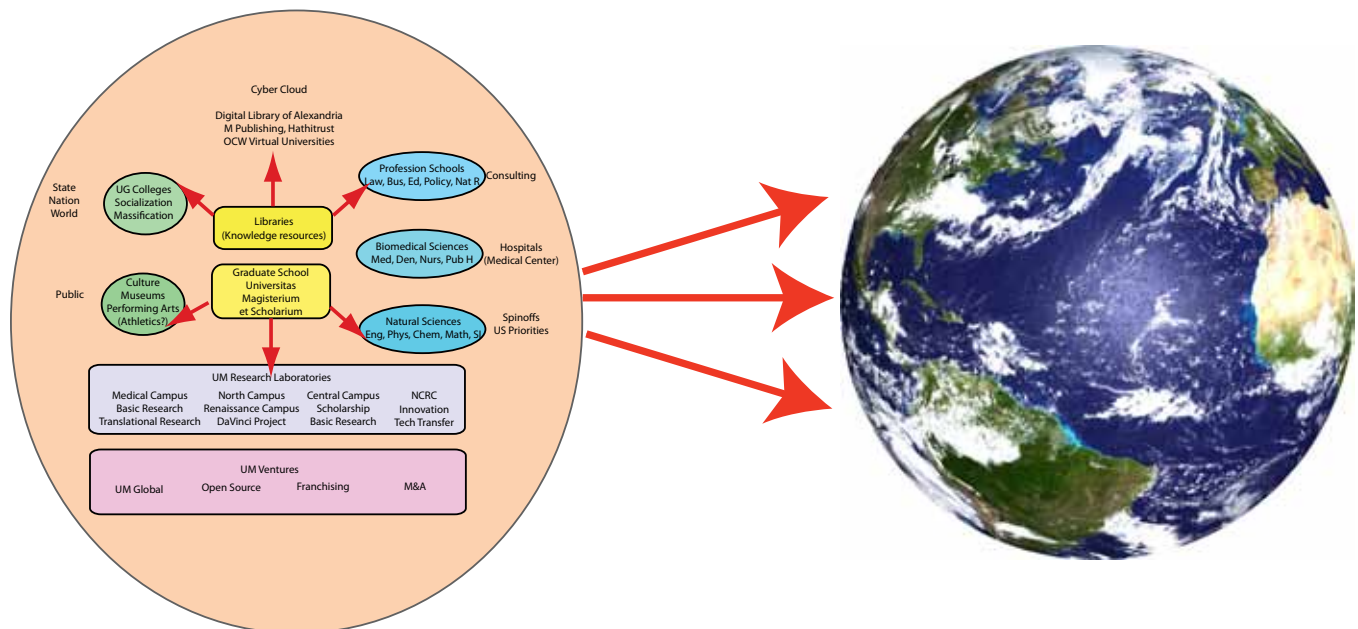
A public purpose for Michigan's Third Century: providing the light of knowledge and learning to the world!

of Michigan became a primary source for much of the innovation and leadership for higher education and then again in the late 20th Century as it evolved into the nation's largest research university. Once again, Michigan has the opportunity to influence the emergence of a new paradigm of what the university must become in our 21st Century world to respond to the changing needs of our society.

This, then, is the particular challenge and opportunity for the University of Michigan. As it has so many times in its past, the University of Michigan must embrace yet again its historic role of leadership for a future characterized by great challenges, immense responsibilities, and exciting opportunities.

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Chapter 1

A Challenge for the Bicentennial

It is hard for those of us who have spent much of our lives as academics to look about at the university, with its traditions and obvious social value, and accept the possibility that it soon might change in dramatic ways. Although the university has existed as a social institution for almost a millennium, with each historical epoch it has been transformed in very profound ways.

The scholasticism of early medieval universities first appearing in Bologna and Paris–the *universitas magistrorum et scholarium*–slowly gave way to the humanism of the Renaissance. The graduate universities appearing in early 19th century Germany (von Humboldt's University of Berlin) were animated by the freedom of the Enlightenment–*Lehnfreiheit* and *Lernfreiheit*–and the rigor of the scientific method. The Industrial Revolution in 19th America stimulated the commitment to education of the working class and the public engagement of the land-grant universities. The impact of campus research on national security during WWII and the ensuing Cold War created the paradigm of the contemporary research university during the late 20th century.

Although the impact of these changes have been assimilated and now seem natural, at the time they involved a profound reassessment of the mission and structure of the university as an institution. This capacity for change is vividly demonstrated by the extraordinary evolution of the University of Michigan campus over the past two centuries, as shown on the following pages.

Our world is again entering a period of dramatic social change, perhaps as profound as earlier periods, such as the Renaissance and the Industrial Revolution— except, while those earlier transformations took decades, if not centuries, today's often take only a few years. We live in an era of breathtaking and accelerating change. If education was once simpler, our world was simpler too. The most predictable feature of modern society is its unpredictability. We no longer believe that tomorrow will look much like today. Universities must find ways to sustain the most cherished aspects of their core values, while at the same time finding new ways to respond vigorously to the opportunities and challenges of a rapidly evolving world.

The recurrent theme of this report, and, indeed, of the history of the University of Michigan, is the need for change in higher education if our colleges and universities are to serve a rapidly changing world. Yet Michigan's challenge is greater than simply institutional change, since throughout its history it has been one of the most progressive forces in American higher education. Michigan's unique combination of quality, size, breadth, innovation, and pioneering spirit is particularly well suited to exploring and charting a course for higher education as it evolves to serve a changing world. And soon it will have an important opportunity to embrace this mantle of leadership as a pathfinder, trailblazer, and pioneer once again.

UM 2017: The Bicentennial Year

The University of Michigan is approaching a singular moment in its history, its bicentennial year in 2017, which will provide a remarkable opportunity to consider once again the vision for the future of the University. Of course, although Michigan is one of the oldest public universities in America, it is actually a rather young institution when considered on a broader scale. After all, Harvard celebrated its 350th anniversary in 1986, and Cambridge has recently observed the 800th anniversary of its founding in 1209. Furthermore, Michigan is an exceptionally modest institution. All too

The University of Michigan campus (1855, Cropsey)

The University of Michigan campus (1910, Rummell)

The University of Michigan campus (1930)

The University of Michigan campus (1970)

The University of Michigan campus (2000)

The University of Michigan campus (2014)

often we tend to pave over our past and build anew rather than enshrine our heritage, as do universities such as Harvard, Cambridge, and Bologna. As a consequence, Michigan is all too frequently seen (and portrayed) only within the limited public perspectives of conventional colleges and universities, e.g., in terms of young students, old faculties, and winning football teams.

Yet this is unfortunate, since in many ways the University of Michigan has not only provided leadership for American higher education, but its impact frequently has extended far beyond the campus to have world-wide implications. It was one of the first attempts to build a true university in the New World, stressing scholarship in addition to teaching in contrast to the colonial colleges that were still focused on the collegiate model for educating young students. The University also provided one of the earliest examples of a public university, although since it was established by federal action through the Northwest Ordinance two decades before Michigan's statehood, one might suggest it began as a territorial or national public university rather than a "state" university. It was also one of the earliest examples of a research university, building one of the three largest telescopes in the world in the 1850s for scientific work, the first university hospital, and the first chemistry laboratory for teaching.

The broader impact of the University on society has been immense. Beyond introducing new disciplines ranging from bacteriology, meteorology, sociology, and modern history to computer engineering, nuclear engineering, and information science, the University has also had broader impact on the world through its educational and research activities. It was the first university in the world to promote the peaceful uses of atomic energy with the Michigan Memorial Phoenix Project, leading to the world's first academic program in nuclear science and engineering and new discoveries such as the use of I-131 in nuclear medicine and the bubble chamber detector for nuclear physics. It conducted the clinical trials that confirmed the effectiveness of the Salk vaccine and identified the genetic causes of diseases such as cystic fibrosis. Michigan was a leader in space exploration and astronaut education, e.g., the entire crew of Apollo 15 lunar mission consisted of Michigan graduates.

Through its Willow Run Laboratories, the University developed much of the technology of remote sensing including holography and the maser.

More recently, Michigan partnered with IBM and MCI to build and operate the backbone of the Internet from the mid-1980s until this role was transferred to the commercial sector in 1993. The University's role in advanced networking continued with its leadership in the founding and development of Internet2 during the 1990s. Today, Michigan is pioneering in the digitization of the great libraries of the world and the provision of access to their collections through its leadership role in digital libraries, the JSTOR project, the Google Book project, and the HathiTrust (which is today the largest digital library in the world with over 14 million volumes).

Hence the approaching bicentennial of the University of Michigan will provide an important occasion to recall, understand, and honor its remarkable history. But it will also provide a opportunity to learn from the University's past, to assess the challenges and opportunities it faces at the present, and to chart a course for its future. Indeed, since Michigan's greatest impact has resulted in part from its capacity to capture and sustain the important elements of its history while developing bold visions for the future, the UM Bicentennial should be viewed as a compelling challenge to develop a new vision for Michigan's third century!

The Importance of Vision, Planning and Leadership

Developing a bold and compelling vision for the future of an institution can be both a challenging and hazardous activity, particularly for a university with a long history of leadership and distinction. Yet while the status quo may be the safest course for university leadership and governance, it can also pose substantial risks to the institution. Universities that drift along, without a bold vision and leadership, can founder on the rocky shoals of a changing world. Although a university may seem to be doing just fine with benign neglect from the administration building, over a longer period of time a series of short-term tactical decisions will dictate a de facto strategy that may not be in

One of the world's largest telescopes

The nation's first instructional chemistry laboratory

The nation's first university hospital

The world's first academic programs in atomic energy

Apollo 15, the All-Michigan mission to the moon

Michigan's leadership in developing the Internet

Michigan is one of the few universities capable of changing the world.

the long-range interests of the university. Leading a university during a time of great social change without some formal planning process is a bit like navigating the Titanic through an iceberg floe dodging icebergs in the dead of night. Simply reacting to challenges and opportunities as they arise can eventually sink the ship.

Throughout its history, during times of challenge and opportunity, the University has demonstrated the capacity to develop and execute the strategies necessary to achieve bold visions. Tappan's vision of building a true university in America was embraced by his successors who developed the strategies to achieve intellectual leadership across a wide spectrum of academic disciplines during the late 19th and early 20th century. Similar leadership and planning enabled the University of Michigan to become the prototype of the emerging American research university following World War II. Careful planning was necessary to sustain both its quality and leadership during an era of rapid growth during the post-war years. More recently, visionary planning and courageous actions during the last decades of the 20th century enabled the University to adjust to the loss of its state support with quality, public purpose, and leadership still intact.
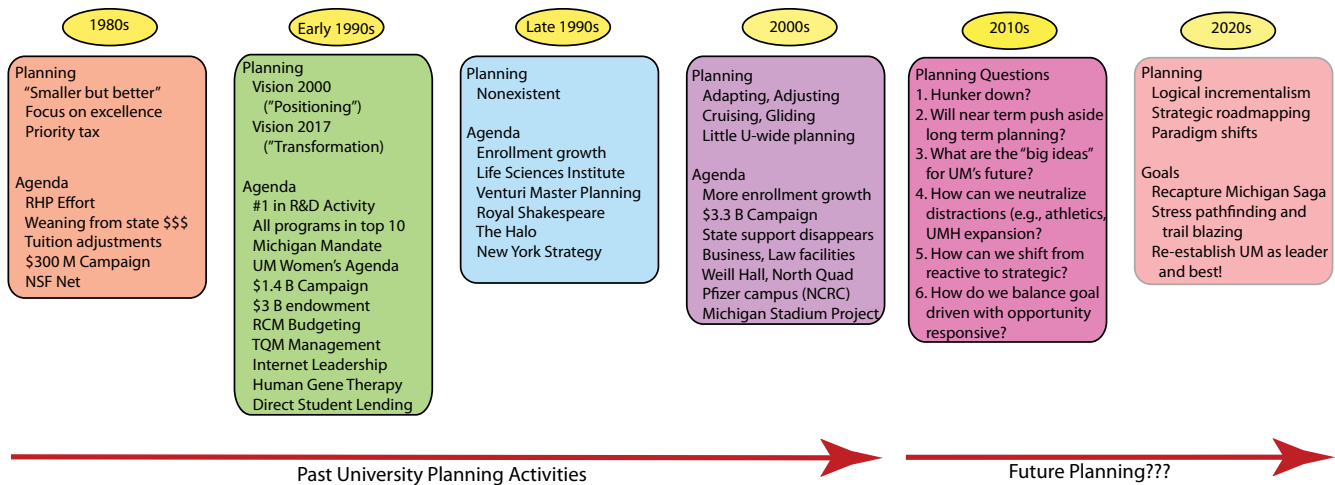
This essay represents an effort to continue this long tradition of strategic planning by suggesting an appropriate vision for the University's third century. Of course, there have been two decades of further change and transformation in our world since the last university-wide planning activities of the 1980s

and 1990s. Many familiar challenges remain, e.g., economic, demographic, technological, and cultural. But new challenges must also be added into planning activities: rapid globalization; profoundly changing demographics, exponentiating technologies; and even the sustainability of humankind on Planet Earth (e.g., climate change, financial stability, global poverty and health, terrorism and nuclear proliferation).

Future possibilities have become not only more diverse but more extreme and possibly even unimaginable. Using recent discoveries in gene modification such as gene editing (CRISPR) and gene drive to modify life forms–including humankind. Or the emergence of sentient behavior in artificial intelligence that rapidly exceeds human control.

Because of the unusual challenges and opportunities facing the University of Michigan in its third century, today it is imperative to develop progressive, flexible, and adaptive planning processes, capable of responding to a dynamic environment and an uncertain—indeed, unknowable—future. Planning for such a complex, rapidly changing, and unpredictable future requires a somewhat different approach. Beyond boldness and attentiveness to the University's traditions, it requires rigor, discipline, and insight to develop achievable goals, strategies, and tactics.

In this report, we have adapted a planning technique, *strategic roadmapping*, commonly used in those sectors of industry and the federal government characterized by extremely rapid and unpredictable change: strategic

1980s	Early 1990s	Late 1990s	2000s	2010s	2020s

Planning
"Smaller but better"
Focus on excellence
Priority tax
 	
Agenda
RHP Effort
Weaning from state $$$
Tuition adjustments
$300 M Campaign
NSF Net
	Planning
	Vision 2000
	("Positioning")
	Vision 2017
	("Transformation)
	
	Agenda
	#1 in R&D Activity
	All programs in top 10
	Michigan Mandate
	UM Women's Agenda
	$1.4 B Campaign
	$3 B endowment
	RCM Budgeting
	TQM Management
	Internet Leadership
	Human Gene Therapy
	Direct Student Lending
		Planning
		Nonexistent
		
		Agenda
		Enrollment growth
		Life Sciences Institute
		Venturi Master Planning
		Royal Shakespeare
		The Halo
		New York Strategy
			Planning
			Adapting, Adjusting
			Cruising, Gliding
			Little U-wide planning
			
			Agenda
			More enrollment growth
			$3.3 B Campaign
			State support disappears
			Business, Law facilities
			Weill Hall, North Quad
			Pfizer campus (NCRC)
			Michigan Stadium Project
				Planning Questions
				1. Hunker down?
				2. Will near term push aside
				   long term planning?
				3. What are the "big ideas"
				   for UM's future?
				4. How can we neutralize
				   distractions (e.g., athletics,
				   UMH expansion?
				5. How can we shift from
				   reactive to strategic?
				6. How do we balance goal
				   driven with opportunity
				   responsive?
					Planning
					Logical incrementalism
					Strategic roadmapping
					Paradigm shifts
					
					Goals
					Recapture Michigan Saga
					Stress pathfinding and
					   trail blazing
					Re-establish UM as leader
					   and best!

Past University Planning Activities   Future Planning???

The progression of University-wide strategic planning activities

roadmapping (Garcia, 1997). This approach begins by using panels of experts to propose goals or visions for the organization. It then constructs a map of existing resources, performs an analysis to determine the gap between what currently exists and what is needed, and finally develops a plan or roadmap of possible routes from here to there, from now to the future. Although sometimes cluttered with confusing jargon such as environmental scans, resource maps, and gap analysis, in reality the roadmapping process is quite simple. It begins by asking *where we are today*, then *where we wish to be tomorrow*, followed by an assessment of *how far we have to go*, and finally concludes by developing *a roadmap to get from here to there*. The roadmap itself usually consists of a series of recommendations aimed at navigating toward the vision.

To provide an historical context for the "Third Century" planning process, we begin in Chapter 2 with a brief history of the University of Michigan, describing the role it has played in the evolution of higher education both in the United States and abroad. In particular, we develop the concept of the University's *institutional saga*, those factors evolving over the past two centuries that have shaped its character, traditions, and roles.

In Chapter 3, we turn to a discussion of the University of Michigan today. Here we review its key characteristics, e.g., traditional missions, available resources, achievements, and including its challenges, opportunities, and responsibilities–roughly comparable to what is known in corporate strategic planning as a SWOT analysis ("strengths, weaknesses, opportunities, and threats"). We consider a longitudinal analysis over the past half-century of key metrics that characterize Michigan and higher education more generally to provide better understanding of just how the institution has evolved to its current situation.

In Chapter 4, we turn to an environmental scan of powerful forces driving change in our world, e.g., the emerging knowledge- and innovation-driven economy, globalization, changing demographics, shifting social priorities, rapidly evolving technologies, and global sustainability–and the implications for education in general and public research universities such as Michigan in particular. Although most of our analysis concerns the near term challenges and opportunities

Strategic roadmapping is needs-driven planning process to help identify, select and develop alternatives to satisfy the need. A roadmap can help make accurate predictions of future demands and determine innovative processes, products, and systems required to satisfy them.
1) Identifies critical system requirements
2) Sets performance targets
3) Alternatives and milestones for meeting targets.

Environmental Scan	A thorough analysis of the planning enviroment from a broad perspective.
Resource Map	Identify assets and capabilities as they currently exist
Visioning	Identify endpoint and possible alternaives for achieving it using resources such as expert panels, shareholder engagement, and detailed studies.
Gap Analysis	Determine gap between existing assets and challenges and those objectives specified by vision.
Roadmap Development	Develop strategies and actions necessary to achieve vision objectives.
Tactics and Processes	Identify tactics for putting roadmap in place and processes for sustaining the effort until the vision objectives are achieved

The roadmapping process

of the knowledge economy, we include some brief speculation on possible trends and surprises for the longer term, a topic we return to in more detail in the last chapter of this report.

In Chapter 5, we discuss bolder visions that consider truly over-the-horizon opportunities and challenge, game changers such as the spontaneous emergence of new geopolitical structures or a truly global culture. Such futures would require new policies, practices, and perspectives of higher education that depart quite radically from the status quo and result in paradigm shifts in the most fundamental character of the university.

Next in Chapter 6, we suggest a vision for the University of Michigan future as it prepares to begin its third century of service to the state, the nation, and the world. This vision is constructed in three phases: what we should accomplish prior to the University's Bicentennial, what we should prepare for in the near term, and what we should aspire to as a bold vision for the University's roles in the century ahead.

In Chapter 7, by comparing this vision with the current reality, we can identify the gap that exists between characteristics of the University today (in

the broadest sense, e.g., its people, quality, finances, campus, plans, and values) and what we will need to achieve the proposed vision for Michigan's Third Century.

In Chapter 8, we conclude with the development of the Third Century Roadmap itself, a set of goals and actions designed to move the University toward this vision of its future. We have separated the roadmap into timeframes or "event horizons" to provide a framework that recognizes the increasing uncertainty as the timeframe reaches further into the future.

In Chapter 9 we turn to the plans, tactics, and processes necessary to achieve the objectives set by the roadmap studies. Here we suggest that instead of adopting a "master plan", one should embrace a process of continual engagement, action, and refinement to build and sustain momentum.

Finally, in Chapter 10, we conclude with some comments on just how challenging this expanded role of the University of Michigan will be, yet also how important it could be to our state, our nation, and our world.

The Road Ahead

As we look to the profound changes ahead of us, it is important to keep in mind that throughout their history, universities have evolved as integral parts of their societies to meet the challenges of their changing environments. They continue to evolve today. This disposition to change is a basic characteristic and strength of university life, the result of our constant generation of new knowledge through scholarship that, in turn, changes the education we provide and influences the societies that surround us.

At the same time, this propensity of universities to change is balanced by vital continuities, especially those arising from our fundamental scholarly commitments and values and from our roots in a democratic society. While the emphasis, structure, or organization of university activity may change over time to respond to new challenges, it is these scholarly principles, values, and traditions that animate the academic enterprise and give it continuity and meaning.

Thus, an integral part of the life of the university has always been to continuously evaluate the world around

The road ahead...

us, in order to adjust our teaching, research, and service missions to serve the changing needs of our constituents while preserving basic values and commitments. Today, we must once again try to anticipate the future direction of our society in order to prepare students for the world they will inherit.

This capacity for change, for renewal, is the key objective that the University of Michigan must strive to achieve in the years ahead—a capacity that will allow it to transform itself once again as it has done so many times in the past, to become an institution capable of serving a changing society and a changing world. This challenge must be approached strategically rather than reactively, with a deep understanding of the role and character of the University, its important traditions and values from the past, and a clear and compelling vision for its future.

This, then, is the particular challenge and opportunity for the University of Michigan, an

institution that has long served as both the pathfinder and trailblazer for higher education not only in America but throughout the world. As it has so many times in its past, the University of Michigan must embrace yet again its heritage of leadership as it prepares for a third century characterized by great challenges, immense responsibilities, and exciting opportunities.

Chapter 2

The Michigan Saga

Clearly, the first step in developing any plan for the future is to understand not only where we are today but where we came from and how we have evolved over time! This certainly applies to universities, which are based on long-standing traditions and continuity, evolving over many generations (in some cases, even centuries), with very particular sets of values, traditions, and practices. Burton R. Clark, a noted sociologist and scholar of higher education, introduced the concept of "organizational legend " or "institutional saga," to refer to those long-standing characteristics that determine the distinctiveness of a college or university. (Clark, 1970) Clark's view is that "an organizational legend (or saga), located between ideology and religion, partakes of an appealing logic on one hand and sentiments similar to the spiritual on the other"; that universities "develop over time such an intentionality about institutional life, a saga, which then results in unifying the institution and shaping its purpose." Clark notes: "An institutional saga may be found in many forms, through mottoes, traditions, and ethos. It might consist of long-standing practices or unique roles played by an institution, or even in the images held in the minds (and hearts) of students, faculty, and alumni. Sagas can provide a sense of romance and even mystery that turn a cold organization into a beloved social institution, capturing the allegiance of its members and even defining the identity of its communities."

As Clark explains, all colleges and universities have a social purpose, but for some, these responsibilities and roles have actually shaped their evolution and determined their character. The appearance of a distinct institutional saga involves many elements—visionary leadership; strong faculty and student cultures; unique programs; ideologies; and, of course, the time to accumulate the events, achievements, legends, and mythology that characterize long-standing institutions.

Hence the first task in constructing an appropriate vision for the University of Michigan's third century is to understand clearly its key values, traditions, and attributes. And, to do this requires us to sift through the layers of the University's history to discover and articulate its institutional saga.

A University on the Frontier

It can be argued that it was in the Midwest, in frontier towns such as Ann Arbor and Madison, that true universities first appeared in America. By augmenting the traditional mission of educating the young with faculty scholarship and public service to society, the emerging public state universities created a uniquely American university capable of responding to the needs of a rapidly changing nation in the 19th Century and that still dominates higher education today.

The University of Michigan was established in 1817 in the village of Detroit by an act of the Northwest Territorial government and financed through the sale of Indian lands granted by the United States Congress. (Price, 2003) Since it benefited from this territorial land grant, the new university was subject to the Enlightenment themes of the Northwest Ordinance guaranteeing civil rights and religious freedom. But equally significant for our purposes was the Northwest Ordinance's statement of the importance of education in the new territories: "Religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged." (Northwest Ordinance, 1909)
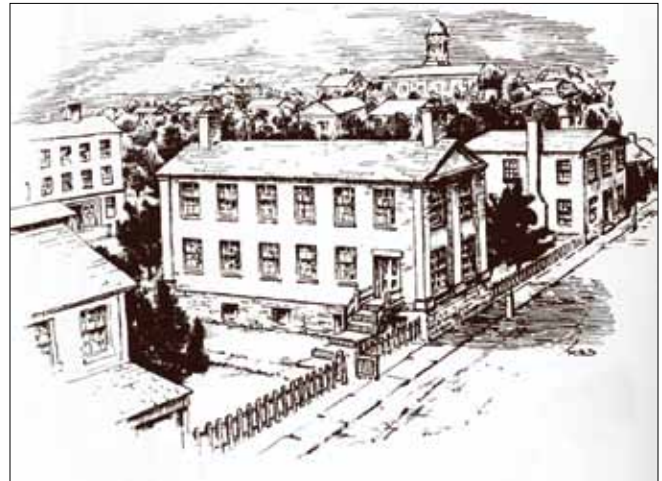
The University of Michigan traces its earliest heritage to two quite different models of higher education in 19th century Europe. Actually, the first incarnation of the University of Michigan proposed by Augustus Woodward, Secretary and later Governor

The words of the Northwest Ordinance
in the auditorium of old University Hall

The original building of the Catholepistemiad
or University of Michigania in Detroit, 1817

of the Michigan Territory, was not a university but rather a centralized system of schools, libraries, and other cultural institutions borrowing its model from the *Universite Imperiale de France* founded by Napoleon a decade earlier. (Ruegg, 1996) Named "the Catholepistemiad or University of Michigania" by Woodward, this was actually an extraordinary vision for the times. It proposed an intellectual breadth far beyond the classical curriculum of the colonial colleges that would be run by the professors rather than boards of churchman and denominations like other American colleges of the early 19th century. Woodward also proposed that it would be supported by taxation so that its primary schools were free and its higher education programs would require only a modest tuition from students.

It was only after the State of Michigan entered the Union in 1837 that a new plan was adopted to focus the University on higher education, establishing it as a "state" university after the Prussian system, with programs in literature, science and arts; medicine; and law–the first three academic departments of the new university. The new Michigan State Legislature authorized funds to purchase a campus for the University, and an enterprising group of citizens from Ann Arbor offered a 40 acre site in their community. (Actually, the group first wanted to attract the state capital, but that went to Lansing. Then they considered going after the state prison before finally offering the site for a university.)

Because the University had already been in existence for two decades before the State of Michigan entered the Union in 1837, and because of the frontier society's deep distrust of politics and politicians, the new

The University of Michigan's campus in 1852 (Cropsey Painting)

state's early constitution (1851) granted the University an unusual degree of autonomy as a "coordinate branch of state government," with full powers over all University matters granted to its governing board of regents, although surprisingly enough it did not state the purpose of the University. This constitutional autonomy, together with the fact that the University traces its origins to an act of Congress rather than a state legislature, has shaped an important feature of the University's character. In financial terms, the University of Michigan was actually a United States land grant university supported entirely by the sale of its federal lands and student fees rather than state resources until after the Civil War. Hence throughout its history the University has regarded itself as much as a national university as a state university, albeit with some discretion when dealing with the Michigan State Legislature.

Implicit in the new constitution was also a provision that the University's regents be determined by statewide popular election, again reflecting public dissatisfaction with both the selection and performance of the early-appointed regents. (The last appointed board retaliated by firing the professors at the University.) The constitution also provided for the University to be led by a president, who would preside over the meetings of the regents (without vote). Hence the first assignment of the newly elected board was to select a president for the University (after inviting back the fired professors).

After an extensive search, they elected Henry Philip Tappan, a broadly educated professor of philosophy from New York, as the first president of the reconfigured University.

Under Tappan's leadership, the University rapidly began to evolve into yet a third European form with the appointment of its first president. In fact, one can make a strong case that with Tappan's arrival, the University of Michigan became the first attempt in America to build a true university. At a time when the colonial colleges were teaching young boys the classical curriculum of Greek, Latin, and rhetoric using the scholastic methods to "transform savages into gentlemen", much as the British public school, Tappan brought to Ann Arbor a vision of building a true university in the European sense, one which would not only conduct instruction and advanced scholarship, but also respond to popular

needs. He was strongly influenced by European leaders such as Wilhelm von Humboldt, Prussian minister of education and founder of the University of Berlin, who stressed the importance of combining specialized research with humanistic teaching to define the intellectual structure of the university. (Ruegg, 2004; Clark, 2006)


President Henry Tappan

Tappan articulated a vision of the university as a capstone of civilization, a repository for the accumulated knowledge of mankind, and a home for scholars dedicated to the expansion of human understanding. In his words, "a university is the highest possible form of an institution of learning. It embraces every branch of knowledge and all possible means of making new investigations and thus advancing knowledge."(Tappan, 1851) He aimed to develop "an institution that would cultivate the originality and genius of those seeking knowledge beyond the traditional curriculum, with a graduate school in which diligent and responsible students could pursue their studies and research under the eye of learned scholars in an environment of enormous resources in books, laboratories, and museums". (Peckham, 1963)

Henry Tappan's concept for the University wove together the classical curriculum and mental discipline of the collegiate model, the utilitarian emphasis of the newly emerging state universities, and the German university emphasis on pure scholarship. (Thelin, 2004) During his tenure, the University of Michigan broadened the classical curriculum to include the sciences, planted the early seeds for a graduate school to distinguish postgraduate professional studies from undergraduate education, and introduced the seminar model of instruction for graduate education. (Peckham, 1963) Furthermore Michigan faculty members carried this broader concept of the university with them as they moved on to leadership roles at other institutions (e.g., Andrew Dixon White at Cornell, Charles Kendall Adams at Cornell and Wisconsin, and Erastus Haven at

Scenes of the University of Michigan campus in the 19th century

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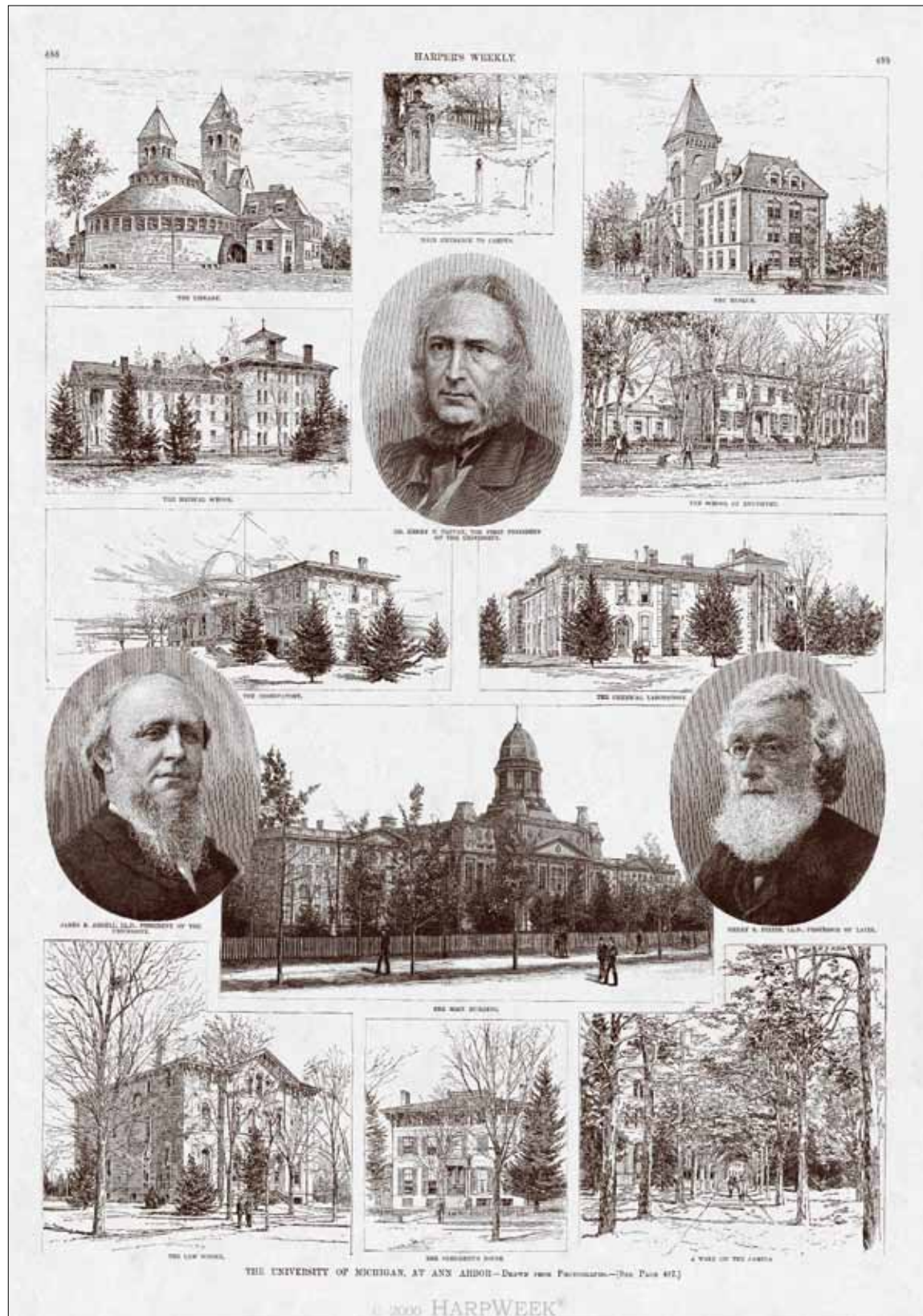
The University of Michigan in 1887, as depicted in the famous article in Harper's Weekly

Northwestern). (Rudolph, 1962)

Although premature for a frontier state, Tappan's vision for the University of Michigan in the 1850s and 1860s provided the first American model of a modern university. Hence from its founding, the University of Michigan has been identified with the most progressive forces in American higher education. The early colonial colleges served the aristocracy of colonial society, stressing moral development over a liberal education, much as the English public schools, and based on a classical curriculum in subjects such as Greek, Latin, and rhetoric. In contrast, Michigan blended the classical curriculum with the European model that stressed faculty involvement in research and dedication to the preparation of future scholars. Michigan hired as its first professors not classicists but a zoologist and a geologist. Unlike other institutions of the time, Michigan added instruction in the sciences to the humanistic curriculum, creating a hybrid that drew on the best of both a "liberal" and a "utilitarian" education. (Turner, 1988)

The University of Michigan can also claim to be one of the first truly public universities in America, created by the Northwest Territorial government in a non-sectarian spirit 20 years before Michigan was admitted to the Union. (Technically, the Universities of Georgia and North Carolina were the first state universities, but since they were highly influenced by the church–think "Chapel Hill"–they could not strictly be regarded as "public" in character.) (Thelin, 2004)

One might also consider the University of Michigan as one of the earliest examples of the American research university, with its construction of one of the three largest telescopes in the world, the first teaching laboratory building for chemistry, and the first courses in new disciplines such as bacteriology, forestry, meteorology, sociology, modern history, journalism, and American literature. In fact, almost every American intellectual movement from the mid-19th century onward must include some mention of Michigan. Beyond its impact on the traditional literature, arts, and science, the University led in the creation of many new disciplines such as the quantitative social sciences, biomedical disciplines, engineering sciences, and policy disciplines. (Turner, 1988)

The influence of Michigan on the professions has

Michigan has long placed high value on diversity.

also been immense. Michigan was the first university in the West to pursue professional education, establishing its medical school in 1850, engineering courses in 1854, and a law school in 1859. Michigan joined with Columbia and Penn in creating the paradigm for medical practice and education by defining the M.D. as a graduate degree, introducing laboratory science in the curriculum, and opening the first university hospital for clinical training. Decades later, this model would be adopted to transform the rest of medicine through the Flexner Report of 1910. (Flexner, 1910) Moreover through the efforts of Henry Frieze, Michigan stimulated the development of secondary education (high schools) throughout the Midwest.

An Uncommon Education for the Common Man

By the late 19th Century, Michigan was recognized, to quote *Harper's Weekly*, as "an institution in whose progress not a single State alone, but the whole country as well, may claim an interest". (*Harper's Weekly*, 1887) The magazine went on to note: "The most striking feature of the University is the broad and liberal spirit in which it does its work. Students are allowed the widest freedom consistent with sound scholarship in pursuing the studies of their choice. Women are admitted to all departments on equal terms with men; the doors of the University are open to all applicants who are properly qualified, from whatever part of the world they may come."

Particularly notable here was the role of Michigan

Michigan also values its international presence.

President James Angell in articulating the importance of Michigan's commitment to provide "an uncommon education for the common man" while challenging the aristocratic notion of leaders of the colonial colleges such as Charles Eliot of Harvard. (Rudolph, 1962) Angell argued that Americans should be given opportunities to develop talent and character to the fullest. He portrayed the state university as the bulwark against the aristocracy of wealth. This commitment continues today, when even in an era of severe fiscal constraints, the University still meets the full financial need of every Michigan student enrolling in its programs.

The University has long placed high value on the diversity of its student body, both because of its commitment to serve all of society, and because of its perception that such diversity enhanced the quality of its educational programs. From its earliest years, Michigan sought to attract students from a broad range of ethnic and geographic backgrounds. In 1860, the regents referred "with partiality" to the "list of foreign students drawn thither from every section of our country." Forty-six percent of the University's students then came from other states and foreign countries. Although the Michigan legislature occasionally objected to this high out-of-state enrollment, the Regents reminded state government that the University had not been founded by state action or money but by a grant of land from the United States Congress, which support rendered its obligations at the national level. President Haven noted that the larger fees from out-of-state students provided much of the University's income that subsidized in part the education of Michigan residents (a situation that continues today).

The first African American students arrived on campus in 1868. Michigan was one of the first large universities in America to admit women in 1870. At the time, the rest of the nation looked on with a critical eye, certain that the experiment of co-education would fail. Although the first women students were true pioneers, the objects of intense scrutiny and some resentment, by 1898 the enrollment of women had increased to the point where they received 53 percent of Michigan's undergraduate degrees. The University's constitutional autonomy enabled it to defend this commitment to diversity in the face of considerable political resistance to challenging the status quo, eventually taking the battle for diversity and equality of opportunity all the way to the United States Supreme Court in the landmark cases of 2003. In more contemporary terms, it seems clear that an important facet of the institutional saga of the University of Michigan would be its achievement of excellence through diversity.

Michigan's international presence in both students and activities has also been unusual for public universities. The University awarded the first doctorate to a Japanese citizen who later was instrumental in founding the University of Tokyo. President Angell's service in 1880-82 as United States Envoy to China established further the university's great influence in Asia, including providing the resources to establish Tsinghua University from the reparations from the Boxer Rebellion.

Hence in many ways, it was at the University of Michigan that Thomas Jefferson's embrace of the principles of the Enlightenment in his proposition for nation, "We hold these truths to be self-evident: That all men are created equal", was most fully embraced and realized. Whether characterized by gender, race, religion, socioeconomic background, ethnicity, or nationality–not to mention academic interests or political persuasion–the University has always taken great pride in the diversity of its students, faculty, and programs.

The Biggest in the Land

Throughout its history, the University of Michigan

Michigan's scale and its national influence can be seen in its commencements with Presidents Bush and Obama.

has also been one of the nation's largest universities, vying with the largest private universities such as Harvard and Columbia during the 19th and early 20th centuries, and then holding this position of national leadership until the emergence of the statewide public university systems (e.g., the University of California and the University of Texas) in the post-WWII years. Perhaps this addiction to growth is best explained by Michigan's president during the 1920s, Marion Burton, when he concluded that, "A state university must accept happily the conclusion that it is destined to be large. If its state grows and prospers, it will naturally reflect those conditions." (Peckham, 1963)

Although growth stabilized during the Depression years of the 1930s, enrollments exploded once again following World War II, growing to 20,000 in 1947, of whom 11,000 were returning veterans. To accommodate the growth of the campus, the Regents first purchased 300 acres north of the Huron River as a North Campus, then later agreed to attach upper division senior colleges to the junior colleges in Flint and Dearborn to accommodate the post-war baby boom population explosion. In 1971, these senior colleges were separated off and given full four-year academic programs as regional campuses of the University. Growth of the Ann Arbor campus began to slow during the 1970s and 1980s, stabilizing at 35,000 students in the mid-1990s. But as state support continued to deteriorate, the University launched yet another major expansion over the first decade of the new century, expanding to 44,000 students in an effort to capture the higher

tuition revenue provided by major growth in out-of-state and international students, while maintaining its commitment to serve Michigan resident students regardless of need.

Today the Ann Arbor campus is the largest in the nation–indeed, in the world–in facilities (35 million gsf), budget ($7 billion/year), and research activity ($1.3 billion/year). The University continues to benefit from one of the largest alumni bodies in higher education, with over 500,000 living alumni. Michigan sends more of its graduates into professional study in fields such as law, medicine, engineering, and business than any other university in the nation. Michigan graduates are well represented in leadership roles in both the public and private sector and in most of the learned professions. The University's influence on the nation and the world has been immense, both through the achievements of the faculty and staff on its campus and of its graduates as they continue on to roles in commerce, service, and leadership.

Michigan Does Big Things!

Michigan students have often stimulated change in our society through their social activism and academic achievements. From the teach-ins against the Vietnam War in the 1960s to Earth Day in the 1970s, to the Michigan Mandate in the 1980s, Michigan student activism has often been the catalyst for national movements. In a similar fashion, Michigan played a leadership role in public service, from John Kennedy's

Leadership in medical education

The first nuclear reactor on a college campus

Leadership in engineering education

A leader in computer development

Leadership in the performing arts

Kennedy's Peace Corps speech at Michigan

announcement of the Peace Corps on the steps of the Michigan Union in 1960 to the AmeriCorps in 1994. Its classrooms have often been battlegrounds over what colleges will teach, from challenges to the Great Books canon to more recent confrontations over diversity and social inclusion. This spirit of democracy and tolerance for diverse views among its students and faculty continues today.

Nothing could be more natural to the University of Michigan than challenging the status quo. Change has always been an important part of the University's tradition. Michigan has long defined the model of the large, comprehensive, public research university, with a serious commitment to scholarship and progress. It has been distinguished by unusual breadth, a rich diversity of academic disciplines, professional schools, social and cultural activities, and intellectual pluralism. The late Clark Kerr, the president of the University of California, once referred to the University of Michigan as "the mother of state universities," noting it was the first to prove that a high-quality education could be delivered at a publicly funded institution of higher learning. (Kerr, 1963)

This deep commitment to academic excellence, broad student access, and public service continues today. In virtually all national and international surveys, the University's programs rank among the very best, with most of its schools, colleges, and departments ranking in quality among the top ten nationally and with several regarded as the leading programs in the nation. Other state universities have had far more generous state support than the University of Michigan. Others have had a more favorable geographical location than "good, gray Michigan." But it was Michigan's unusual commitment to provide a college education of the highest possible quality to an increasingly diverse society–regardless of state support, policy, or politics– that might be viewed as one of the University's most important characteristics. The rapid expansion and growth of the nation during the late 19th and early 20th centuries demanded colleges and universities capable of serving all of its population rather than simply the elite as the key to a democratic society. Here Michigan led the way in both its commitment to wide access and equality and in the leadership it provided for higher education in America.

> Indeed, over the past two centuries the University's unusual autonomy has been the most important characteristic of the University of Michigan, as stated eloquently by Samuel Trask Dana, Dean of the School of Forestry and Natural Resources when he introduced a film, *The Idea of Michigan*, created in 1960 to prepare for the University's 150th anniversary (and to make the case for the importance of the University's constitutional autonomy to the Constitutional Convention of 1961) in which he explained: "Freedom is the "Idea of Michigan" that leads to greatness. Freedom is the seed upon which Michigan was founded. Things happen the way they do because of the seeds from which they spring and the influences that shape their growth. The seeds of ideas grow into great institutions. The University of Michigan has been fortunate in both respects. It has had founders with vision, leaders who were great men, students who were the pick of the land, alumni who were devoted to their alma mater. Above all, Michigan has had freedom, freedom to pioneer, to experiment, to pursue an ideal, to grow into what it is today. It has become great because of its freedom, the idea of Michigan!" (Dana, 1960)

A list of many of the ways that the University of Michigan has contributed to society–on occasion even changing the world, is provided at the end of this chapter.

The Key to Michigan's Leadership

Interestingly enough, both the University's growth and success in building an unusually broad array of world-class programs had little to do with the generosity of state support. For the first half-century following its founding in 1817, the University was supported entirely from its federal land grant endowment and the fees derived from students. During these early years, state government both mismanaged and then misappropriated the funds from the Congressional land grants intended to support the University. (Peckham, 1963) The University did not receive direct state appropriations until 1867, and for most of its history, state support has actually been quite modest relative to many other states. Although there were periods during which state support matched those for other

public universities, such as the 1920s and 1960s when both adequate appropriations and support for facilities became available, these were followed by long periods of deteriorating state support (e.g. the Depression years of the 1930s and then the recessions of the 1970s , 1980s, and 2000s).

More specifically, the strong support of both operating appropriations and capital facilities enabling strong growth of the Ann Arbor campus during the post-WWII years began to slow in the 1960s. The efforts of state government to take over direct control of all campus construction in direct conflict with Regental authority led to a moratorium in state-funded campus construction during the late 1960s and much of the 1970s. The impact of the OPEC oil embargo and the emergence of strong competition from the Japanese auto industry weakened state tax revenues. Although the University and the state shared in the support of the Replacement Hospital Project in the early 1980s, the drain of this mammoth project on the state funds once again severely limited state support for capital facilities.

President Harold Shapiro understood well the longer-term implications of weakening state support (dropping from 65% to less than 30% of the academic budget during his tenure). He moved in the 1980s to put in place a series of major financial measures to sustain the quality and capacity of the University. First a more conservative financial management and investment strategy was implemented, making tough decisions to set priorities, focusing resources to achieve excellence, and beginning a major decentralization of authority and responsibility for resource decisions that was better aligned with both revenue generation and cost containment. As the state subsidy of the costs of educational programs declined, it was necessary to compensate with major increases in tuition, highly differentiated between Michigan resident and out-of-state students. Finally, aggressive fund-raising efforts were launched with campaigns raising over $300 million during the 1980s and $1.4 billion in the 1990s. More aggressive efforts were taken to actively manage the University's endowment, increasing it from a modest $200 million during the 1980s to over $2.5 billion by the late 1990s.

As a consequence of these actions, the financial strength of the University rose dramatically even as state support declined to less than 10% of its total operating budget. In fact by 1997 the University of Michigan earned Wall Street's highest AAa credit rating, joining the University of Texas (with its rich oil assets) as the only public universities to achieve this. It would be this unusually high credit rating

President Harold Shapiro

that would allow the University to borrow at minimum interest rates the resources to sustain further campus facility expansion and renovation, despite the fact that the state support would continue to decline to one of the lowest levels in the nation (dropping to 47th among the states by 2010). Yet even as the University became predominantly supported by private resources (tuition revenue, private gifts, and endowment earnings) and federal grants (for research and student financial aid), it was able to sustain its strong commitment to serve both the needs of the state and the nation. As Frank Rhodes, a former Michigan dean and provost before becoming president of Cornell put it, Michigan had become the prototype of a "privately financed but publicly committed" university, a description that characterizes many of the nation's leading public research universities today.

The real key to the University's quality and impact over its two centuries of history has certainly not been support by the State of Michigan, but rather the very unusual autonomy granted the institution by the state constitution of 1851 as a "coordinate branch of state government". This unusual characteristic of constitutional autonomy for the young university not only arose from the concerns of a frontier state about the role of government but also reflected the importance of freedom as a key Enlightenment theme embraced by Jefferson and his colleagues in defining the early structure of the republic and later became an important founding principle of the Northwest Ordinance that led to the creation of the University.

This constitutional autonomy, together with the fact that the University traces its origins to an act of Congress rather than a state legislature, has shaped an important feature of the University's character. Throughout its history the University has regarded itself as much as a national university as a state university, as exemplified by the declaration of its early Regents:

"The University of Michigan is indebted for its existence of the munificence of Congress, in the redemption of its solemn pledge given to the whole Northwest that 'schools and the means of education should forever be encouraged', and to keep up the mutual good feeling between our State and the General Government in which the endowment of the University originated. The doors of all its Departments are open to students from every State in the Union, upon the same terms as to those of our own State; so that it may, in some sense, with propriety, be styled a National Institution, and every State in the Union has an interest in its prosperity." (Regents Minutes, 1859)

Furthermore, Michigan's constitutional autonomy, periodically reaffirmed through court tests and constitutional conventions, has enabled the University to have much more control over its own destiny than most other public universities. (Peckham, 1963)

The University has always been able to set its own goals for the quality of its programs rather than allowing these to be dictated by the vicissitudes of state policy, support, or public opinion. Put another way, although the University is legally "owned" by the people of the state, it has never been obligated to adhere to the priorities or whims of a particular generation of Michigan citizens. Rather, it has been viewed as an enduring social institution with a duty of stewardship to commitments made by generations past and a compelling obligation to take whatever actions were necessary to build and protect its capacity to serve future generations. Even though these actions might conflict from time to time with public opinion or the prevailing political winds of state government, the University's constitutional autonomy clearly gave it the ability to set its own course. When it came to objectives such as program quality or access to educational opportunity, the University of Michigan has always viewed this as an institutional decision rather than succumbing to public or political pressures.

The Michigan Saga

What might be suggested for the University of Michigan institutional saga in view of the University's history, its traditions and roles, and its leadership over the years? Among the possible candidates from Michigan's history are the following characteristics:

The Catholepistemiad or University of Michigania (the capstone of a system of public education)

The flagship of public universities or "mother of state universities"

A commitment to providing "an uncommon education for the common man"

The "broad and liberal spirit" of its students and faculty

The University's control of its own destiny, due to its constitutional autonomy providing political independence as a state university and to an unusually well-balanced portfolio of assets providing independence from the usual financial constraints on a public university

An institution diverse in character yet unified in values

A relish for innovation and excitement

A center of critical inquiry and learning

A tradition of student and faculty activism

A heritage of leadership

The leaders and best" (to borrow a phrase from Michigan's fight song, *The Victors*)

But one more element of the Michigan saga seems particularly appropriate during these times of challenge and change in higher education. It is certainly true that the vast wealth of several of the nation's elite private universities–e.g., Harvard, Yale, Princeton, and Stanford–can focus investments in particular academic areas far beyond anything that Michigan or almost any other university in the nation can achieve. They are capable of attracting faculty and students of extraordinary quality and supporting them with vast resources.

Yet, Michigan has one asset that these universities

will never be able to match: its unique combination of quality, breadth, scale, and spirit. This enables Michigan to take risks far beyond anything that could be matched by a private university. Because of their relatively modest size, most elite private universities tend to take a rather conservative approach to academic programs and appointments, since a mistake could seriously damage a small academic unit. Michigan's vast size and breadth allows it to experiment and innovate on a scale far beyond that tolerated by most institutions, as evidenced by its long history of leadership in higher education. It can easily recover from any failures it encounters on its journeys along high-risk paths. This ability to take risks, to experiment and innovate, to explore various new directions in teaching, research, and service, enables Michigan's unique role in American higher education. During a time of great change in society, Michigan's most important institutional saga is that of a pathfinder and a trailblazer, building on its tradition of leadership and relying on its unusual combination of quality, capacity, and breadth, to reinvent the university, again and again, for new times, new needs, and new worlds.

Here, perhaps we should be more precise in our choice of descriptors: *pathfinders* are those who identify new directions; *trailblazers* explore the new pathways; *pioneers* build the roads along the new paths that others can follow; and *settlers* occupy the new territory. (Cheri Pancake, 2003) Hence we suggest that Michigan should be viewed first and foremost both as a pathfinder and a trailblazer, identifying possible paths into new territory and blazing a trail for others to follow. Michigan has also been at times a pioneer, building roads that others could follow (e.g., the Internet).

Whether in academic innovation (e.g., the quantitative social sciences), social responsiveness (e.g., its early admission of women, minorities, and international students), or its willingness to challenge the status quo (e.g., teach-ins, Earth Day, and the Michigan Mandate), Michigan's history reveals this pathfinding and trailblazing character time and time again. Recently, when Michigan won the 2003 Supreme Court case concerning the use of race in college admissions, the general reaction of other colleges and universities was "Well, that's what we expect of Michigan. They carry the water for us on these
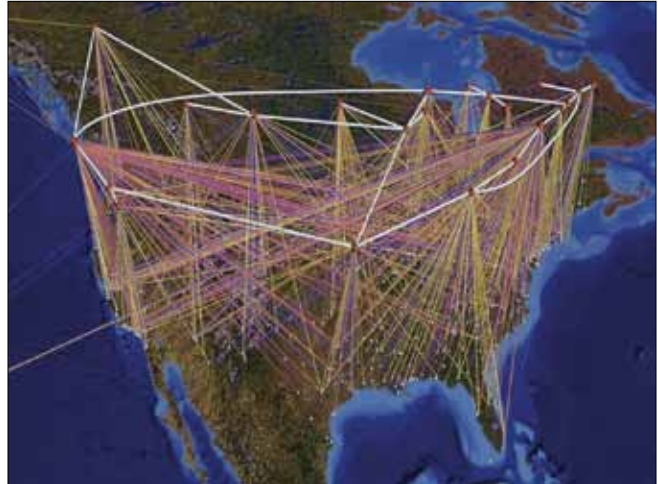
Michigan does BIG things...such as build and manage both the Internet and Internet2.

issues." When Michigan, together with IBM and MCI, built NSFnet during the 1980s and expanded it into the Internet, this again was the type of leadership the nation expected from the University.

Continuing with the frontier analogy, while Michigan has a long history of success as a pathfinder, trailblazer, and occasional pioneer, it has usually stumbled as a settler, that is, in attempting to follow the paths blazed by others. All too often this leads to complacency and even stagnation at an institution like Michigan. The University almost never makes progress by simply trying to catch up with others.

Michigan travelers in Europe and Asia usually encounter great interest in what is happening in Ann Arbor, in part because universities around the world see the University of Michigan as a possible model for their own future. Certainly they respect—indeed, envy— distinguished private universities, such as Harvard and Stanford. But as public institutions themselves, they realize that they will never be able to amass the wealth of these elite private institutions. Instead, they see Michigan as the model of an innovative university, straddling the characteristics of leading public and private universities.

Time and time again colleagues mention the "Michigan model" or the "Michigan mystique." Of course, people mean many different things by these phrases: the University's unusually strong and successful commitment to diversity; its hybrid funding

model combining the best of both public and private universities; its strong autonomy from government interference; or perhaps the unusual combination of quality, breadth, and capacity that gives Michigan the capacity to be innovative, to take risks. Of course, all these multiple perspectives illustrate particular facets of what it means to be "the leaders and best."

The institutional saga of the University of Michigan involves a combination of quality, size, breadth, innovation, and pioneering spirit. The University has never aspired to be Harvard or the University of California, although it certainly admires these institutions. Rather, Michigan possesses a unique combination of characteristics, particularly well suited to exploring and charting the course for higher education as it evolves to serve a changing world.

And it is this unique character as a pathfinder, trailblazer, and pioneer that should shape the University's mission, vision, and goals for the future. Such bold efforts both capture and enliven the institutional saga of the University of Michigan. And these are the traits that must be recognized, honored, and preserved as the University enters its third century.

UM Does Big Things!

Ways in which the University of Michigan has changed the world:

(1817) Catholepistimead or University of Michigania (in Detroit with Michigan Territorial Land Grant)

(1837) University moves to Ann Arbor; Michigan achieves statehood.

(1845) Alpha Epsilon chapter of Chi Psi Fraternity: first fraternity house in the nation.

(1850s) First effort to build a true "university" (rather than a "college") in America similar to those emerging in Europe (von Humboldt), secular in character with a balance between teaching and research, as evidenced by the construction of the Detroit Observatory, the third largest observatory in the world (Tappan)

(1856) First university building designed and equipped solely as a chemical laboratory

(1859) First university to introduce moot courts in law curriculum

(1860s) First university to own and operate its own hospital

(1868) Alumnus Joseph Beal Steere, naturalist, explorer, educator; set off in 1870 on a five-year exploration around the world, particularly on the Amazon River and later in the Philippines, where he discovered many previously unknown species of flora and fauna

(1869) Alumnus Charles F. Brush earned recognition as the "Father of the Arc Electric Lighting Industry" for his many inventions

(1870s) Created secondary school system (Henry Frieze)

(1870) The first large university to admit women.

(1871) Introduced the seminar method of teaching

(1873) Alumnus John Harvey Kellogg developed and advocated the eating of a dry breakfast cereal, from which came the flaked cereal product that led his brother to found the famed Kellogg cereal brand in 1906

(1870s-1890s) Developed and taught the first courses in new disciplines such as bacteriology, forestry, meteorology, sociology, modern history, journalism, and American literature, modern languages, pharmacy, speech, forest administration, sanitary science, science and art of teaching

(1880s) One of a handful of early leaders in the reform of U.S. medical education

(1880s) Leadership in introducing new disciplines of engineering: naval architecture, marine engineering (1881), aeronautical engineering (1916), automotive engineering (1913), transportation engineering (1922)

(1893) Alumna Alice Hamilton, a specialist in lead poisoning and industrial diseases, was known as the "Mother of Industrial Health." Her work led to a state law requiring medical examinations and various safety procedures in the workplace

(1900) Moses Gomberg, U-M professor of chemistry, discovered organic free radicals

1900s: Microbiology: development of culture techniques for parasites and spirochetes (Frederick George Novy)

(1905) Built the first naval architecture towing tank and model basin.

(1915) First degrees in public health (together with Harvard)

(1915) Alumni E. C. Sullivan and H. W. Hess, invented several new forms of glass, including Pyrex, "Daylight Glass" and chemical-resistant glassware, which helped relieve shortage of German-made glassware during Word War I

(1919) The first student union (the Michigan Union)

(1924) Development of iodized salt to wipe out endemic goiter (David Cowie)

(1929) First courses in data processing

(1920s and 1930s) Summer physics conferences on quantum mechanics

(1930s) Development of electrocardiogram or EKG (Frank N. Wilson)

(1931) Created the first Alumni University

(1934) First Bureau of Industrial Relations

(1939) Development of plan for voluntary health insurance (Nathan Sinai)

(1940s) William Dow led Allied scientists in the design and construction of a 125-ton jamming device used to disable German and Japanese radar systems.

(1944) Development of influenza vaccine for U.S. Army (Thomas Francis, Jr.)

(1945) Bureau of Public Health Economics established in UM School of Public Health as primary source of archival information on medical care

(1940s) Alumnus Kelly Johnson, working for Lockheed, he established the legendary Lockheed Skunk Works and created the P-38, the F-104, the U-2 and the SR-71 Blackbird during a remarkable 40-year career.

(1940s) James V. Neal discovery that defective genes cause sickle cell anemia

(1947) Own and operate a large commercial airport (Willow Run Airport)

(1950s) First university program in peaceful uses of atomic energy (Phoenix Project)

(1950s) First degree program in nuclear science and engineering

(1950s) Developed first major programs in quantitative social sciences (Survey Research Center)

(1958) Built and operated the largest nuclear reactor on college campus (1 MW Ford Nuclear Reactor)

(1960s) Lawrence Klein develops econometric models (Nobel Prize)

(1950s) William Beierwaltes develops the use of I-131 in nuclear medicine using UM's Ford Nuclear Reactor

(1950s and 1960s) Developed the first university-based programs in rocketry and guided missile technology for the Air Force

(1960s) Became a major astronaut training center

(1960s) The Apollo 15 mission had an all Michigan crew (and a car) on the moon

(1950s) Developed first degree program in computer engineering

(1953) Jonas Salk, research associate and fellow in the U-M School of Public Health from 1940-44, developed an effective polio vaccine.

(1954) Donald Glaser, developed in 1954 the world's first liquid bubble chamber to study high-energy subatomic particles and won the Nobel Prize in physics for his invention in 1960

(1955) Clinical trials for Salk vaccine for polio (Thomas Francis)

(1957) Chihiro Kikuchi, professor of nuclear engineering, developed the ruby maser, a device for amplifying electrical impulses by stimulated emission of radiation

(1957) Alumnus John Sheehan, pioneered development of synthetic penicillin, the life-saving antibiotic discovered in 1928 and developed ampicillin, a semi-synthetic penicillin taken orally.

(1958) Faculty member C. Wilbur Peters and Lawrence

E. Curtis developed a fiberoptic technique leading to medical endoscopy technology.

(1959) First program in engineering meteorology and later atmospheric science

(1960) First program in computer and communications science

(1964) Alumnus Jerome Horwitz, an organic chemist at Michigan Cancer Foundation, synthesized the drug AZT, which is used to fight AIDS.

(1960s, 1980s) Peace Corps and later Americorps announced at UM

(1960s) Developed time-sharing computing (MTS with IBM)

(1960) First courses in thermonuclear fusion for AEC

(1962s) Developed laser holography (Emmett Leith and Juris Urpatnieks)

(1962) Center for Research on Learning and Teaching is first research center on university teaching.

(1963) First university research institute on hearing and deafness (Kresge Hearing Research Institute)

(1964) Center for Education of Women (CEW), the first center focused on enabling the continuing education of women (Jean Campbell and Louise Cain)

(1960s-1970s) Willow Run Labs development of satellite remote sensing

(1968) Alumnus Marshall Nirenberg shared the 1968 Nobel Prize in medicine and physiology for cracking the genetic code

(1968) John G. Wagner, professor of pharmacy, began to develop pharmacokinetics, a field that uses mathematical models to study the body's metabolism of drugs, and to determine safe dosage levels

(1969) Richard C. Schneider, professor of neurosurgery, co-patented a football helmet with an inflatable inner lining that is designed to reduce head injuries

(1970s) MERIT Computer Network (Eric Aupperle)

(1970s) Discovery that CFCs cause Ozone Hole (Ralph Cicerone)

(1972) Founding of the nation's first Anxiety Disorders Program (George Curtis)

(1976) Alumnus Samuel C. C. Ting shared the 1976 Nobel Prize in physics for co-discovering a subatomic structure called the J particle

(1980s) NSFnet and the Internet (with IBM and MCI) (Doug Van Houweling, Eric Aupperle)

(1980s) Development of Photoshop and software for

digital photography (Tom and John Knoll)

(1982) Discovery that Venus seas were lost to greenhouse gases (Thomas Donahue)

(1980s) Computer-Aided Engineering Network (Richard Phillips, Daniel Atkins)

(1985) Key Study and Senate testimony on health implications of tobacco (Kenneth Warner); Tobacco Research Network established in 1999

(1985) Alumnus Richard Smalley , along with two other scientists, won 1996 Nobel Prize in chemistry for the 1985 discovery of a form of the carbon element in the faceted shape of a soccer ball called fullerene

(1986) Alumnus Stanley Cohen was co-winner of the 1986 Nobel Prize in medicine for discovering growth factors (proteins regulating cell growth) in human and animal tissue.

(1987) Development of high-power chirped-pulsed lasers (Gerard Mourou)

(1987) Douglas Richstone, professor of astronomy, discovered evidence for massive black holes in the Andromeda Galaxy and its satellite galaxy M32

(1988) Art Rich and James Van House develop positron microscope

(1990) Avedis Donabedian developed the statistical model paradigm for ranking hospitals and health care facilities

(1990s) Francis Collins identifies gene for cystic fibrosis and neurofibromatisis

(1990s) Developed JSTOR project for the Mellon Foundation (Randy Frank, Daniel Atkins)

(1990s) NSF Digital Library Project

(1990s) First School of Information (and informatics program) (Dan Atkins)

(1996) Created the Media Union (aka Duderstadt Center) to explore paradigms for the future of higher education.

(1997) Developed technology for operating research nuclear reators on low-enrichment (non-weapons-grade) uranium to secure nonproliferation (John Lee)

(1998) Mark Burns headed 1998 multidisciplinary team that created miniature "laboratory on a chip" for the analysis of DNA samples

(1999) Alumnis Tony Fadell creates the iPod (and subsequent mobile devices such as the iPhone).

(2003) FDA approves FluMist nasal flu vaccine developed at the School of Public Health (Hunein "John"

Maassab)

(2000s) Alumnus Larry Page creates Google, the nation's leading search engine

(2004) UM Libraries as leader in Google Book project

(2006) Created first University National Depression Center (John Greden)

(2008) Created and managed the HathiTrust (world's largest digital library) (John Price Wilkin, Paul Courant)

(2010) Involvement of SPH on Genome Wide Association Studies identifying key (druggable) targets for widespread and orphan disease (Goncalo Abecasis and Mike Boehnke)

(2010) SPH and UM Cancer work on understanding responses to chemotherapies.

Chapter 3

The University of Michigan Today

As we stressed in Chapter 2, long-enduring institutions such as universities need to begin with an understanding of their history, traditions, and values, i.e., their institutional saga. A university cannot escape reckoning with its history, especially when it comes to developing a planning process. For example, a consideration of both the fundamental public purposes and values of the institution is essential–e.g., questions such as whether these have these been followed; and have they changed over time. Equally important is an assessment of the availability and deployment of resources—human and physical, tangible and intangible—as the outcome of dynamic processes occurring over time. It is important always to consider the evolutionary path that has brought the University to its current situation. These form the initial conditions for any planning process.

Beyond this, it is important to gain an understanding of possible constraints that might restrict planning options, since these might be challenged and relaxed. In U-M's case, a faltering Michigan economy that is no longer able to support a world-class public research university is clearly a serious concern. But so, too, are an array of demographic issues, such as the need to serve underrepresented minority communities and to embrace diversity as key to our capacity to serve an increasingly diverse state, nation, and world. Michigan's long history of international activities positions us well to address the growing trends of globalization, just as the university's leadership in developing and implementing new technologies, such as the Internet, has given us a good perspective of technological change.

## Michigan Today: By the Numbers

Data and other indicators characterizing the University of Michigan today can be found in recent University publications such as the *Michigan Almanac*. (Schweitzer, 2015) We have summarized this material in this section taken directly from this resource (indicated in blue).

Academic Programs

The University of Michigan has grown to include 19 schools and colleges covering the liberal arts and sciences as well as most professions. The fall 2015 enrollment of undergraduate, graduate and professional students was 43,625. The current faculty consists of 3,051 individuals who are tenured or on a tenure-track. Lecturers, clinical faculty, research professors, librarians, archivists, and post-doctoral fellows add 3,801 bringing the total academic staff to the Ann Arbor campus 6,852. The staff count is 14,003, bringing the total personnel to 20,855. The FY2014 operating revenues from the state appropriation, tuition, research grants and contracts, gifts and other sources reached $3.37 billion for the Ann Arbor campus. The U-M Health System revenues added $3.0 billion for a grand total of $6.37 billion. (The projected budget for 2015 is $7.1 B.) According to the latest national data, the U-M expenditures on research–$1.3 billion in FY2014 – represent more than any other U.S. university. The U-M provides housing to 9,300 undergraduate students in 18 residence halls and apartment buildings. Graduate students are accommodated through 1,100 apartments in the Northwood housing complex.
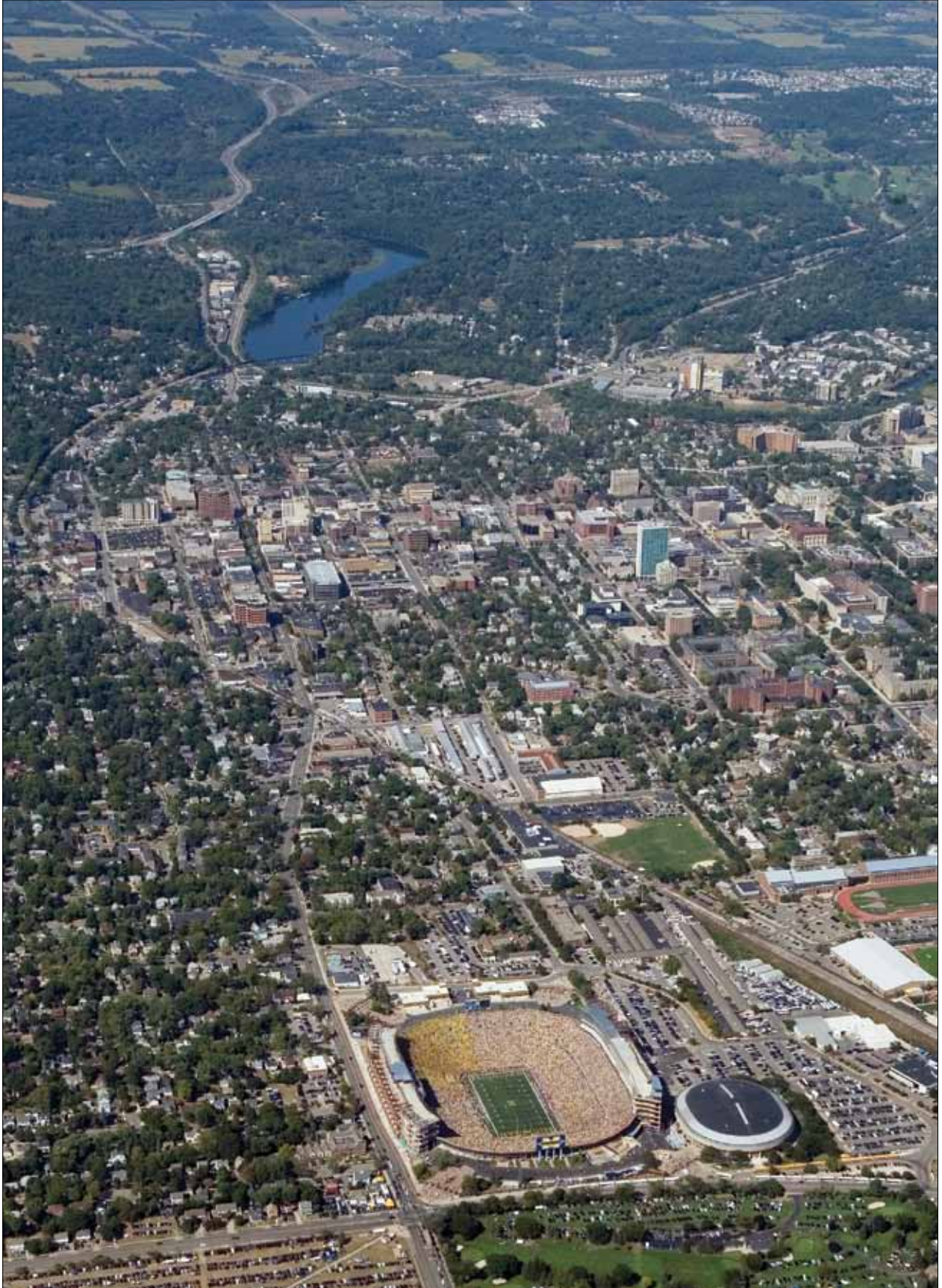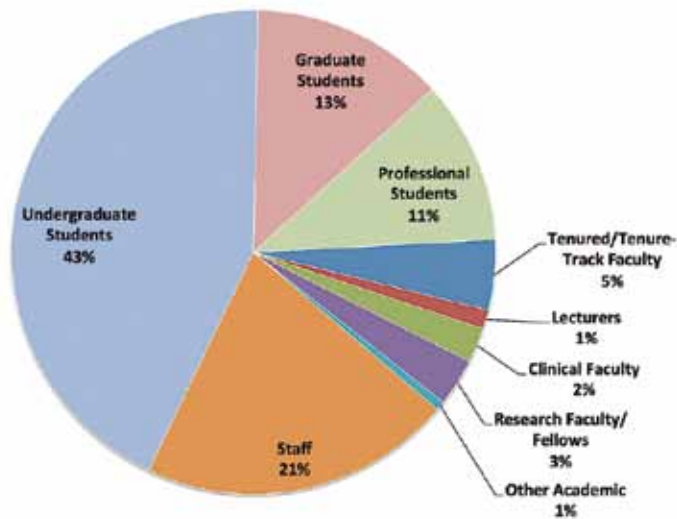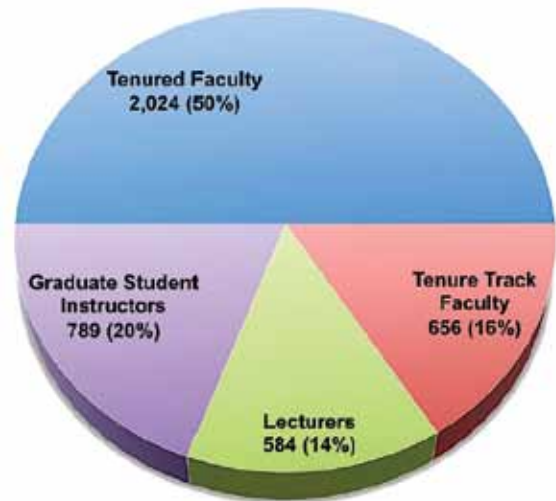
Composition of UMAA Community

Composition of UMAA Faculty

In 2014 the University enrolled 28,395 undergraduate students and 15,332 graduate students, including 6,831 in professional degree programs, 3,172 in masters programs, and 5,329 in academic doctorate programs.

Undergraduate Students

A central priority for the University is access; its goal is to enable qualified students to attend regardless of socioeconomic background. For a number of years, the U-M has provided financial aid packages that meet full cost of attendance to admitted students from Michigan. Freshmen application numbers have nearly doubled since 2004, growing to 49,776 in 2014 due in part to the switch to the Common Application. As a highly selective institution, U-M offers admission to fewer than half of those who apply. The size of the enrolling freshmen cohort has hovered around 6,000 for the past five years, which met or exceeded annual targets. The U-M offers more than 250 academic programs for undergraduates, opportunities for international study, more than 1,200 student clubs, 26 NCAA Division I teams, and art and theatre offerings by and for students and professionals. The University actively pursues students from the state of Michigan, the nation and around the globe. In 2014, the 28,395 undergraduate students on campus came from 82 of 83 Michigan counties, all 50 states, and 90 countries. 59% of currently enrolled undergraduates are in-state students. The diverse origins, backgrounds and experiences found in every entering class contribute to the varied interests and characteristics of the student body.

More than two-thirds of Michigan undergraduate students complete their first degree within four years of enrolling as freshmen. After six years, that figure is nearly 90 percent. University of Michigan students' completion rates are 20 percentage points higher than the average of public Association of American Universities (AAU) member institutions. U-M undergraduates are surveyed during their senior year and report very positive opinions of the University as a whole and of their individual academic programs. Ninety percent of seniors surveyed say that if they had it to do over, they would attend the University of Michigan again. Lastly, nearly half of all undergraduates continue their academic careers by enrolling in graduate or professional school within four years of completing a degree at the U-M.

The University of Michigan is a firm proponent of the educational value provided by a diverse, multicultural and inclusive campus community. Although the U.S. Supreme Court ruling in 2003 on the Admissions lawsuits and the 2006 passage of Proposal 2 put limits on the University's actions, the U-M remains committed to fostering racial, ethnic, gender and socioeconomic diversity at the institution by all legal means possible.

Graduate and Professional Students

The University of Michigan offers a remarkably

The University of Michigan seeks a balance between teaching and research.

broad and rigorous array of graduate and professional degree programs that are among the very best in the country in each field of study. The University attracts outstanding students to graduate study, and prepares them to make lasting contributions to society through successful careers in professions and academic disciplines. Interdisciplinary study and joint degrees are a special strength of the University. The vibrant community of graduate and professional students on campus is highly diverse in citizenship, demographic background, and intellectual perspective.

The Horace H. Rackham School of Graduate Studies oversees graduate academic education in partnership with the schools and colleges. For fall 2014, the University enrolled 8,501 students in 108 Ph.D., 87 master's, and 33 graduate-level certificate programs offered by the University's schools and colleges. In addition to obtaining an education, graduate students contribute significantly to the conduct of research, scholarship and teaching on campus. The research enterprise at the U-M benefits enormously from the talent and intelligence of these students.

Another 6,831 students enrolled in professional degree programs in medicine, law, business, public health, dentistry, pharmacy, nursing, information, engineering, social work and architecture and urban planning in fall 2014. The schools or colleges administer these degree programs in keeping with each profession's requirements and standards. Compared to its peers, the University of Michigan awards a high number of graduate and professional degrees. Among its peers, only the combined total of Columbia University's advanced degrees is higher than Michigan's.

Post-graduation plans vary along disciplinary lines. Ph.D. graduates in the humanities and the arts often find academic positions immediately after graduating. Graduates in the biological, physical and social sciences frequently take a postdoctoral training position before moving into other employment. Industry positions attract a large number of graduates from engineering and the physical sciences. U-M's international students tend to remain in the U.S. after graduation, probably reflecting the kind and number of opportunities available in this country for those holding advanced degrees. In several professions, prospective practitioners must pass one or more examinations before becoming a full member of his or her chosen career; U-M students in medicine, law and dentistry have high pass rates.

Faculty and Staff

A great university is defined in large part by its outstanding faculty. The University of Michigan attracts faculty members with commitment to excellence in both teaching and research, as shown by the high quality of its graduates and the superior research and scholarship by its faculty. The faculty headcount at the University of Michigan is 6,852 while the total of faculty full-time equivalents (FTEs) is 5,757. Instructional appointments comprise 3,293 FTEs, and another 2,460 FTEs are

individuals with clinical, research and other titles who are primarily involved in health care, research, and related scholarly activities.

U-M faculty members are primarily involved in teaching, research and scholarship. However, the faculty also have service responsibilities to the university and broader academic community and society at large, as well as administrative duties and an important role in setting academic policies for admissions, the granting of degrees, and the content of the curriculum. The staff of the University currently number 13,475 and play key roles in the efficient and productive operation of nearly all facets of the University. Staff members are involved in the conduct and administration of research; they provide academic, housing, and other services for students; handle financial operations of the institution; manage the physical and digital infrastructure of the campus; and monitor the many federal, state, and professional compliance rules the institution must follow.

Research

Excellence in research and scholarly activity is a central tenet of the University of Michigan's mission. The broad scope and overall size of the U-M's research program, along with its emphasis on interdisciplinary approaches, contributes to Michigan's standing as one of the world's leading research universities. As such, the faculty attracts generous financial support from the public and private sectors. Total research expenditures by the University exceed $1.32 billion per year. However it is important to note that more than 70 percent of the money that the University spends on research in any given year is funding provided by outside sources. The biggest share of that research funding comes from the federal government. When research funding from all sources is counted, U-M ranks No. 1 in the nation among all universities. The University's largest fraction of grant-supported work occurs in the biomedical and clinical sciences. The U-M Medical School alone regularly attracts several hundred millions of dollars each year to support research by its faculty. In 2013, the Medical School's $302 million in new grant funding was 11th highest of all U.S. medical schools.

Space

The physical plant of the University of Michigan's Ann Arbor campus is extensive (in 2015 numbers):

35 M gsf of buildings and core infrastructure
601 buildings, 2,125 classrooms and labs
900 study rooms, and 6,300 labs
7 miles of utility tunnels
150 miles of fiber optic cables
137,200 networked desktop computers
660 elevators and escalators
25 miles or roads
4.7 M sf of sidewalks, steps, and plazas
280 acres of parking lots and decks
16,100 trees and 13 M sf of turf

Space utilization guidelines have been established for classrooms, food services, research activities, and offices. In particular, effective classroom scheduling is critical to the academic mission of the University.

Academic Characteristics

The Organization of Academic Programs

The usual Copernican view of the solar system of the university would place the liberal arts college and its core academic disciplines as the sun, the four inner planets as the most powerful professional schools—Medicine, Engineering, Law, and Business—and then a series of elliptical orbits for the remaining professional schools, depending upon their quality and priority within a particular institution. Actually, some universities have evolved almost into a binary star system in which the medical center has assumed a size and financial importance almost comparable to that of the rest of the university. Some of my liberal arts colleagues suggest that a more appropriate astronomical metaphor would be that of the university as a star orbiting about a gigantic black hole created by the gravitational collapse of the University Hospital and the Athletic Department.

It is useful to consider a somewhat different model: At the center of the university solar system would be the University Library and the Graduate School (at

Operating Revenues (inc Hospitals)

Operating Revenues (w/o Hospitals)

UM Total Budget (including hospitals)

UM Academic Budget (without hospitals)

UM Budget Revenue (2014)

UM Budget Planned Expenditures (2014)

The Central Campus

Aerial of the Central Campus

Aerial of the Central Campus Residence Halls

Aerial of the North Campus

Aerial of the Medical Campus

Aerial of the Athletic Campus

The goal: spires of excellence

U-M, posed strategically on either end of Ingalls Mall running through the core of our Central Campus). This, of course, is the contemporary remnant of the medieval university, the *Universitas Magistrorum et Scholarium*, the union of scholars and masters both mastering and extending knowledge. Then the nearest four planets, where one at least has a chance of finding life, would be the liberal arts: the humanities, the arts, the natural sciences, and most recently the social sciences. Still farther out are the gas giants, the four large professional schools: medicine, law, engineering, and business. Finally, there is a range of other planet-like disciplines…some very similar to the liberal arts (e.g., the performing and visual arts), some that behave like comets (e.g., public policy, information sciences), and some that appear to be remnants of ancient university activities (e.g., kinesiology as the remnant of physical education).

With a very good telescope, one might even see possible signs of life a light year away from the sun, from the so-called Oort Cloud, where has-been presidents are exiled and only visible when they launch an occasional comet to rattle around the inner planets to shake things up a bit (such as this book).

Spires of Excellence

Michigan's character as leader through its pathfinding and trailblazing also requires it to build spires of excellence in key fields, rather than trying to achieve a uniform level of lesser quality across all of its activities. Only by attempting to be the best in these fields can we develop in our students, faculty, and staff the necessary intensity and commitment to excellence. Furthermore, only by competing with the best can it establish appropriate levels of expectation and achievement.

It must be stressed here that it is not the University's goal to build a few isolated spires of excellence in the manner of smaller private universities. Rather, it seeks to achieve within each of its academic units–its schools, departments, centers, and institutes–a number of spires of focused excellence. In other words, the general level of quality in each of our academic units can be achieved through the development of a series of sharply focused peaks of excellence within the units. Thus, even for those programs where the University is unable to provide the resources to be national leaders, it aspires to achieve some peaks of extraordinary excellence through the focusing of resources. It is determined to make every effort to avoid mediocrity, but constrained resources suggest that it will inevitably have some areas that were very good as opposed to excellent.

The theme of pathfinding leadership influences the focus of emphasis within Michigan's traditional endeavors of education, scholarship, and service. For example, it requires that the University become even more committed to the concept of a liberal education for its students. The development of leaders among its students demands challenging intellectual experiences, both in formal instruction and in the extracurricular environment.

Of course while learning and scholarship have long been viewed as missions of the university, so too has been the creation of new knowledge across all intellectual and professional disciplines, since this is one of the most important missions of the research university. Developing new approaches to scholarship, great works in literature and the arts, ingenious approaches to investigating physical and social phenomenon, these have long been the goal of most scholars.

But here we need to think more strategically about how to provide the opportunities for such creative work to our existing faculty. Today much of the exciting new work occurs across disciplinary boundaries, so we must take care that our academic organizations and constraints on faculty scholarship and teaching do not hinder such efforts. The University's faculty should be encouraged to work in seminal, cross-disciplinary areas where extraordinary insight and intellectual breadth can lead to the creation of entirely new fields of knowledge. So, too, this intellectual breadth should be an important characteristic of many of the new faculty members that the University hires.

The University continues to have important service roles. Leadership requires that such activities be justified as important experiences for its students and faculty, as models to be propagated to other institutions, and as sources of important questions for basic investigation.

The Link Between Quality, Breadth, and Scale

The quality of the University of Michigan academic programs is the most fundamental determinant of its ability to develop and maintain leadership. However, a comprehensive and diverse array of intellectual, social, and cultural experiences is also important for its leadership role in higher education. And, the scale of our programs not only contributes to the richness and quality of the University (e.g., the size and quality of central resources such as libraries, computing networks, and athletic facilities), but it also determines its potential impact on society.

Rather than viewing the quality, breadth, and scale of the University as competing objectives–or possibly even as constraints on what it can accomplish within a world of limited resources–instead these characteristics, when linked together creatively, can provide an unusual opportunity. By building leadership in an environment that demands commitment to all three characteristics, with a particular stress on academic excellence, it can distinguish the University from other institutions that tend to focus on only one of these factors.

For example, highly selective private institutions sometimes sacrifice breadth and size in an effort to achieve absolute excellence in a small number of fields. This results in institutions highly focused in an intellectual sense, which while certainly capable of conducting distinguished academic programs, are nevertheless unable to provide the rich array of opportunities and diverse experiences of "multiversities" such as Michigan. At the other end of the spectrum, the University can also set itself apart from many other large, comprehensive public universities by the degree to which it chooses to focus its resources on academic quality.

The Intellectual Character of Teaching, Research, and Service

The theme of pathfinding leadership also influences the focus of emphasis within Michigan's traditional endeavors of education, scholarship, and service. In order to develop leaders among its faculties, at least some fraction of its scholarship needs to be shifted to venturesome intellectual activities at the cutting edge of inquiry. Some of the University's faculty should be encouraged to work in seminal, cross-disciplinary areas where extraordinary insight and intellectual breadth can lead to the creation of entirely new fields of knowledge.

The development of leaders among its students demands challenging intellectual experiences, both in formal instruction and in the extracurricular environment. Key in these endeavors is the concept of a liberal education. Michigan's former president Harold Shapiro defines such an objective as "The need to better understand ourselves and our times, to discover and understand the great traditions and deeds of those who came before us, the need to free our minds and our hearts from unexamined commitments, in order to consider new possibilities that might enhance both our own lives and build our sympathetic understanding of others quite different from us; the need to prepare all

Michigan students in search of a liberal education

thoughtful citizens for an independent and responsible life of choice that appreciates the connectedness of things and peoples." (Shapiro, 1988)

The foundation for educational objectives are the liberal arts, originally identified by the disciplines of the *trivium* (grammar, logic, and rhetoric) and later the *quadrivium* (geometry, arithmetic, astronomy, and music). However, to these each age added further to the liberal arts, e.g., the humanities, the physical and biological sciences, and the social sciences in the 19th and 20th century. As Shapiro notes, additional objectives have also been added to the concept of a liberal education, such as freeing of the individual from previous ideas, the disinterested search for truth, the pursuit of alternative ideas, the development of the integrity of the individual, and the power of reason.

To be sure, the notion of a liberal education for the 21st Century will be different than that characterizing our times. Yet, as difficult as it is to define and as challenging as it is to achieve, perhaps the elusive goal of liberal learning remains the best approach to prepare students for a lifetime of learning and the capacity to both adopt to and occasionally drive change.
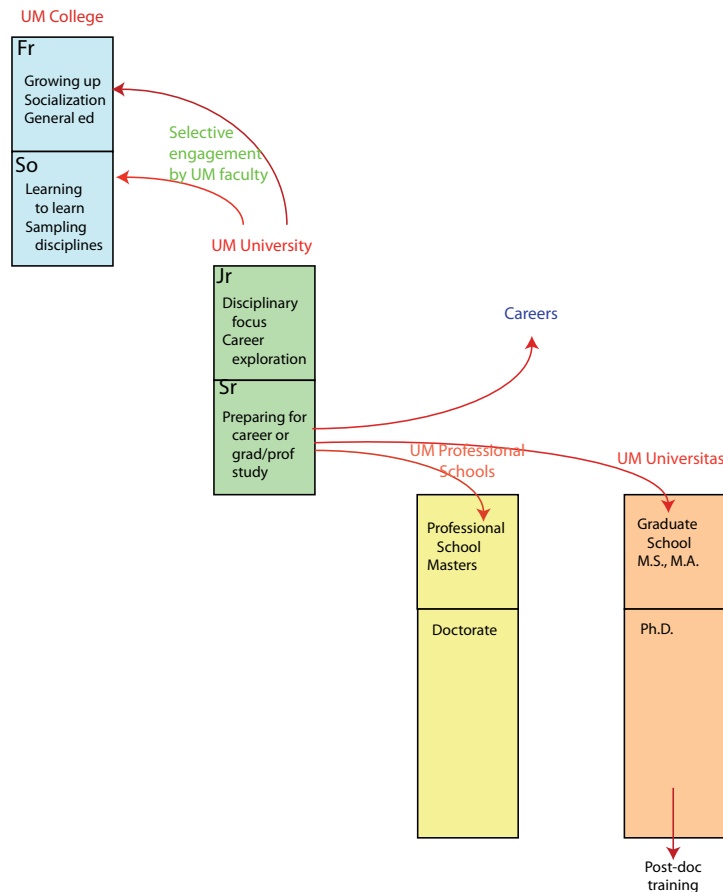
Today's students will enter an increasingly complex, changing, and fragmented world. Too many undergraduates channel their energies into pre-professional and more narrowly vocational directions. The challenge is to cultivate among undergraduates a greater willingness to explore and to discover–to assist undergraduates to develop critical, disciplined, and inquiring minds.

For Michigan, the challenge is even greater. On the one hand, the strength of its professional schools and the strong research and scholarly orientation of our faculties should not be compromised. On the other hand, the University needs to generate a fresh commitment to cultivating a spirit of liberal learning among its undergraduates and its faculties, to encourage major efforts to improve the quality of teaching and learning. The University attempts to provide resources to ensure that these efforts can go forward in an atmosphere of continuous experimentation–of intelligent trial and error. Broad faculty participation is essential, and the unprejudiced testing of alternative ideas can be expected to generate vigorous debate. This is as it should be, since the stakes are high. The University aims to prepare its students not merely to function in our complex society, but to serve as leaders shaping society's future directions.

Similarly, leadership requires a major re-examination of the role of graduate studies and professional education within the University. It is important to understand better how these programs respond to the needs of both students and society and how they relate to our undergraduate instruction.

The Flow of Students

Yet, even as the university continues to grow and diversify as it evolves, one must always remember that at its core are its academic programs. One might describe the academic programs of the university

UM College

Fr
Growing up
Socialization
General ed

So
Learning
to learn
Sampling
disciplines

Selective engagement by UM faculty

UM University

Jr
Disciplinary
focus
Career
exploration

Sr
Preparing for
career or
grad/prof
study

Careers

UM Professional Schools

Professional
School
Masters

Doctorate

UM Universitas

Graduate
School
M.S., M.A.

Ph.D.

Post-doc
training

The flow of students through the academic programs of the university

in terms of the flow of students, first entering the university as undergraduates at the lower division (freshman, sophomore) level with the primary early objectives of socializing young adults, providing foundational learning, and enabling students to sample an array of disciplines for possible majors. Although lower division programs comprise a primary mission of community colleges and four-year liberal arts colleges, most public research universities today assign both instruction and student counseling to non-tenure track faculty (lecturers and instructors) and professional staff, with only occasional student interaction with senior faculty in survey courses. There is a much greater involvement of senior faculty with undergraduate education at the upper division level, where students concentrate coursework in an academic discipline and begin to prepare either for careers or further study at the graduate or professional level.

Although entering careers following the B.A./B.S. degree is the initial objective of many, if not most, of our graduates, a significant number of students at leading research universities such as Michigan will continue their studies in professional schools at the graduate level in fields such as law, medicine, business administration, or education. These studies generally lead to graduate professional degrees at the masters level (MBA, M.Arch, MAT) or doctorate level (M.D., L.L.D.).

A select few undergraduates will choose instead to enter the graduate programs of the university to prepare for careers in research or as college faculty. These graduate programs of the university are the closest analogy to the *Universitas Magistrorum et Scholarium* of ancient universities since learning and scholarship occurs through unions or communities of masters (the faculty) and scholars (the students) leading to graduate degrees such as the M.S. or M.A. and the Ph.D. In fact, in many fields such as the physical and biomedical sciences, even further education at the postdoctorate level has become the norm for students wishing to enter the academy.

From a more fundamental perspective, these
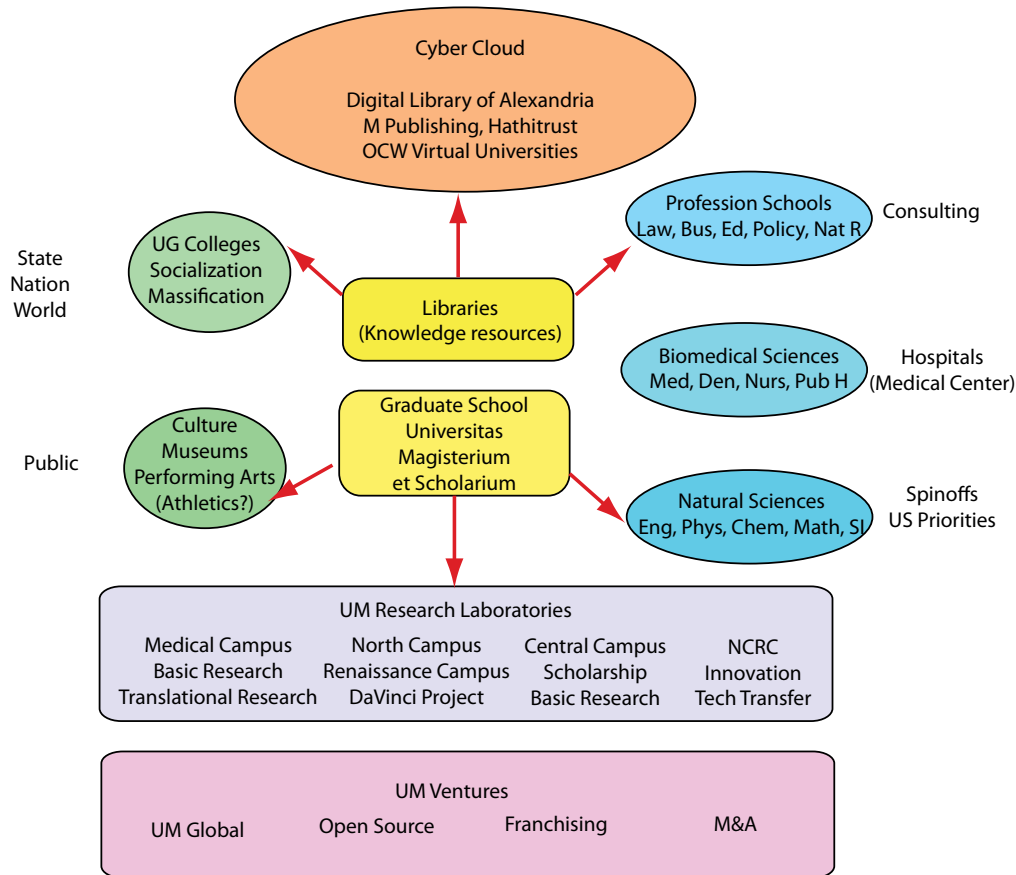
The University of Michigan as a "core-in-cloud" structure

graduate programs (and their associated graduate schools in many universities), along with knowledge resources such as the university libraries, comprise the true academic core of the research university. They determine the intellectual vitality and reputation of the university and its various undergraduate and graduate programs. At Michigan, this academic core also has an important physical presence on the university campus, with the Rackham School of Graduate Studies and the University Library at either ends of the Ingalls Mall, about which are distributed not only the various schools and colleges but as well key cultural resources for the performing arts (e.g., Hill Auditorium and the Power Center) and museums (e.g., Museum of Art, Kelsey Museum, Ruthven Museum of Natural Sciences). Moving beyond this academic core, one finds first the University's many professional schools (e.g., Law, Business Administration, Education, Social Work, Public Policy), then moving still further away are those professional schools associated with major research and clinical activities (e.g., the health sciences and the University Hospital, the North Campus with the creative disciplines such as Art, Music, Architecture, and Engineering) and finally to the many research institutes and laboratories scattered about Ann Arbor. Many American research universities have a similar structure, with a clearly identifiable academic core surrounded by an array of schools, colleges, cultural institutions, and research activities.

Yet, as the influence of powerful forces, such as the changing needs of society, globalization, and information technology reshape the activities of the university, one can expect its organization and structure to continue to evolve. Many research universities are already evolving into so-called "core in cloud" organizations in which academic departments or schools conducting elite education and basic research, are surrounded by a constellation of quasi-academic organizations— research institutes, think tanks, corporate R&D centers—that draw intellectual strength from the core university and provide important financial, human, and physical resources in return. Such a structure reflects

the blurring of basic and applied research, education and training, the university and broader society.

More specifically, while the academic units at the core retain the traditional university culture of faculty appointments, tenure, and intellectual traditions, for example, disciplinary focus, those organizations evolving in the cloud can be far more flexible and adaptive. They can be multidisciplinary and project focused. They can be driven by entrepreneurial cultures and values. Unlike academic programs, they can come and go as the need and opportunity arise. And, although it is common to think of the cloud being situated quite close to the university core, in today's world of emerging electronic and virtual communities, there is no reason why the cloud might not be widely distributed, involving organizations located far from the campus. In fact, as virtual universities become more common, there is no reason that the core itself has to have a geographical focus. It could exist in cyberspace, independent of space and time.

To some degree, the core-in-cloud model revitalizes core academic programs by stimulating new ideas and interactions. It provides a bridge that allows the university to better serve society without compromising its core academic values. But, like the entrepreneurial university, it can also scatter and diffuse the activities of the university, creating a shopping mall character with little coherence. And it can create a fog that distorts the true nature of the university by the public.
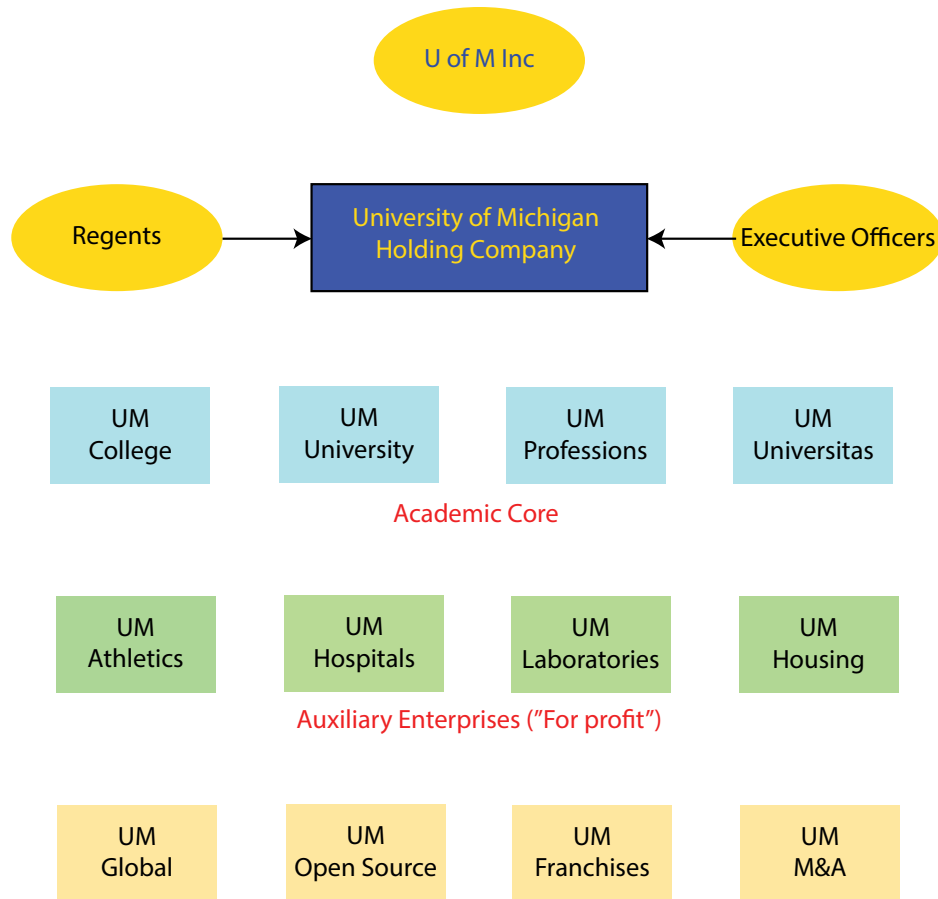
The University of Michigan, Inc.

The nature of the contemporary university and the forces that drive its evolution are complex and frequently misunderstood. The public still thinks of us in very traditional ways, with images of students sitting in large classrooms listening to faculty members lecture on subjects such as literature or history. The faculty thinks of Oxbridge—themselves as dons, and their students as serious scholars. The federal government sees another R&D contractor or health provider—a supplicant for the public purse. And armchair America sees the university on Saturday afternoon as yet another quasi-professional athletic franchise. The reality is far different—and far more complex.

The University of Michigan, with an annual budget of roughly $7 billion per year, and an additional $16 billion of investment assets under active management, would rank roughly 270th on the Fortune 500 list. It educates roughly 60,000 students on its several campuses at any given time. This would correspond to an educational business line with a budget of roughly $3.5 billion per year. The University is also a major federal R&D laboratory conducting over $1.3 billion a year of research, supported primarily from federal contracts and grants.

Michigan runs a massive health care company. Its university-owned hospitals and clinics currently treat over two million patients a year, with a total medical center income of $3.0 billion per year. The University is actively involved in providing a wide array of knowledge services, from degree programs offered in Hong Kong, Seoul, and Paris, to cyberspace-based products such as online continuing education and massively open online courses (MOOCs). In fact, Michigan played a leading role in building and managing the Internet in the 1980s and 1990s, and today it is the world's leader in capturing, curating, and archiving digital materials, as evidenced by its creation and management of the HathiTrust, the largest digital library in the world with over 14 million volumes.

UC President Clark Kerr once coined the term "multiversity" to describe today's comprehensive university, a loosely coupled adaptive system that mutates and evolves with ever-greater complexity to respond to the ever-greater knowledge needs and opportunities posed by society. (Kerr, 1964) One can certainly understand this viewpoint when considering the current organization of the University of Michigan. In fact, one might depict U of M, Inc., as essentially a holding company of knowledge-intensive services. This would include the traditional components of a university–undergraduate colleges, graduate and professional schools, all clustered about an intellectual core of faculty masters and advanced student scholars (in medieval terms, *a Universitas Magistrorum et Scholarium*). But it also includes an array of auxiliary enterprises, largely operated on a self-financing basis, including sponsored research institutes, laboratories, and projects; clinical activities such as hospitals and health systems; student housing and services; and, of course, public entertainment venues such

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                    │  U of M Inc  │
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┌──────────┐      ┌─────────────────────────┐      ┌────────────────────┐
│ Regents  │ ───▶ │ University of Michigan   │ ◀─── │ Executive Officers │
└──────────┘      │     Holding Company      │      └────────────────────┘
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| UM College | UM University | UM Professions | UM Universitas |

Academic Core

| UM Athletics | UM Hospitals | UM Laboratories | UM Housing |

Auxiliary Enterprises ("For profit")

| UM Global | UM Open Source | UM Franchises | UM M&A |

The multiversity as a "holding company"

as intercollegiate athletics. Furthermore, a major university such as Michigan is always launching new ventures such as international programs, not-for-profit knowledge services such as digital libraries, and possibly even activities that draw on the "brandname" of the university to establish new institutions through franchising or mergers and acquisition.

This diversity of activities is not unique to Michigan. Most of the major research universities in America are characterized by very similar organizational structures, indicative of their multiple missions and diverse array of constituencies. Yet few have Michigan's scale.

The university today has become one of the most complex institutions in modern society—far more complex, for example, than most corporations or governments. It is comprised of many activities, some non-profit, some publicly regulated, and some operating in intensely competitive marketplaces. It teaches students; conducts research for various clients; provides health care; engages in economic development; stimulates social change; and provides mass entertainment (athletics). In systems terminology, the modern university is a "loosely coupled, adaptive ecosystem," with a growing complexity, as its various components respond to changes in its environment.

The modern university has become a highly adaptable knowledge conglomerate because of the interests and efforts of its faculty. It provides faculty with the freedom, the encouragement, and the incentives to move toward their personal goals in highly flexible ways. One might even view the university of today as a type of holding company of faculty entrepreneurs, who drive the evolution of the university to fulfill their individual goals.

Universities have developed a transactional culture, in which everything is up for negotiation. The university administration manages the modern university as a federation. It sets some general ground rules and regulations, acts as an arbiter, raises money for the enterprise, and tries—with limited success—to

keep activities roughly coordinated.

This entrepreneurial character of the university has made it remarkably adaptive and resilient throughout the 20th Century, but it still faces serious challenges. Many contend that universities have diluted their core enterprises of learning, particularly undergraduate education, with a host of entrepreneurial activities. They have become so complex that few, whether on or beyond their campuses, understand what they have become. They have great difficulty in allowing obsolete activities to disappear. They face serious constraints on resources that no longer allow them to be all things to all people. They also have become sufficiently encumbered with processes, policies, procedures, and past practices that their best and most creative people no longer determine the direction of our institutions.

If these institutions are to respond to future challenges and opportunities, the modern university must engage in a more strategic process of change. While the natural evolution of a learning organization may still be the best model of change, it must be guided by a commitment to preserve its fundamental values and mission. Universities must find ways to allow its most creative people to drive their future. The challenge is to tap the great source of creativity and energy associated with entrepreneurial activity in a way that preserves the university's core missions, characteristics, and values.

The Foundation for Leadership

Today the University of Michigan has a solid foundation on which to build new strengths to serve a new era. Its current assets can be summarized into the following characteristics.

Excellence: Michigan's unwavering commitment to quality encompasses its people—students, faculty, and staff—and its programs. As a result, we rank nationally among the top ten among peers in virtually everything we do, whether in the classroom, the studio, the laboratory, the library, or the concert hall. By any measure, Michigan is known throughout the world as one of the preeminent universities in teaching, research, and service.

Character: With its more than 60,000 students, 19 schools and colleges, two regional campuses, 8,000

faculty and 13,500 staff, Michigan is a university of exceptional scholarly breadth, depth, and range in academic disciplines and professions. It has a highly entrepreneurial, decentralized organization and a tradition of creative interdisciplinary collaboration in its approach to problem solving.

Autonomy and Flexibility: The University uniquely bridges the gap between public and private education and among state, national, and global roles and responsibilities. As a public university, Michigan is remarkable in its ability to control its own destiny. Thanks to its constitutionally guaranteed autonomy, the University has the flexibility to attract a balance of resources to sustain the quality and range of its academic programs regardless of short-term shifts in the political or economic environment. In recent years, the University's resource portfolio has become far more diverse, drawn primarily from tuition and fees, federal grants, private giving, and auxiliary activities such as the UM Medical Center while its state appropriation has dwindled to less than 4 per cent of its total operating funding and 8% of its academic budget,

Public-Private Partnership: Michigan forges a partnership of public and private resources. Public funding builds and sustains our foundation, size, and scope; private funding supports the margin for excellence, the creative innovation, and the generous extension of opportunity.

Public Stewardship: Michigan has long been animated by a progressive vision and spirit. The University of Michigan embodies the hopes and dreams, the energy and drive, the commitment and stewardship of ten generations of Michigan citizens and University friends and alumni. They entrust to us the responsibility for sustaining the Michigan educational opportunity for future generations.

The Michigan Spirit: Above all, there is the special gift of the Michigan spirit—the willingness and ability to take the risks necessary for leadership, a determination to be the best.

However, despite these attributes, there are reasons for caution as we plan for the future. In planning terminology, next we need to conduct an environmental scan.

Chapter 4

Setting the Context: An Environmental Scan

We live in a time of great change, a global society, knitted together by pervasive communications and transportation technologies and driven by the exponential growth of new knowledge. It is a time of challenge and contradiction, as an ever-increasing human population threatens global sustainability; a global, knowledge-driven economy places a new premium on workforce skills through phenomena such as outsourcing and off-shoring; governments place increasing confidence in market forces to reflect public priorities even as new paradigms, such as open-source technologies, challenge conventional free-market philosophies; and shifting geopolitical tensions driven by the great disparity in wealth and power about the globe, national security, and terrorism.

More specifically, 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, develop innovative applications of these discoveries, and transfer them into the marketplace through entrepreneurial activities.

Yet the traditional institutions responsible for education and research–schools, colleges, universities, research institutes–are being challenged by the powerful forces characterizing the global economy: hypercompetitive markets, demographic change, increasing ethnic and cultural diversity, rapidly evolving technologies such as computers and networking, and the growing concern about the sustainability of humankind on Planet Earth in the face of its increasingly disruptive activities.

Brave, New World

The Knowledge Economy

Today we are evolving rapidly into a post-industrial, knowledge-based society as our economies are steadily shifting from material- and labor-intensive products and processes to knowledge-intensive products and services. A radically new system for creating wealth has evolved that depends upon the creation and application of new knowledge. Unlike natural resources, such as iron and oil, which have driven earlier economic transformations, knowledge is inexhaustible. The more it is used, the more it multiplies and expands. But knowledge can be created, absorbed, and applied only by the educated mind. The knowledge economy is demanding new types of learners and creators and new forms of learning and education.

As a survey in *The Economist* put it, "The value of 'intangible' assets–everything from skilled workers to patents to know-how–has ballooned from 20 percent of the value of companies in the S&P 500 to 70 percent today. The proportion of American workers doing jobs that call for complex skills has grown three times as fast as employment in general". (*The Economist*, 2006) Economists estimate that 40 to 60 percent of economic growth each year is due to research and development activity, particularly in American universities. Another 20 percent of the increased resources each year are based upon the rising skill levels of our population. In other words, 60 to 80 percent is really dependent upon higher education in terms of research and development and skills of the labor force. (Augustine, 2005)

Nations are investing heavily and restructuring their economies to create high-skill, high-pay jobs in knowledge-intensive areas such as new technologies, financial services, trade, and professional and technical
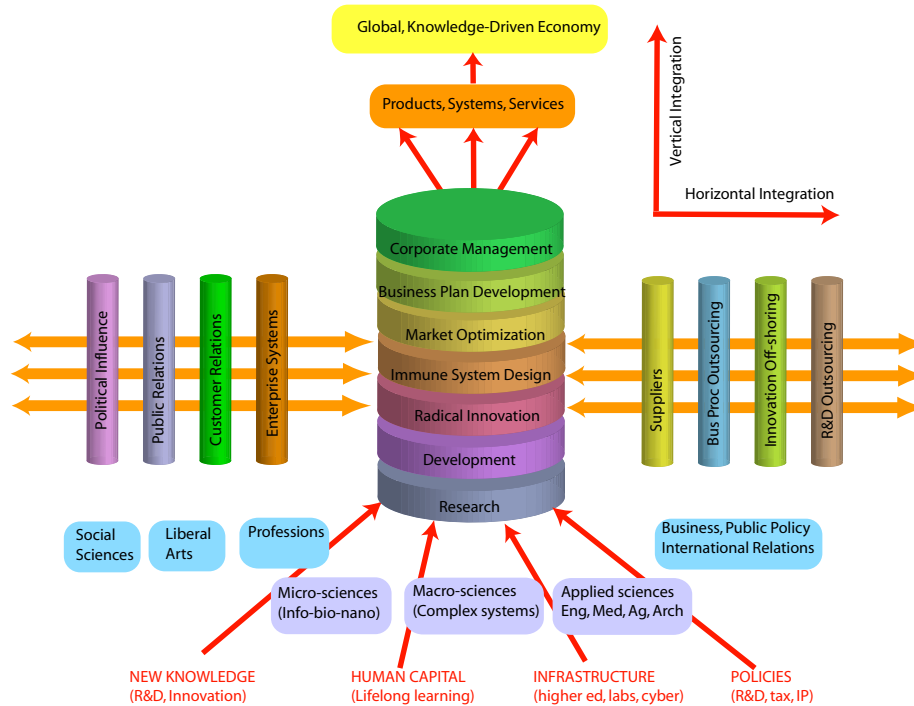
The way the knowledge economy works.

services. From Paris to San Diego, Bangalore to Shanghai, there is a growing recognition throughout the world that economic prosperity and social well being in a global knowledge-driven economy requires public investment in knowledge resources. That is, regions must create and sustain a highly educated and innovative workforce and the capacity to generate and apply new knowledge, supported through policies and investments in developing human capital, technological innovation, and entrepreneurial skill. Nations both large and small, from Finland to China, are reaping the benefits of such investments aimed at stimulating and exploiting technological innovation, creating serious competitive challenges to American industry and business both in the conventional marketplace (e.g., automobiles) and through new paradigms such as the off-shoring of knowledge-intensive services (e.g. software development).

In the knowledge economy, the key asset driving corporate value is no longer physical capital or unskilled labor. Instead it is intellectual and human capital. An increasingly utilitarian view of higher education is reflected in public policy. Education is becoming a powerful political force. Just as the space race of the 1960s stimulated major investments in research and education, there are early signs that the skills race of the 21st Century may soon be recognized as the dominant domestic policy issue facing our nation. But there is an important difference here. The space race galvanized public concern and concentrated national attention on educating "the best and brightest," the academically elite of our society. The skills race of the 21st Century will value instead the skills and knowledge of our entire workforce as a key to economic prosperity, national security, and social well-being. The National Governors Association concludes that, "The driving force behind the 21st Century economy is knowledge, and developing human capital is the best way to ensure prosperity." Some governors are even taking the courageous step of proposing tax increases to fund new investments in higher education, research, and innovation. (NGA, 2007)

Perhaps former University of California president Clark Kerr stated it best a half-century ago: "The basic reality for the university is the widespread recognition that new knowledge is the most important factor in economic and social growth, and since that is the university's invisible product, it may be the most powerful single institution in our culture." (Kerr, 1963)

Globalization will define our 21st century society.

Globalization

Whether from travel and communication, the arts and culture; the internationalization of commerce, capital, and labor; or common environmental concerns, the United States is becoming increasingly linked with the global community. The liberalization of trade and investment policies, along with the revolution in information and communications technologies, has vastly increased the flow of capital, goods, and services, dramatically changing the world and our place in it. Today, globalization determines not only regional prosperity but also national and homeland security. A truly domestic economy has ceased to exist. It is no longer relevant to speak of the health of regional economies or the competitiveness of American industry, because we are no longer self-sufficient or self-sustaining. Markets unleashed by lowering trade barriers are by the instantaneous flows of knowledge, capital, and work. Such markets are creating global enterprises based upon business paradigms such as out-sourcing and off-shoring, a shift from public to private equity investment, and declining identification with or loyalty to national or regional interests.

Our economy and many of our companies are international, spanning the globe and interdependent with other nations and other peoples. Worldwide communication networks have created an international market, not only for conventional products, but also for knowledge professionals, research, and educational services. Markets characterized by the instantaneous flows of knowledge, capital, and work unleashed by lowering trade barriers are creating global enterprises based upon business paradigms such as out-sourcing and off-shoring, a shift from public to private equity investment, and declining identification with or loyalty to national or regional interests. Market pressures increasingly trump public policy and hence the influence of national governments. As the report of the National Intelligence Council's 2020 Project has concluded, "The very magnitude and speed of change resulting from a globalizing world–apart from its precise character– will be a defining feature of the world out to 2020. Globalization–growing interconnectedness reflected in the expanded flows of information, technology, capital, goods, services, and people throughout the world will become an overarching mega-trend, a force so ubiquitous that it will substantially shape all other major trends in the world of 2020." (National Intelligence Council, 2005)

Tom Friedman stresses in his provocative book, *The World is Fla*t, "The playing field is being leveled. Some three billion people who were out of the game have walked and often have run onto a level playing field, from China, India, Russia, and Central Europe, from nations with rich educational heritages. The flattening of the world is moving ahead apace, and nothing is going to stop it. What can happen is a decline in our standard of living if more Americans are not empowered and educated to participate in a world where all the knowledge centers are being connected. We have within our society all the ingredients for American individuals to thrive in such a world, but if we squander these ingredients, we will stagnate." (Friedman, 2005)

In such a global economy, it is critical that regions not only have global reach into markets abroad, but they also have the capacity to harvest new ideas and innovation and to attract talent from around the world. Interestingly enough, higher education becomes a critical asset in providing access to such global markets of commerce and human capital. American universities have long enjoyed a strong international character among their students, faculty, and academic programs. These institutions stand at the center of a worldwide system of learning and scholarship, providing powerful regional magnets to attract new talent, new industry,

and new resources from around the world.

Globalization implies a deeper interconnectedness with the world–economically, politically, and culturally– that goes far beyond simply the international exchange of students, faculty, and ideas and the development of international partnerships among institutions. It requires thoughtful, globally identified, and interdependent citizens. And it requires the mastery of the powerful new communications technologies that are transforming modes of learning, collaboration and expression. The same forces of globalization that challenge our regional economies and cultures will also challenge our educational institutions–and particularly our universities.

Demographics

America's population is changing rapidly. One of the most significant demographic trends is the aging of our population. The baby boomers are entering retirement, and the number of young adults is declining. In the U.S., there are already more people over the age of sixty-five than teenagers in this nation, and this situation will continue for decades to come. More generally, the populations of most developed nations in North America, Europe, and Asia are also aging rapidly, where over the next decade, the percentage of the population over 60 will grow to 30% to 40%. Half of the world's population today lives in countries where fertility rates are not sufficient to replace their current populations, e.g. the average fertility rate in the EU has dropped to 1.45, below the 2.1 necessary for a stable population. Aging populations, out-migration, and shrinking workforces are seriously challenging the productivity of developed economies throughout Europe and Asia. (National Intelligence Council, 2004; Baumgardt, 2006)

Yet here the United States stands apart because of a second and equally profound demographic trend: immigration. As it has been so many times in its past, America is once again becoming a highly diverse nation of immigrants, benefiting immensely from their energy, talents, and hope. Such population mobility is rapidly changing the ethnic character of our nation. In fact, over the past decade, immigration from Latin America and Asia contributed 53% of the growth in the United States population, exceeding that

provided by births. (National Information Center, 2006) Immigration is expected to drive continued growth in the U.S. population from 300 million today to over 450 million by 2050, augmenting our aging population and stimulating productivity with new and young workers.

Because America is characterized by great diversity in geography, regional economics, and cultures, immigrants have an incredible array of choice. (The Economist, 2009) The proportion of Americans who are foreign-born, at 13%, is higher than the OPEC-country average of 8.4%. In absolute terms, the gulf is much wider. America's foreign-born population of 38 million is nearly four times larger than those of Russia or Germany, the nearest contenders. It dwarfs the number of immigrants in Japan (below 2 million) or China (under 1 million).

Immigration is vital to growing a regional economy. Although one usually thinks of immigrants taking low-skill jobs in poorly paid services, manufacturing, and agriculture, in reality much of the immigrant population is very high skill. Today's immigrants tend to fall into two classes. At the top are scientists, doctors, engineers, and managers largely from Asia. At the bottom are the laborers, often poorly educated and largely Hispanic, who perform the very low skill jobs that keep our society functioning. Historically, immigrants and multinational populations have been the greatest contributors to urban population and growth, including growth in major U.S. cities over the past 20 years. They are the source of new enterprises, and they stimulate the innovative and entrepreneurial culture that creates diverse, multi-ethnic, urban communities that are attractive to talented, educated, and young residents. (Longworth, 2008)

Yet even without immigration the minority population in the United States will continue to grow for decades to come, rising from 35% today to 42% by 2050. (Frey, 2010; Brownstein 2010) Minorities now comprise 44% of the children under the age of 18, the "Millennial" generation of students now entering our colleges. By 2023, minorities will comprise the majority of American children (and eventually our population).

The increasing diversity of the American population with respect to race, ethnicity, gender and national origin is both one of our greatest strengths and one of our most serious challenges as a nation. A diverse

population gives us great vitality. However, the challenge of increasing diversity is complicated by social and economic factors. Far from evolving toward one America, our society continues to be hindered by the segregation and non-assimilation of minority cultures, as well as a backlash against long-accepted programs designed to achieve social equity (e.g., affirmative action in college admissions). Furthermore, since most current immigrants are arriving from developing regions with weak educational capacity, new pressures have been placed on U.S. educational systems for the remedial education of large numbers of non-English speaking students.

The full participation of currently underrepresented minorities will be of increasing concern as we strive to realize our commitment to equity and social justice. Yet the achievement of this objective also will be the key to the future strength and prosperity of America, since our nation cannot afford to waste the human talent presented by its minority and immigrant populations. If we do not create a nation that mobilizes the talents of all of our citizens, we are destined for a diminished role in the global community and increased social turbulence. Most tragically, we will have failed to fulfill the promise of democracy upon which this nation was founded.

Technological Change

The new technologies driving such profound changes in our world such as nformation technology, biotechnology, and nanotechnology evolve at an exponential pace. For example, the information and communications technologies enabling the global knowledge economy double in power for a given cost every year or so, amounting to a staggering increase in capacity of 100 to 1,000 fold every decade. Computer scientists and engineers believe this trend will continue for the foreseeable future, suggesting that these technologies will become a thousand, a million, and a billion times more powerful as the decades pass. (Reed, 2005; Kuzweil, 2006)

In particular, the fundamental intellectual activities of discovery and learning enabling the knowledge economy are being transformed by the rapid evolution of information and communications technology.

Titan supercomputer (Oak Ridge National Laboratory)

Although many technologies have transformed the course of human history, the pace and impact of digital information technology is unprecedented. In little more than half a century, we have moved from mammoth computer temples with the compute power of a digital wristwatch to an ecosystem of billions of microelectronic devices, linked together at nearly the speed of light, executing critical complex programs with astronomical quantities of data. Rapidly evolving digital technology has played a particularly important role in expanding our capacity to generate, distribute, and apply knowledge. It has become an indispensable platform for discovery, innovation, and learning. Information and communications services are increasingly delivered as a utility, much like electricity, from remote data centers and networks. Both hardware and software are now moving into massive network "clouds" managed by providers, such as Microsoft, Google, and Amazon. They provide not only global connectivity to organizations (e.g., corporations, governments, and universities) but also to individuals in rapidly changing forms, such as instant messaging, televideo, crowd sourcing, and affinity communities.

As Brynjolfsson and McAfee suggest, information technology is both quantitatively and qualitatively different in character since it evolves exponentially (Moore's Law), is easily and cheaply reproduced because of its digital character, and is highly recombinant through networks and ubiquitous access. (Brynjolfsson, 2013) More generally it is becoming increasingly clear that we are approaching an inflection point in the potential of rapidly evolving information and communications technology to transform how the

scientific and engineering enterprise does knowledge work, the nature of the problems it undertakes, and the broadening of those able to participate in research activities. To quote Arden Bement, former director of the National Science Foundation, "We are entering a second revolution in information technology, one that may well usher in a new technological age that will dwarf, in sheer transformational scope and power, anything we have yet experienced in the current information age". (Bement, 2007)

Perhaps an even greater change is occurring today in the biological sciences, with the emerging capacity to analysis and manipulate the DNA composition of living species. Within the last several years, biological scientists have developed the capacity not only to target but replace components of the DNA sequence characterizing the gene using the CRISPR technique of gene editing. Not only does this represent with stunning accuracy and simplicity the capacity to reedit the function of a gene, but it enables a mechanism for gene drive where the modification can be reintroduced into a population for rapid change of a species. Insect populations can be made resistant to diseases such as malaria, and gene therapy can now be carefully targeted to cure diseases.(Travis, Science 2015)

But this powerful technique in principle could also be used to modify the human germ cell and embryos. It represents not only a potential approach to eliminating inherited diseases but beyond that, modifying the human species itself. Because of the power of biological science to now change the human race itself, there have been numerous meetings to develop guidelines and ethical bounds for researchers and funders, similar to those that emerged from Asilomar Conferences on gene splicing in the 1970s. Yet the power of this new approach to gene manipulation and both its potential benefit and risk cannot be denied. (Baltimore, 2015)

Global Sustainability

While history has always been characterized by periods of both change and stability–war and peace, intellectual progress and decadence, economic prosperity and contraction–today the pace and magnitude of such changes have intensified, driven by the powerful forces of globalization, changing
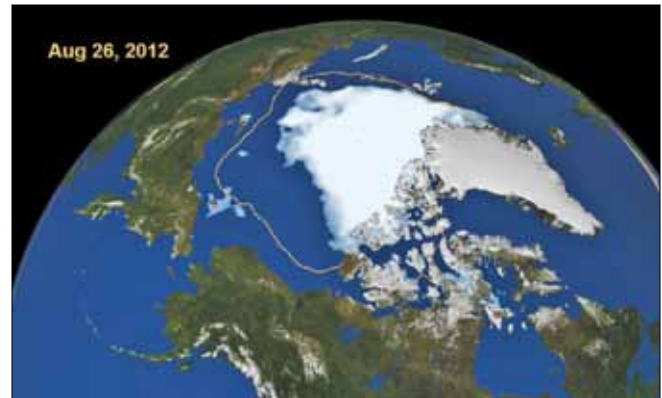
Increasing signs of global climate change.

demographics, rapidly evolving technologies and the expanded flows of information, technology, capital, goods, services and people worldwide. Economies are pushing the human exploitation of the Earth's environment to the limits; the military capacity of the great powers could destroy the world population many times over, business corporations have become so large that they can influence national policies, the financial sector has become so complex and unstable that it has the capacity to trigger global economic catastrophes in an instant, and corrupted regimes leading to failed states still appear in all parts of the world. Many believe that the impact of human activities, ever more intense, globally distributed and interconnected, threatens the very sustainability of humankind on Earth, at least in terms that we currently understand and enjoy.

While the fruits of development and modernity are indisputable, the negative consequences of these recent developments appear to be increasingly serious. For example, 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 multiplying in number and intensifying in severity: the destruction of forests, wetlands and other natural habitats by human activities, the extinction of millions of species and the loss of biodiversity; the buildup of greenhouse gases and their impact on global climates; the pollution of our air, water and land. We must find new ways to provide for a human society that presently has outstripped the limits of global sustainability.

The magnitude, complexity, and interdependence (not to mention accountability) of business practices, financial institutions, markets and government policies

now threaten the stability of the global economy, as evidenced by the impact of complex financial instruments and questionable market incentives in triggering the collapse of the global financial markets that led to the "Great Recession" of 2008-2009. Again, the sustainability of current business practices, government policies and public priorities must be questioned.

Of comparable concern are the widening gaps in prosperity, health and quality of life characterizing developed, developing and underdeveloped regions. To be sure, there are some signs of optimism: a slowing population growth that may stabilize during the 21st century, technological advances such as the "green revolution" that have fed much of the world, and the rapid growth of developing economies in Asia and Latin America. Yet it is estimated that one-sixth of the world's population still live in extreme poverty, suffering from diseases such as malaria, tuberculosis, AIDS, diarrhea and others that prey on bodies weakened by chronic hunger, claiming more than 20,000 lives daily. These global needs can only be addressed by the commitment of developed nations and the implementation of technology to alleviate poverty and disease.

The world's research universities have for many years been actively addressing many of the important issues associated with global sustainability. The "green revolution" resulting from university programs in agricultural science has lifted a substantial portion of the world's population from the ravages of extreme poverty. University scientists were the first to alert the world to the impact of human activities on the environment and climate, e.g., the impact of CFCs on atmospheric ozone depletion; the destruction of forests, wetlands and other natural habitats by human activities leading to the extinction of thousands of biological species and the loss of biodiversity; and the buildup of greenhouse gases, such as carbon dioxide and their impact on the global climate. University biomedical research has been key to dealing with global health challenges, ranging from malaria to Nile virus to AIDS, and the international character of research universities, characterized by international programs, collaboration and exchanges of students and faculty provide them with a unique global perspective.

Universities are also crucial to developing academic programs and culture to produce a new generation of thoughtful, interdependent and globally identified citizens. These institutions are evolving rapidly to accept their global responsibilities, increasingly becoming universities not only "in" the world, in the sense of operating in a global marketplace of people and ideas, but "of" the world, accepting the challenge of extending their public purpose to addressing global concerns. To quote from the 1999 Glion Declaration:

"The daunting complexity of the challenges that confront us would be overwhelming if we were to depend only on existing knowledge, traditional resources, and conventional approaches. But universities have the capacity to remove that dependence by the innovations they create. Universities exist to liberate the unlimited creativity of the human species and to celebrate the unbounded resilience of the human spirit. In a world of foreboding problems and looming threats, it is the high privilege of universities to nurture that creativity, to rekindle that resilience, and so provide hope for all of Earth's peoples." (Rhodes, 2009)

The Implications for Higher Education

Today we have entered an era in which educated people, the knowledge they produce, and the innovation and entrepreneurial skills they possess have become the keys to economic prosperity, public health, national security, and social well being. To provide our citizens with the knowledge and skills to compete on the global level, the nation must broaden access to world-class educational opportunities at all levels: K-12, higher education, workplace training, and lifelong learning. It must also build and sustain world-class universities capable of conducting cutting-edge research and innovation; producing outstanding scientists, engineers, physicians, teachers, and other knowledge professionals; and building the advanced learning and research infrastructure necessary for the nation to sustain its leadership in the century ahead.

The Educational Needs of 21st-Century Citizens

Historically, people have always looked to education as the key to prosperity and social mobility. Education in America has been particularly responsive

to the changing needs of society during major periods of social 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. Our schools, colleges, and universities evolved from the educational paradigms of the 18th century serving only the elite, to the public institutions of the 19th century serving the working class, and then once again to knowledge-intensive institutions of the 20th century such as the research university, critical to the economic prosperity, public health, and security of the nation. 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.

Now more than ever, people see education as their hope for leading meaningful and fulfilling lives. The level of one's education has become a primary determinant of one's personal economic security. Just as a high school diploma became the passport to participation in the industrial age, today, a century later, a college education has become the requirement for economic security in the age of knowledge. In fact, the recent White House Task Force on the Middle Class concludes, "the most effective means of helping American families secure economic stability is increasing access and affordability to higher education". (Biden, 2010)

Today, a college degree has become a necessity for most careers, and graduate education desirable for an increasing number. The pay gap between high school and college graduates continues to widen, more than doubling from a 50% premium in 1980 to 130% today. (College Board, 2010) Not so well known is an even larger earnings gap between baccalaureate-degree holders and those with graduate degrees. This should not be surprising given that in the knowledge economy the key asset driving corporate value is no longer physical capital or unskilled labor but rather intellectual and human capital. In fact, there is an even more pragmatic way to look at the importance of advanced education. Today we invest about $100,000 of public funds to produce a high school graduate (K-12). Yet statistics indicate that the careers available to those with only a high school diploma will never repay in state and local taxes the cost of their education. It is only at the bachelor's-degree level and above that the public can expect to regain its investment in education from tax revenues. (Wiley, 2003)

It is estimated that over 80 percent of the new jobs created by our knowledge-driven economy require education at the college level (Glazer, 2009), and for many careers, a baccalaureate degree will not be enough to enable graduates to keep pace with the knowledge and skill-level required for their careers. The knowledge base in many fields is growing exponentially. In some fields such as engineering and medicine the knowledge taught to students becomes obsolete even before they graduate! Hence a college education will serve only as a stepping-stone to a process of lifelong education. The ability to continue to learn and to adapt to—indeed, to manage—change and uncertainty are among the most valuable skills of all to be acquired in college.

Yet many people–and most politicians–continue to think of a college education much as they envision secondary school, with young students listening to professors lecturing about history or economics. It is important to challenge these old-fashioned perspectives with a dose of the current realities, e.g., students are studying intricate subjects such as software engineering, biotechnology, neuroscience, or global supply chain management, since these are the disciplines of today preparing students for rewarding careers tomorrow. The skills of these disciplines are not mastered in the lecture hall but in the laboratory, surgery suite, or through international experience. Clearly such advanced education does not come cheap. But it also has never been more important.

Although a growing population will necessitate growth in higher education to accommodate the projected increases in traditional college-age students, even more significant will be the growing demand of working adults, who increasingly realize that in the high-performance workplace, without further education they are only one paycheck away from the unemployment line. Less than 20 percent of today's college students fit the stereotype of eighteen- to

twenty-two-year-olds living on campus and attending college full-time. Today, most college students are adults—in fact, one-quarter are over the age of thirty. A college degree has become key to a decent job in our knowledge-driven society, and most of today's students see a college education as critical to their future quality of life, the key to a good job, financial security, and well-being. Most adult students have definite career objectives and are majoring in professional or pre-professional programs. And while they may have strong academic abilities and enjoy learning, both financial and family responsibilities motivate a far more utilitarian approach to their education. Since the residential college experience is not as central to adult lives, they seek a different kind of relationship with the university, much as they would other service providers such as banks or filling stations. They approach their education as consumers, seeking convenience, quality, relevance, and affordability–hence frequently see the more pragmatic learning services for-profit higher education providers such as the University of Phoenix and DeVry Institutes.

As we move further into an age of knowledge, a region's workforce will require even more sophisticated and sustained education and training to sustain its competitiveness. Today's graduates will change careers many times during their lives, requiring additional education at each stage. Furthermore, with the ever-expanding knowledge base of many fields, along with the longer life span and working careers of our aging population, the need for intellectual retooling will become even more significant. Even those without college degrees will soon find that their continued employability requires advanced education.

Both young, digital-media savvy students and adult learners will likely demand a major shift in educational methods, away from passive classroom courses packaged into well-defined degree programs, and toward interactive, collaborative learning experiences, provided when and where the student needs the knowledge and skills. There will be a shift from "just in case" learning, in which formal education is provided through specific degree programs early in one's life in the hope that the skills learned will be useful later, to "just in time" lifelong learning, in which both informal and formal learning will be expected to occur throughout one's life, when it is relevant and needed. (Duderstadt, 2000) This suggests that most of one's learning will occur after the more formal K-16 experience, either in the workplace or other learning environments. Furthermore, learners will increasingly demand "just for you" education, highly customized learning experiences attentive to their needs and learning styles.

Knowledge workers are likely to make less and less distinction between work and learning. In fact, continuous learning, just as continuous quality improvement in industry, will be a necessity for workforce relevance and security. Employers will seek individuals who can consistently learn and master new skills to respond to new needs. They will place less emphasis on the particular knowledge of new employees than on their capacity to continue to learn and grow intellectually throughout their careers. From the employee's perspective, there will be less emphasis placed on job security with a particular company and more on the provision of learning opportunities for acquiring the knowledge and skills that are marketable more broadly. 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 knowledge infrastructure. Lifelong and "life-wide" learning will become the norms. (Atkins, 2010)

Learning in the Digital Age

Today's students are citizens of the digital age. They have spent their early lives surrounded by robust, visual, interactive media—not the passive broadcast media, radio and television of our youth, but rather iPhones, iPads, Facebook, and virtual reality. They are "digital natives", comfortable learning, working, and living in the digital world, unlike those of us who are "digital immigrants" who are struggling to keep pace with digital technologies. (Pensky, 2001) This is not an easy task for educators, who for the most part remain reluctant to embrace the new technologies in their teaching and hence are increasingly detached from today's students. (Gura and Percy, 2005)

The Millennial generation

Today's students are not the people our current educational system was designed to teach. Rather they learn by experimentation and participation, not by listening or reading passively. They are indeed the "plug and play" generation. They embrace interactivity and demand the right to shape and participate in their learning. They are constantly interacting with one another through social networking (e.g., instant messaging, Facebook, Twitter). They are comfortable with the uncertainty that characterizes their change-driven world. These students will increasingly demand new learning paradigms more suited to their learning styles and more appropriate to prepare them for a lifetime of learning and change.

New knowledge media are forcing us to rethink the nature of literacy. We have seen the definition of literacy shift before in history, from the oral tradition to the written word to the images of film and then television and now to the computer and multimedia. Of course, there are many other forms of literacy: art, poetry, mathematics, science itself, etc. But more significantly, the real transformation is from literacy as "read only, listening, and viewing" to composition in first rhetoric, then writing, and now in multimedia. Both young, digital-media savvy students and adult learners will likely demand a major shift in educational methods, away from passive classroom courses packaged into well-defined degree programs, and toward interactive, collaborative learning experiences, provided when and where the student needs the knowledge and skills. Emerging tech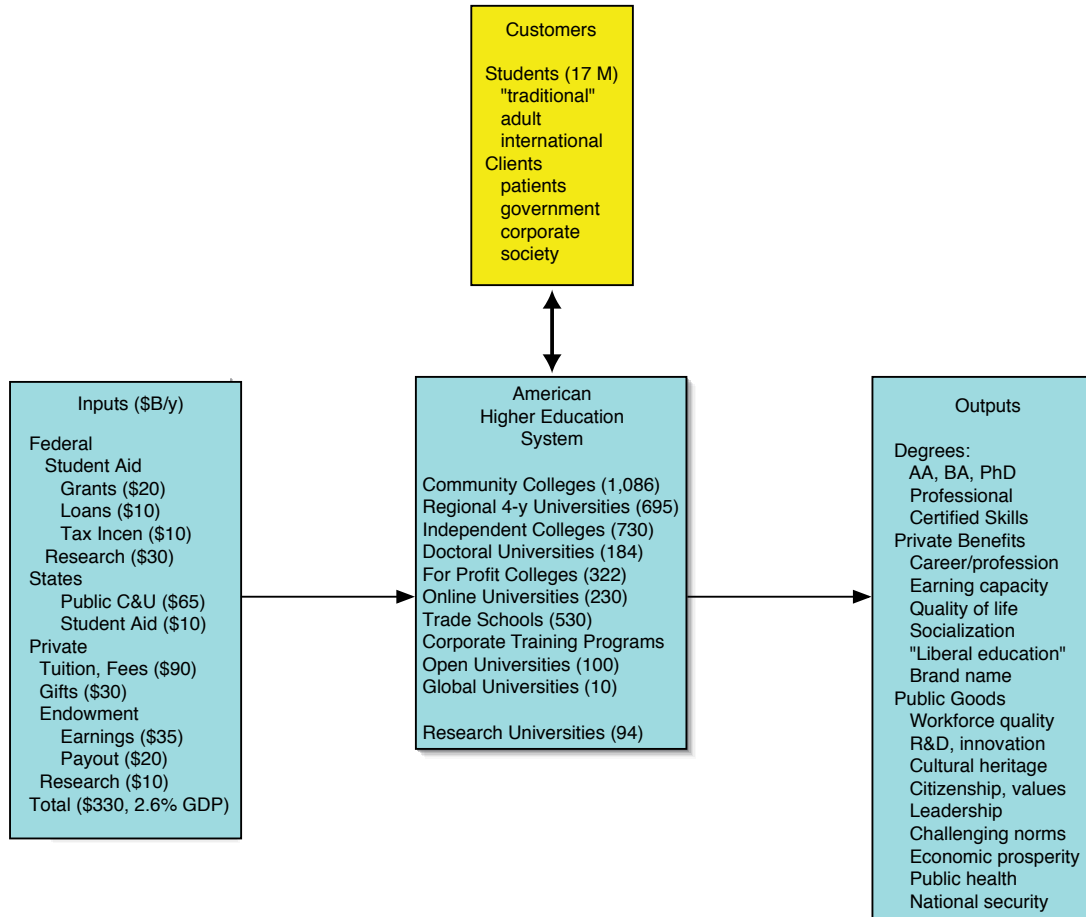nologies that enable social networking to form learning communities and immersive virtual environments for simulation and play facilitate the "deep tinkering" that provides the tacit knowledge necessary to "learn to be", tools already embraced by the young if not yet the academy. In the language of the digital generation, learning has become "hanging out" (knowing), "messing around" (playing), and "geeking out" (creating). (Ito, 2009; Brown, 2009)

From a broader perspective, our society increasingly values not just analysis but synthesis, enabled by the extraordinary tools of the digital age. Learning occurs not simply through study and contemplation but through the active discovery and application of knowledge. From John Dewey to Jean Piaget to Seymour Papert, we have ample evidence that most students learn best through inquiry-based or "constructionist" learning. As the ancient Chinese proverb suggests "I hear and I forget; I see and I remember; I do and I understand." To which we might add, "I teach and I master!"

Characteristics of American Higher Education

America's Higher Education Enterprise

Higher education in our nation is characterized both by its great diversity in colleges and universities and an unusual degree of institutional autonomy–understandable in view of the limited role of the federal government. As *The Economist* notes, "The strength of the American higher education system is that it has

Customers

Students (17 M)
  "traditional"
  adult
  international
Clients
  patients
  government
  corporate
  society

Inputs ($B/y)

Federal
  Student Aid
    Grants ($20)
    Loans ($10)
    Tax Incen ($10)
  Research ($30)
States
    Public C&U ($65)
    Student Aid ($10)
Private
  Tuition, Fees ($90)
  Gifts ($30)
  Endowment
    Earnings ($35)
    Payout ($20)
  Research ($10)
Total ($330, 2.6% GDP)

American Higher Education System

Community Colleges (1,086)
Regional 4-y Universities (695)
Independent Colleges (730)
Doctoral Universities (184)
For Profit Colleges (322)
Online Universities (230)
Trade Schools (530)
Corporate Training Programs
Open Universities (100)
Global Universities (10)

Research Universities (94)

Outputs

Degrees:
  AA, BA, PhD
  Professional
  Certified Skills
Private Benefits
  Career/profession
  Earning capacity
  Quality of life
  Socialization
  "Liberal education"
  Brand name
Public Goods
  Workforce quality
  R&D, innovation
  Cultural heritage
  Citizenship, values
  Leadership
  Challenging norms
  Economic prosperity
  Public health
  National security

The structure of American Higher Education

no system". (*The Economist*, 2005) In the United States our colleges and universities, both public and private, are relatively free from government control, at least compared to institutions in other nations. We have no ministry of higher education or national system of education, relatively few federal regulations, and essentially no broad federal higher education policies.

The American university's constituencies are both broad and complex. Clients of university services include not only students but also patients of its hospitals; federal, state, and local governments; business and industry; and the public at large (e.g., as spectators at athletic events). To address this diversity— indeed, incompatibility—of the values, needs, and expectations of the various constituencies served by higher education, the United States has encouraged a highly diverse array of tertiary educational institutions to flourish. From small colleges to immense multi-campus universities, religious to secular institutions, vocational schools to liberal arts colleges, land-grant to urban to national research universities, public to private to for-profit universities, there is a rich diversity in both the nature and the mission of America's roughly 3,600 post-secondary institutions.

From an economic perspective, today the United States spends roughly 2.6% of its GDP on higher education ($335 billion/year). Public sources provide 45% of this support: the states provide 24% ($75 B/y) primarily through appropriations directly to public colleges and universities; the federal government provides the remaining 21% ($70 B/y) through student financial aid, subsidized loans, and tax benefits ($40 B/y) and research grants ($30 B/y). Here it is important to stress that federal support of American higher education is primarily channeled to individuals (students and faculty research investigators) rather than to institutions. In contrast, the states play a more direct role in supporting and governing institutions,

providing significant funding to their public universities and imposing governance structures ranging from rigidly controlled systems (e.g., New York and Ohio) to strategic master plans (e.g., California and Texas) to anarchy and benign neglect (e.g., Michigan).

Over 55% of the support of American higher education ($190 B/y) comes from private support, including tuition payments ($95 B/y), philanthropic gifts ($30 B/y), endowment earnings ($35 B/y on the average), and revenue from auxiliary activities such as medical clinics and athletics ($30 B/y). This very large dependence on private support–and hence the marketplace–is a major reason why on a per-student basis, higher education in America is supported at about twice the level ($26,021 per year) as in Europe. There is a caveat here, however, since roughly half of this cost is associated with non-instructional activities such as sponsored research, health care, student housing, economic development, and, of course, intercollegiate athletics–missions unique to American universities. After subtracting the sources earmarked for nonacademic missions, one finds that the actual instructional costs of American higher education today are quite comparable to those of many European nations.

A few other characteristics of American institutions should be mentioned. Beyond their fundamental purpose of teaching and scholarship, American colleges and universities have inherited from their British antecedents the mission of the socialization of young students, or in the words of Lord Rugby, "transforming savages into gentlemen". Not only does this require a very substantial investment in residence halls, community facilities, and entertainment and athletic venues, but it can also distract the university from its more fundamental knowledge-based mission. Nevertheless, American parents tend to see college as "the place where we send our children to grow up".

Furthermore, American colleges and universities are expected to compensate for the significant weaknesses currently characterizing primary and secondary education in the United States, even if that requires providing remedial programs for many under-prepared students. Today only 26% of high school graduates are college-ready across the full spectrum of academic disciplines (English, reading, math, and

science). (ACT, 2013) While many leaders of American universities sometimes wish they could shift to the "no-frills" approach of European universities and focus their activities on teaching and scholarship for more mature students, this has proved difficult for all but the highly focused for-profit and on-line colleges designed for adult learners (e.g., the University of Phoenix and the Western Governors University).

The reality faced by most American universities is that many of the valuable academic services they provide to society–e.g., educating low income students, offering instruction in the arts and humanities, and conducting research and scholarship–are inherently unprofitable and hence must be subsidized either through government support or through other activities capable of generating a profit. American universities are continually adding new activities only marginally related to their fundamental educational mission in an effort to generate new revenues, e.g., aggressive management of endowment assets and intellectual property, equity interest in spinoff high-tech companies, conducting commercial entertainment activities (football, concerts, theatre), and providing educational services to wealthy clients (e.g., oil-rich nations).

Policy Issues and Concerns at the National Level

Although one commonly hears strong criticism of higher education from both the media and political front on issues such as cost and performance, recent opinion surveys actually reveal remarkably strong public support for higher education. (Callan and Immerwahr, 2008) Public attitudes remain favorable toward characteristics such as the quality of our colleges and universities and their contributions through teaching, research, and public service. Both the social and economic values of a college education are perceived as high and increasing. Yet there are clouds on the horizon with concerns about rising costs that could place a college education out of the reach of many students and families. Furthermore the credibility and integrity of higher education have been jeopardized by occasionally flagrant abuses of the public trust such as the recent scandals in the student loan industry, fraud and other episodes of scientific misconduct, and the

excessive commercialization of big-time college sports programs that exploit students while enriching coaches.

While public surveys still suggest strong support of higher education, numerous studies sponsored by government, business, foundations, the National Academies, and the higher education community have suggested that the past attainments of American higher education may have led our nation to unwarranted complacency about its future.

General Challenges to American Higher Education

More generally, American higher education appears to be having difficulty responding to changes demanded by the emerging knowledge services economy, globalization, rapidly evolving technologies, an increasingly diverse and aging population, and an evolving marketplace characterized by new needs (e.g., lifelong learning), new providers (e.g., for-profit, cyber, and global universities), and new paradigms (e.g., competency-based educational paradigms, distance learning, open educational resources). (Bok, 2013). Furthermore, while American research universities continue to provide the nation with global leadership in research, advanced education, and knowledge-intensive services such as health care, technology transfer, and innovation, this leadership is threatened by rising competition from abroad, by stagnant support of advanced education and research in key strategic areas such as science and engineering, and by the complacency and resistance to change of the academy. (Levine, 1997; Callan and Immerwahr, 2008)

The United States currently ranks 10th among OECD nations with 39% of 25-to-34 year olds having an associate degree or higher (although it ranks 5th for 25-to-65 year olds) and almost last in college completion rates, particularly when the fastest growing component of our population comes from minority groups (particularly Hispanic) with the lowest participation in higher education. There is clear evidence of an increasing stratification of access to (and success in) quality higher education based on socioeconomic status. Students from the highest income quartile are ten times more likely to graduate with college degrees than those from the lowest quartile! Many question whether our colleges and universities are achieving acceptable student learning outcomes (including critical thinking ability, moral reasoning, communication skills, and quantitative literacy).

The future of public higher education is of immense importance to the United States. Beyond the fact that three-quarters of all college students are enrolled in public universities, the increasing dependence of our nation on advanced education, research, and innovation compel efforts to both sustain and enhance the quality of our public colleges and universities. Yet, the current structure for financing public higher education may no longer be viable. Traditionally, this has involved a partnership among states, the federal government, and private citizens (the marketplace). In the past the states have shouldered the lion's share of the costs of public higher education through subsidies in an effort to keep tuition low for students; the federal government has taken on the role of providing need-based aid and loan subsidies. Students and parents (and to a much lesser extent donors) pick up the rest of the tab.

This system has become vulnerable as the states face the increasing Medicaid obligations of a growing and aging uninsured population, made even more difficult by the state tax-cutting frenzy during the boom period of the late 1990s. This is likely to worsen as a larger percentage of young people and working adults seek higher education while the tax-paying population ages and health care costs continue to escalate. As Kane and Orzag conclude, "the traditional model of higher education finance in the U.S. with large state subsidies to public higher education and modest means-tested grants and loans from the federal government is becoming increasingly untenable". (Kane, 2003)

Little wonder then that many are calling upon national leaders to articulate a national agenda for higher education in America, similar to other national agendas in K-12 education such as "A Nation At Risk" and "No Child Left Behind". Of course, we have had such national higher education agendas before during times of major national challenge and opportunity. The Land-Grant Acts of the 19th century addressed the needs of an emerging industrial nation and the importance of education to the working class. The government-university research partnership, proposed by Vannevar Bush in 1944 and implemented following WWII, along with the G.I. Bill and the recommendations

of the Truman Commission, established the principle of federal support of research and graduate education on the campuses while launching the massification of higher education in America. The National Defense Education Act of the late 1950s and 1960s established investments in higher education as critical to national security during the height of the Cold War.

Yet since that time, for almost four decades, the nation really has had no agenda for higher education in America. Little wonder that at times we appear to be drifting aimlessly, with changing social priorities putting at great risk the very institutions that earlier generations built and supported so strongly as key to the future of a great nation. Here part of the challenge is a profound misunderstanding of the relationship among the cost, price, and value of a college education by both students and parents and by elected public officials. The funding of higher education by state and federal government support (including tax benefits), philanthropy, and other various revenue streams not only disguise true costs but make pricing, e.g., tuition, largely fictitious, since all students, rich and poor, in public and private institutions receive very substantial subsidies. In some ways the financing of higher education is reminiscent of health care, where third-party payers (insurance companies, Medicare and Medicaid) also decouple the consumer from the marketplace. However in health care, at least one can estimate the costs of medical treatment and patients can assess the value of their health care, in contrast to higher education where true costs are difficult to estimate and the benefit of a college education is usually assessed only many years later.

One might approach this as an appropriate challenge to the federal government. After all, in some ways it was federal inaction by earlier Washington administrations that created the current dilemma, crippling state budgets with unfunded federal mandates such as Medicaid, through federal inaction on national priorities such as universal health care, and shifting philosophies of federal financial aid programs. It is also the federal government's responsibility to invest adequately in providing for economic prosperity and national security, particularly in the new flat world characterized by phenomena such as outsourcing and off-shoring characterizing a hypercompetitive, global,
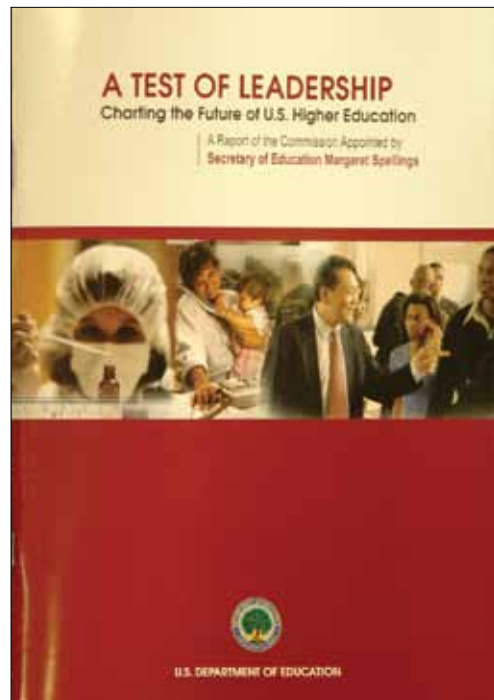
Report of the National Commission on the Future of Higher Education (The Spellings Commission)

knowledge-driven economy increasingly dependent upon knowledge workers, research, and technological innovation. (Friedman, 2005)

In 2005 the National Commission on the Future of Higher Education concluded that "Too few Americans prepare for, participate in, and complete higher education. Notwithstanding the nation's egalitarian principles, there is ample evidence that qualified young people from families of modest means are far less likely to go to college than their affluent peers with similar qualifications. America's higher-education financing system is increasingly dysfunctional. Government subsidies are declining; tuition is rising; and cost per student is increasing faster than inflation or family income." (Miller, 2006)

Furthermore, at a time when the United States needs to be increasing the quality of learning outcomes and the economic value of a college education, there are disturbing signs that suggest higher education is moving in the opposite direction. Numerous recent studies suggest that today's American college students are not really learning what they need to learn." (Bok, 2006)

This Commission proposed a set of higher education objectives for the nation and recommended

a series of actions necessary to achieve these objectives. These include demanding, building, and sustaining a truly world-class system of higher education by achieving an optimum balance between market forces and public policy; addressing those factors that have created a strong dependence of access and success in higher education upon socioeconomic status; shifting the education paradigm to stress the critical thinking and lifelong learning skills necessary to cope with uncertainty and change; stressing the importance of measuring, characterizing, and coordinating the activities of the postsecondary education enterprise in the United States; stimulating and sustaining the knowledge creation role of higher education (research and innovation); and engaging with the public to re-establish an adequate understanding of the public purpose of higher education in America while earning its understanding, trust, and confidence through bold initiatives aimed at addressing public concerns.

But the most important proposal of the Commission was to extend the opportunities for higher education in a manner similar to earlier federal initiatives such as the Land Grant Acts in the 19th century providing higher education to the working class, achieving universal access to secondary education in the early 20th century, and the G. I. Bill enabling the college education of the returning veterans of World War II. Today a major expansion of educational opportunity could have extraordinary impact on the future of the nation. To this end, the Commission recommended that the United States take bold action, completing in a sense the series of these earlier federal education initiatives, by *providing all American citizens with universal access to lifelong learning opportunities*, thereby enabling participation in the world's most advanced knowledge and learning society. The Commission urged the nation to accept a responsibility as a democratic society to enable all of its citizens to take advantage of the educational, learning, and training opportunities they need and deserve, throughout their lives, thereby enabling both individuals and the nation itself to prosper in an ever more competitive global economy.

While the ability to take advantage of educational opportunity always depends on the need, aptitude, aspirations, and motivation of the student, it should not depend on one's socioeconomic status. Access to livelong learning opportunities should be a right for all rather than a privilege for the few if the nation is to achieve prosperity, security, and social well-being in the global, knowledge- and value-based economy of the 21st century.

Challenges Faced by Research Universities

Our nation's primary source of both new knowledge and graduates with advanced skills continues to be its research universities. These institutions, with the strong and sustained support of government and working in partnership with American industry, are widely recognized as the best in the world, admired for both their research and their education. America's research universities are, today, a key asset for our nation's future.

Clearly today America's research universities are a key asset for our nation's future. They are so because of the considered and deliberate decisions made in the past by policy makers, even in difficult times. Our future now depends on the willingness of our current policy makers to follow their example and make the decisions that will allow us to continue as a nation to reaffirm, revitalize, and strengthen substantially the unique partnership that has long existed among the nation's research universities, the federal government, the states, and philanthropy by enhancing their roles and linkages and also providing incentives for stronger partnership with business and industry. In doing so, we will encourage the ideas and innovations that will lead to more high-end jobs, increasing middle-class incomes, and the security, health, and prosperity we expect.

The crucial importance of the research university as a key asset in achieving economic prosperity and security is widely understood, as evidenced by the efforts that nations around the globe are making to create and sustain institutions of world-class quality. Yet, while America's research universities remain the strongest in the world, they are threatened by many forces: the economic challenges faced by the nation and the states, the emergence of global competitors, changing student demographics, and rapidly evolving technologies. Even as other nations have emulated the United States in building research universities to drive economic growth, America's commitment to sustaining
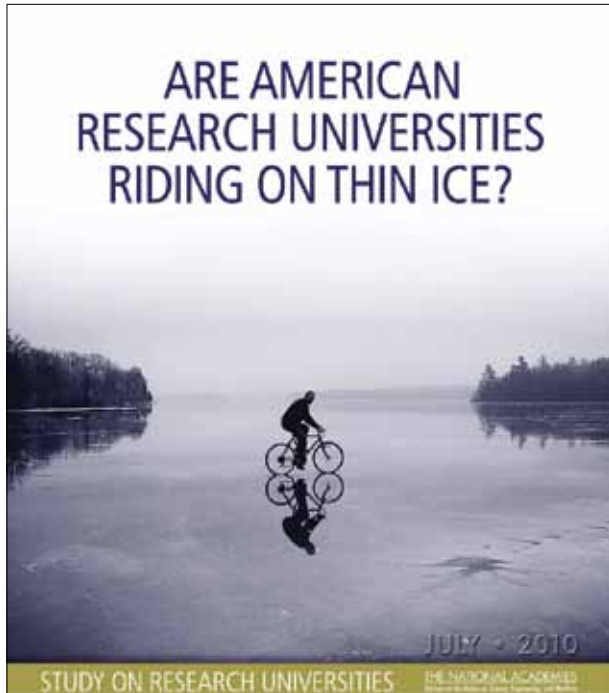
There are many concerns facing research universities.

National Academies Report on Research Universities

the research partnership that built a great industrial nation seems to have waned, hence stimulating the growing concern of our government.

To address these concerns, in 2010, Congress asked the National Academies to carefully study the challenges facing research universities and provide recommendations on how to address these. In its charge, Congress warned: "America's research universities are admired throughout the world, and they have contributed immeasurably to our social and economic well-being. Our universities, to an extent unparalleled in other countries, are our nation's primary source of long-term scientific, engineering, and medical research. We are concerned that they are at risk."

The National Academy Research University Commission's study found that the fundamental concern has been a weakening of the partnership among research universities, the federal government, the states, business and philanthropy, that had been key to the strength of these critical institutions. More specifically it concluded that each member of the national research partnership appears to be backing away from the earlier commitments that created and sustained the American research university. The policies and practices of our federal government no longer place a

priority on university research and graduate education. (Berdahl, 2010) In the face of economic challenges and the priorities of aging populations, our states no longer are either capable or willing to support their public research universities at world-class levels. American business and industry have largely abandoned the basic and applied research that drove American industrial leadership in the 20th century (e.g., Bell Laboratories), largely ceding this responsibility to research universities but with only minimal corporate support. Finally, our research universities themselves have failed to achieve the cost efficiency and productivity enhancement in teaching and research required of an increasingly competitive world.

While in the wake of the 2008 meltdown of the equity markets and subsequent recession, when all American research universities were facing challenges, there was general agreement that perhaps the most serious challenges were faced by the nation's public research universities as the states withdrew support. (McPherson, et. al., 2009) The endowments of private universities will recover rapidly, but state support is unlikely to recover for at least a generation.

In its recommendations the National Academies Commission stressed the importance of both

reaffirming and revitalizing the unique partnership that has long existed among the nation's research universities, the federal government, the states, and business and industry. More specifically, it proposed ten key recommendations:

1. The federal government should adopt stable, efficient, and effective policies and funding for university R&D and graduate education.

2. States should provide public research universities with greater autonomy to compete strategically. States also should strive to restore per-student funding to the mean inflation-adjusted level for the 15-year period covering 1987-2007. The Federal government should provide incentives to strengthen state support for public research universities.

3. The partnership between businesses and other research-performing institutions should be strengthened so that new knowledge, ideas, and technology are transferred more rapidly into the economy;

4. Universities, university associations, and key stakeholders should work together to increase university efficiency, provide a greater return on investment for research sponsors, while also educating key audiences about the value of U.S. research universities;

5. The federal government should create a Strategic Investment Program to fund education and research initiatives that advance key national priorities. The effort should include an endowed faculty chairs program to facilitate the careers of young investigators and a program to strengthen university research infrastructure with an initial focus on computing capabilities;

6. The federal government and other research sponsors should strive to fully fund the costs of research projects they sponsor at research universities;

7. Federal and state governments should eliminate regulations that increase administrative costs and impede research productivity without improving the research environment. Specifically, state and federal policymakers should review the costs and benefits of regulations and eliminate those whose costs outweigh their benefits. Furthermore, the federal government should make regulations and reporting requirements more consistent across agencies.

8. Research universities, federal agencies, and employers across all sectors should improve the capacity of graduate programs to attract talented students by addressing attrition rates, time-to-degree, funding, and alignment with both student career opportunities and national interests. To do this, the federal government should increase its support for graduate education and employers should more deeply engage research university programs, for example, by providing internships and advising on curriculum design;

9. Research universities, government at all levels, and other stakeholders should strive to ensure that all Americans, including women and underrepresented minorities, have the opportunity to study and eventually pursue careers in science, technology, engineering, and mathematics (STEM). To do this, research universities should participate in efforts to improve STEM education at the primary and secondary school levels; and

10. The federal government should ensure that the U.S. continues to benefit strongly from the participation of international students and scholars in research. Specifically, federal agencies should recruit international scholars, make it easier for researchers to obtain permanent residency or U.S. citizenship, and consistent with homeland security considerations, improve the efficiency of visa processing.

While sometimes bold and ambitious, the Commission felt that these recommendations and actions are necessary to preserve one of the nation's most important assets: its world-class research universities. While achieving these goals will be challenging, particularly in a rapidly changing economic environment. It is important to keep the recommendations and the report sufficiently flexible to adapt to unforeseen challenges and opportunities as they arise. For example, the staging of implementation steps will depend significantly upon economic circumstances. During the current economic recession, most of the focus should probably be on those federal

Summary of Investment Goals
(Annual Growth Targets Achieved by 2022)

New Investments Requested in Report ($B/y)

Federal Support for Research Universities

Full Funding of the American COMPETES Act (RU share)	$6	
Full-cost funding of research grants (no net increase)	0	
Reduction of regulatory burdens	0	
Strategic Investment Fund (requiring matching grants)		
Junior faculty chairs	2	
Cyberinfrastructure/research infrastructure	5	
Graduate fellowships and traineeships	2	
STEM programs for women and minorities	1	
R&D Tax Credits for industry-university research partnerships	2	
Total new federal support		$18

State support
Restoration of appropriations per student to 1990 levels	$15

Private Sector
Strategic Investment Fund Matching Grants	9	
Industry-University research partnerships (R&D Tax Credit)	6	$15

Research university productivity and cost reduction (20%) $15

Total Investment Requested from All Sources $63 B/y

Implications for Research Universities ($B/y)

Impact of Federal Actions

Full funding of American COMPETES Act (RU share)	$6	
Relief from full-cost funding of research grants (20% of $30 B/y)	6	
Relief from reduction of regulatory burdens (5% of $30 B/y)	1.5	
Strategic Investment Fund	7	
Graduate fellowships and traineeships	2	
STEM programs	1	23.5

State Support   15

Private Sector
Strategic Investment Fund matching grants	9	
Industry-University research partnerships (R&D Tax Credit)	6	15

Research university funds available for reallocation through
productivity and cost-containment   15   15

Total new resources available to research universities $68 B /y

The longer term financial goals of the next phase of the National
Academies project concerning the nation's research universities

and state policies and university practices designed to improve cost-containment and productivity. As the current economic crisis recedes and the economy improves later in the decade, attention should turn to restoring or increasing investments in research and graduate education.

The actions recommended by the National Academies will require significant policy changes, productivity enhancement, and investments on the part of each member of the research partnership: the federal government, the states, stakeholders such as business and philanthropy, and most of all, the nation's research universities. However, the National Academies view these recommendations as comprising a fair and balanced program that will generate significant returns to the nation. Such commitments are necessary for the future prosperity, health, and security of America.

The Particular Challenges Faced by
Public Universities

America's public research universities are the backbone of advanced education and research in the United States today. They conduct most of the nation's academic research (62%) while producing the majority of its scientists, engineers, doctors, teachers, and other learned professionals (70%). They are committed to public engagement in every area where knowledge and expertise can make a difference: basic and applied research, agricultural and industrial extension, economic development, health care, national security, and cultural enrichment. (McPherson, 2009)

Public research universities have become key assets in providing the steady stream of well-educated people, scientific knowledge, and technological innovations central to our robust economy, our vibrant culture, our vital health enterprise, and our security in a complex, competitive, and challenging world. In fact, it was the public research university, through its land-grant tradition, its strong engagement with society, and its commitment to educational opportunity in the broadest sense, that was instrumental in creating the middle class, transforming American agriculture and industry into the economic engine of the world during the 20th century, and defending democracy during two world wars. Today, public research universities must play a

similarly critical role in enabling America to compete in an emerging global economy in which educated citizens, new knowledge, and innovation are key.

Yet today, despite their importance to their states, the nation, and the world, America's public research universities are at great risk. Many states are threatening both the quality and capacity of their public research universities through inadequate funding and intrusive regulation and governance. Rising competition from generously endowed private universities and rapidly evolving international universities threaten their capacity to attract and retain talented students and faculty. While the current budget difficulties faced by the states are painfully apparent, and the highly competitive nature of American higher education is one of its strongest features, it is also important to recognize that public research universities are critical national assets, key to the nation's economic strength, public welfare, and security. It would be a national disaster if the crippling erosion in state support and predatory competition among institutions were to permanently damage the world-class quality of the nation's public research universities.

Today the nation's public research universities face urgent and at times contradictory marching orders. They are challenged by their states to expand participation in higher education significantly and to increase baccalaureate degree production in an effort to enhance workforce quality. At the same time, the nation depends upon them to produce both the world-class research and the college graduates at all levels necessary to sustain an innovation-driven and globally competitive national economy. Aging populations are increasingly dependent upon the clinical services of their medical centers. Local economies depend both on their talented graduates and their entrepreneurial spinoff of companies to market their research achievements. In an increasingly fragmented and hostile world, the nation continues to depend, for its security, on the science and technology developed on their campuses. Meeting these myriad challenges is increasingly difficult as state support of higher education erodes and political constraints on public institutions multiply.

There is ample evidence from the past three decades of declining support that the states are simply not able– or willing–to provide the resources to sustain growth in

public higher education, at least at the rate experienced in the decades following World War II. Despite the growth in enrollments and the demand for university services such as health care and economic development, most states will be hard pressed to sustain even the present capacity and quality of their institutions. In the wake of the recent global financial crisis, many states have already enacted drastic cuts in state appropriations, ranging from 20% to 50%. (SHEEO, 2011) In this budget-constrained climate, public support of higher education and research is no longer viewed as an investment in the future but rather as an expenditure competing with the other priorities of aging populations, e.g., health care, retirement security, safety from crime, and tax relief. Instead, state governments are urging their research universities to wean themselves from state appropriations by developing and implementing strategies to survive what could be a generation-long period of state support inadequate to maintain their capacity, quality, and reputation.

Ironically, even as state support has declined, the effort to regulate universities and hold them accountable has increased. To some degree, this is evidence of governments attempting to retain control over the sector through regulation even as their financial control has waned. Most state governments and public university governing boards tend to view their primary roles as oversight to ensure public or political accountability rather than as stewardship to protect and enhance their institutions so that they are capable of serving both present and future generations. Furthermore, many public research universities today find themselves constrained by university systems, characterized both by bureaucracy and system-wide policies for setting tuition levels and faculty compensation that fail to recognize the intensely competitive environment faced by research universities.

Yet something more fundamental is occurring. While it was once the role of governments to provide for the purposes of universities, today it is now the role of universities to provide for the purposes of government. As costs have risen and priorities for tax revenues have shifted to accommodate aging populations, governments have asked more and more stridently, what are universities for? The imperatives of a knowledge-driven global economy have provided a highly utilitarian answer: to provide the educated workforce and innovation necessary for economic competitiveness. Governments, in other words, increasingly regard universities as delivery agencies for public policy goals in areas such as economic development and workforce skills that may be tangential to their primary responsibilities of education and scholarship. (Newby, 2011)

While it is certainly true that cost-containment and accountability are important issues, it is also the case that most public universities can rightly argue that the main problems for them today is that they are both seriously underfunded through state appropriations and seriously overregulated by state policies in areas such as employment, financial affairs, tuition control, and open meetings requirements. Little wonder that public university leaders are increasingly reluctant to cede control of their activities to state governments. Some institutions are even bargaining for more autonomy from state control as an alternative to restoration of adequate state support, arguing that if granted more control over their own destiny, they can better protect their capacity to serve the public.

Declining state support is driving many public research universities to emulate their private counterparts in the development of an entrepreneurial faculty culture and in the manner in which priorities are set and assets are managed. (Ehrenberg, 2006) In such universities, only a small fraction of operating or capital support comes from state appropriation. Like private universities, these institutions depend on tuition, federal grants and contracts, private gifts, and revenue from auxiliary services such as health care for most of their support.

Many states are encouraging their public universities to reduce the burden of higher education on limited state tax revenues by diversifying their funding sources, e.g., by becoming more dependent upon tuition–particularly that paid by out-of-state students–by intensifying efforts to attract gifts and research contracts, and by generating income from intellectual property transferred from campus laboratories into the marketplace. Some states are even encouraging experimentation in creating a more differentiated higher education structure that better aligns the balance between autonomy and accountability.

Abandoned auto plants...

And an equally abandoned GM Headquarters

A Case Study: The State of Michigan

By any measure, the assessment of the State of Michigan today is very disturbing. The state is having great difficulty in making the transition from a manufacturing to a knowledge economy. In recent years it has led the nation in unemployment; the out-migration of young people in search of better jobs is particularly severe in our state; our educational system is underachieving with one quarter of Michigan adults without a high school diploma and only one-third of high school graduates college-ready. Although the state's system of higher education was once regarded as one of the nation's best, over the past decade Michigan has fallen to the bottom of the nation in its support of higher education. Yet at the same time it has risen to national leadership in its incarceration rate, with prison costs exceeding its investment in higher education. Its ranking in other areas such as personal income growth, GDP growth, employment, economic momentum, and life expectancy ranks among the bottom of the states.

More specifically, while all of the state's public universities have seen declines in inflation-adjusted state appropriation of 30% or more, Michigan's research universities have been particularly hard hit. Because of strong enrollment increases, UM and MSU have seen an effective decline of 50% in state support. State support of the University of Michigan's Ann Arbor campus has now declined to less than 4% of its total operating budget (and only 8% of its academic budget). Following the recession of 2008, the state also eliminated most state-based student financial aid programs (where it now ranks last among the states).

Although both the Michigan public and its politicians strongly criticize the state's public colleges and universities for increasing tuition, the reality is that it has been the state's decision to drastically cut its support of higher education that must entirely bear the responsibility for the rising prices to students and families. In an effort to keep the doors open to Michigan students, it has been necessary to raise tuition to replace disappearing state support to those who can afford it while striving to provide sufficient financial aid from institutional funds to those who cannot. During much of this period, state universities strained to hold tuition increases in check. In fact, their actual instructional costs are comparable to those of the 1980s. Furthermore, when financial aid and inflation are included, the net tuition levels for public higher education in Michigan have actually declined over the past decade. Ironically recent federal studies have found that when financial aid is included, the net cost of higher education to Michigan citizens has been dropping in recent years and now ranks 38th in the nation.

More precisely, Michigan today spends an average of $5,700 a year on a public university student, significantly below the national average of $6,600 and a statewide average of $7,300 for each K-12 student. (Boulus, 2012) But even more disturbing is that after a massive prison building boom in the 1980s, today Michigan spends almost 30% more on locking people up ($1.9 billion, corresponding to $40,000 per inmate)
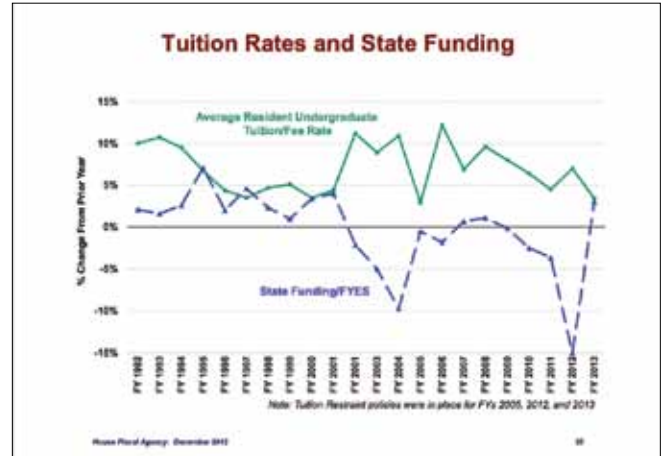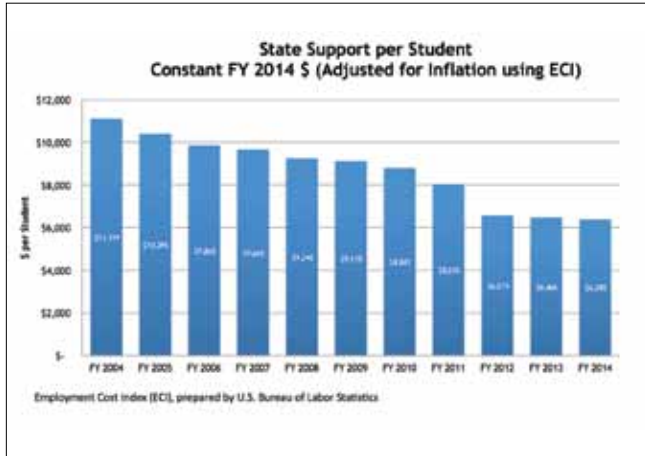
In Michigan today, the increase in tuition is driven almost entirely by withdrawal of state support.

than it does on educating them in our public colleges and universities, a truly tragic statement of our state's priorities. (SHEEO, 2012)

Michigan also lags far behind other states in providing state support of needed academic buildings on university campuses. Since the 1990s, there has been relatively little state funding of capital facilities for higher education. In fact, the state has currently seen a two decade-long drought with no appreciable funding of university facilities, ranking Michigan lowest in the nation in this important criterion.

Today there are increasing signs that both the quality and capacity of Michigan's public universities are beginning to suffer, at just that moment when the challenges of a global, knowledge-driven economy have positioned our universities as among our most important assets. Student-to-faculty ratios and workloads have been increasing, eroding not only the quality of classroom instruction but also constraining research university faculty from conducting the research critical to economic development in a knowledge economy increasingly dependent upon technological innovation. Faculty salaries at our public universities have fallen 20% behind those at private universities (compared to 1980 when they were roughly even), leading to a migration of some of the best professors from public to private institutions. Further erosion has occurred in the value of pension plans, medical benefits, life insurance, housing, and other benefits key to faculty recruiting and retention.

To compound these challenges, state government continues to threaten the autonomy of Michigan's public universities, guaranteed by the state constitution, by attempting to influence admission policies, curriculum, facilities funding, and personnel policies. Particularly insidious has been the impact of recent statewide referenda that now prohibit policies such as affirmative action critical to the ability of Michigan's universities to serve its increasingly diverse population.

The harsh manner in which state government has treated higher education in recent years demonstrates in a convincing fashion that our public leaders simply do not understand its importance. They fail to understand the imperatives of the new economy for Michigan's future. But even in the short term, considering the economic impact of Michigan's colleges and universities, cutting higher education is clearly penny-wise and pound-foolish!

This situation can be stated even more simply for the University of Michigan. The world-class education provided by the University costs roughly $25,000 to $30,000 per student per year, just as it does for other world-class public universities such as the Universities of California, North Carolina, Wisconsin, and Illinois, compared to the $100,000 plus for private universities. In the past, state tax dollars paid for much of this. Today, however, the state has decided that higher education is its lowest priority, and it has dropped its support to 42th in the nation. The University of Michigan has tried to compensate by cutting costs, generating other revenue through gifts and enrolling outstate students who pay tuition somewhat above costs ($45,000 per year). It has, in fact, managed to raise enough funding to guarantee that no Michigan student will ever have
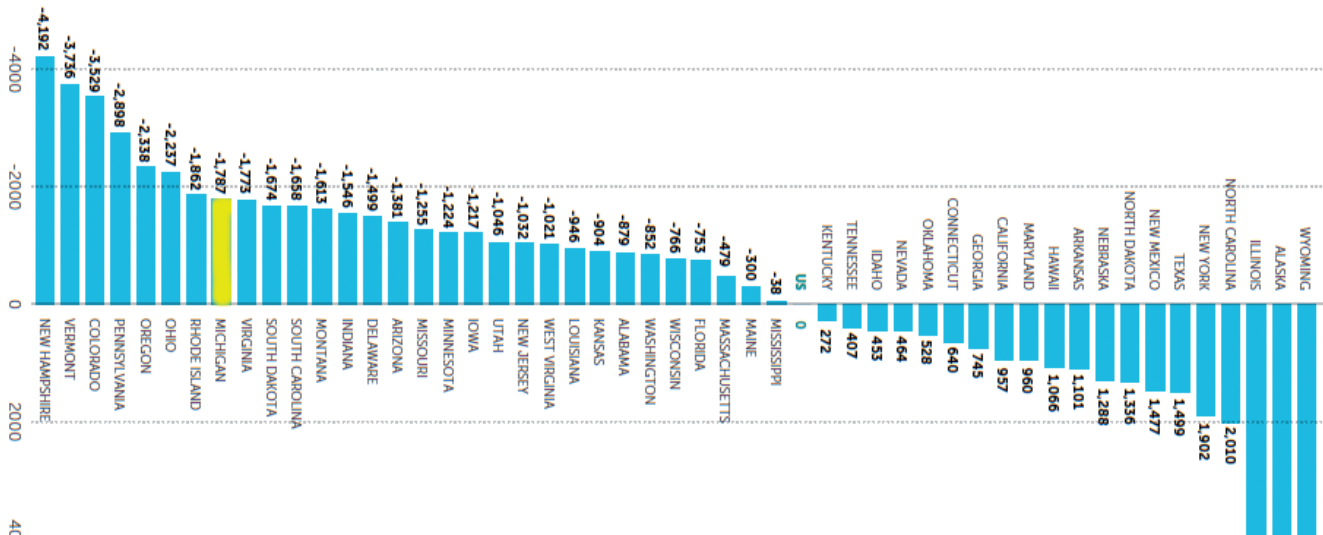
In 2015 Michigan continues to rank among the bottom of the states in its support of public higher education.
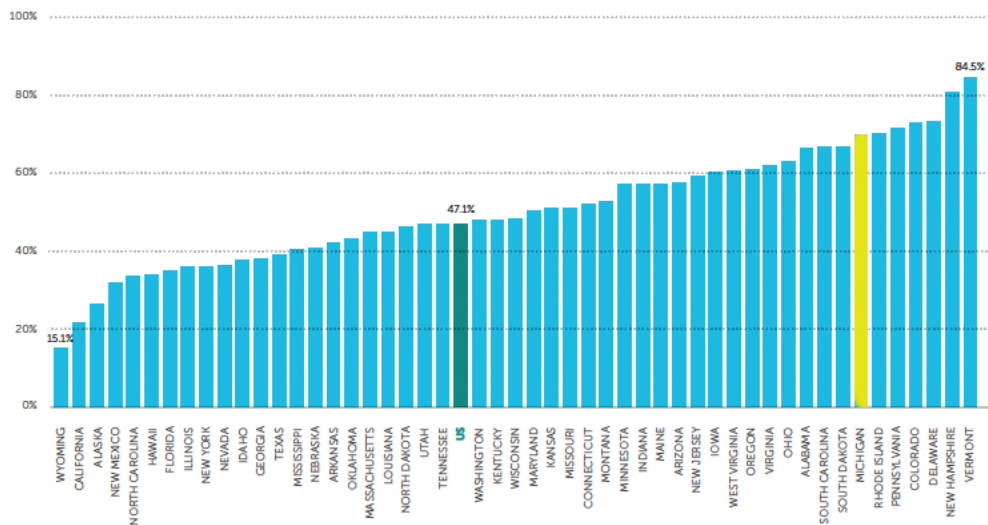
This low level of state support explains why Michigan universities still must charge high tuition

to drop out because of need (a guarantee that has been in place for several decades). Michigan parents have to realize that Michigan citizens no longer want to use their tax dollars to subsidize the college education for their children. So those who can afford it either have to pay more for the education of their students or persuade their elected representatives in Lansing that the tax support of Michigan's public universities should be given a higher priority. Of course, some parents might prefer instead bargain basement quality in return for bargain basement prices. But there are many other universities capable of providing that. The University of Michigan has not been willing to sacrifice its world-class quality throughout its history, and it is

determined not to do so today. Both the state and the nation depend upon its determination to sustain this commitment to excellence.

Little wonder that after the cavalier treatment higher education has received from state leaders over the past several years, the governing boards with fiduciary responsibility for the welfare of Michigan's public universities have begun to lose confidence in state government as a reliable partner in providing adequate support for this critical state asset. Term-limited legislators and governors, political parties controlled by narrow special-interest groups, and a body-politic addicted to an entitlement economy simply cannot be trusted. Instead, governing boards

Report Card

Michigan State Budget Support For Public Higher Education

	Subject	Grade	Comments
	Tuition	F	Tuition in Michigan is an incredible $11,172 per year, the 5th highest price tag in the nation. It's also gone up 30% in the last five years.
	Spending per Student	F	Michigan has cut state appropriations for higher education by 31% per FTE in the past 5 years.
	Burden on Families	F	Students and families shoulder 68% of higher education costs. Is it still a public school when the government only pays for a third?
	State Aid to Students	F	Michigan gives $196 per FTE in grants to students, almost $450 less than the national average.
	Education as a State Priority	F	The state legislature spent just 3.9% of its budget on higher education in 2012, down 13% in the past 5 years.
	Final Grade	F	Given the high tuition rate and low scant student support, Michigan ranks dead last for overall state support of higher education.

Additional Comments: Michigan should increase state support for students and families, as well as work with colleges and universities to lower tuition and make a degree more affordable.

The average student debt load in Michigan is: **$27,451**

Opportunities for Extra Credit

If you or your student group would like to become more informed about the state budget process, and keeping college affordable in your state, please contact Jasmine Hicks at: jasmine.hicks@younginvincibles.org

YOUNGINVINCIBLES

Michigan fails in all phases of a 2014 "report card" for state support of public higher education.

are relying more heavily on the autonomy provided by the state constitution, which gives them control over decisions such as admission, tuition and fees, faculty and staff compensation, procurement, and other areas sometimes micromanaged by state government.

There is little hope of Michigan returning to a level of state support adequate to sustain world-class quality in the foreseeable future. Political resistance to tax increases and the priority of other needs will constrain any significant growth in funding for higher education. Furthermore, political pressures will continue to make it very difficult to prioritize state support for flagship institutions such as the University of Michigan and Michigan State University and instead continue to drive a leveling process in which state appropriation per student gradually equalizes across the state. Of course, this situation will likely be the future of many other flagship public universities in the years ahead. The very concept of the comprehensive "state" university of

world-class quality is in serious jeopardy, at least to the degree that we expect these institutions to be supported in a significant way from state appropriations and driven primarily by state priorities (and politics).

Remaining Questions, Concerns, and Caveats

Today American higher education faces many challenges, including an increasing stratification of access to (and success in) quality higher education based on socioeconomic status; questionable achievement of acceptable student learning outcomes (including critical thinking ability, moral reasoning, communication skills, and quantitative literacy), cost containment, and productivity. Furthermore, institutions are challenged to adapt to changes demanded by the emerging knowledge services economy, globalization, rapidly evolving technologies, an increasingly diverse and aging population, and an evolving marketplace characterized by new needs (e.g., lifelong learning), new providers (e.g., for-profit, cyber, and global universities), and new paradigms (e.g., competency-based educational paradigms, distance learning, open educational resources). While American research universities continue to provide the nation with global leadership in research, advanced education, and knowledge-intensive services such as health care, technology transfer, and innovation, this leadership is threatened by rising competition from abroad, by stagnant support of advanced education and research in key strategic areas such as science and engineering, and by the complacency and resistance to change of the academy.

Of course, one of the most significant challenges facing higher education in America today is the extraordinary shift that has occurred in public perception of its purpose over the past half century. In decades following the Great Depression and World War II, higher education was viewed primarily as a *public good* because of the critical role played by an educated population and the knowledge generated on our campuses in determining the prosperity, health, and security of our nation. Hence strong public support of higher education was viewed as an investment in the future of the nation, as evidenced by important programs such as the GI Bill, the California Master

Plan, and strong support of campus-based research.

Yet today we find higher education increasingly viewed as primarily a *private benefit*, enabling 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. The recent trend toward excessive compensation for university administrators, now viewed less as educators and more akin to corporate executives, has also shaped this increasing public tendency to view higher education as more a business than a public service. It has also played well with those who distrust the presumably liberal bias of college campuses and deny the proposition that democracy necessitates an educated citizenry. (Deresiewicz, 2014)

Ironically, the United States stands largely apart from the rest of the world in its shift from public to private support of higher education, since most nations assume that public financing of higher education is already, in effect, an implicit loan that students repay after graduation in the form of taxes levied on the higher income resulting from their college education. Most European nations charge little or no fee for college attendance, while other nations such as Australia, New Zealand, and England have shifted to income-contingent loans. Of course many economists believe that the shift of the United States from general tax revenues to high tuition/high financial aid models for the support of higher education probably makes more sense since it avoids subsidizing the education of students from affluent families and focuses on providing societal support to low income students. Yet this strategy usually fails to win the support of the body politic.

There is always hope that an aging population will eventually seek meaning to their lives through a greater commitment to future generations. Indeed, the younger generations are already hungry for just such visions. Yet there remain many additional questions for those responsible for governing, supporting, leading, and providing higher education services to society. For example:

What do people expect from higher education? Are these reasonable expectations or do they arise from a lack of understanding of the broad role of higher education? Perhaps more germane to a public agenda is the question of what people really need from higher education–including roles such as social criticism that are rarely valued at the time.

To whom is the university responsible? To whom should it be held accountable? Students? The public? The taxpayer? The politicians? The media? How about responsibility and accountability to society at large? States? The nation? The world? Or framed in a different way, how would one prioritize accountability to respond to the needs of the present with being a responsible steward for past investments and commitments or the responsibilities to preserve and enhance our college and universities to serve future generations?

Who should be held accountable for the performance and quality of higher education? Elected public officials such as governors and legislators? Governing boards? University faculties? University presidents? Football coaches (at least at some institutions…)?

How does one persuade an aging population, most concerned with issues such as retirement security, health care, safety from crime and terrorism, and tax relief, that both their own welfare and their legacy to future generations depends on investing public resources in the strong support of higher education?

In recent years there has been a trend toward expanding the role of state governments in reshaping higher education. Many of these accountability movements call on universities to narrow their goals to focus on near-term imperatives, e.g., more efficient classroom instruction, increased undergraduate enrollments, limiting tuition increases even as state support deteriorates. Rarely are the broader purposes of higher education–e.g., creating the educated citizenry necessary for a democracy, preserving cultural assets for future generations, enabling social mobility, and being a responsible social critic–acknowledged as public priorities by state leaders.

What role should the federal government play in setting and achieving the public agenda for American higher education? While the states have primary responsibility for sustaining public higher education, federal policies have frequently provided the primary stimulus for change through initiatives such as the Land Grant Acts, the GI Bill, the government-research partnership, and the extension of educational opportunities through the Higher Education Acts. What is a national agenda for higher education appropriate to prepare America for tomorrow?

How do we respond to the diverse educational needs of a knowledge-driven society? Here we must realize that while the educational needs of the young will continue to be a priority, we will be challenged to also address the sophisticated learning needs of adults in the workplace while providing broader lifetime learning opportunities for all of our society.

Is higher education a public or a private good? To be sure, the benefits of the university clearly flow to society as a whole. But it is also the case that two generations of public policy have stressed instead 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 in America? 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? Here it is important to recognize that less than 3% of the universities in this nation (and a even smaller percentage on a global level) are research universities, with the responsibility to generate new knowledge as well as to educate students. Indeed, the unique character of education in a research university, in which faculty bring into the curriculum the new knowledge created through original scholarship, is one of the most valuable assets of these institutions.

These are some of the issues that should frame the debate about the future of higher education in America. 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 nation. They provide the context for any consideration of the future of the university in America.

So what are federal and state governments, boards of trustees, and university leaders to do, as their academic institutions are buffeted by such powerful forces of change, and in the face of unpredictable futures? It is important to always begin with the basics, by considering carefully those key roles and values that should be protected and preserved during a period of transformation. For example, how would an institution prioritize among roles such as educating the young (e.g., undergraduate education), preserving and transmitting our culture (e.g., libraries, visual and performing arts), basic research and scholarship (e.g., graduate and professional education), and serving as a responsible critic of society? Similarly, what are the most important values to protect? Clearly academic freedom, an openness to new ideas, a commitment to rigorous study, and an aspiration for the achievement of excellence would be on the list for most institutions. But what about values and practices such as lay governing boards, shared governance, and tenure? Should these be preserved? At what expense?

Of course, we all aspire to excellence, but just how do we set our goals? There is an increasing sense that the paradigm characterizing many elite institutions, which simply focuses more and more resources on fewer and fewer, does not serve the broader needs of our society. Rather, the premium will be on the development of unique missions for each of our institutions, missions that reflect not only their tradition and their unique roles

in serving society, but as well their core competency. If such differentiation occurs, then far greater emphasis should be placed on building alliances with other institutions that will allow them to focus on their core competencies while relying on alliances to address the broader and diverse needs of society.

It is important for university leaders to approach issues and decisions concerning institutional change not as threats but rather as opportunities. True, the status quo is no longer an option. However, 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.

Yet this raises an important caution: In 2005, *The Economist* summarized the status of higher education in America as follows:

"There is no shortage of things to marvel at in America's higher-education system, from its robustness in the face of external shocks to its overall excellence. However, what particularly stands out is the system's flexibility and its sheer diversity. It is all too easy to mock American academia. But it is easy to lose sight of the real story: that America has the best system of higher education in the world!" (Economist, 2005)

Hence, while higher education in the United States faces many challenges, responsibilities, and opportunities, it is important that those responsible for the governance and leadership of American higher education, for establishing its public agenda and ensuring that it has the capacity and intent to address these priorities, always approach their task by heeding the admonition of the physician's Hippocratic Oath: "First…and always…do no harm."

Chapter 5

The University of Tomorrow

As we look even further into an unknowable future, the possibilities and uncertainties become even more challenging. Attempting to predict the future is always a hazardous activity. We generally overestimate change in the near term and under estimate it for the longer term, in part because we usually tend to extrapolate what we know today into a future that becomes increasingly beyond our imagination. It is very difficult to peer over the horizon. But there are some trends apparent today that will almost certainly influence the longer term that already raise many questions.

How will wealth be created and value added in this global, knowledge-driven economy? Will increasingly robust communications technologies (always on, always in contact, high-fidelity interaction at a distance) stimulate the evolution of new types of communities (e.g., self-organization, spontaneous emergence, collective intelligence, "hives")? Suppose info-bio-nano technologies continue to evolve at the current rate of 1,000 fold per decade. Can we really prepare today's kids for the world of several decades from now when technologies such as neural implants, AI agents ("mind children), and perhaps even a new human species from gene drive may actually exist? During the 20th century, the life expectancy in developed nations essentially doubled (from 40 to 80 years). Suppose it doubles again in the 21st century?

More generally, it is clear that as the pace of change continues to accelerate, learning organizations and innovation systems will need to become highly adaptive if they are to survive. Here, we might best think of future learning and innovation environments as ecologies that not only adapt but also mutate and evolve to serve an ever-changing world.

Such future challenges call for bold initiatives. It is not enough to simply build upon the status quo.

Instead, it is important to 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 this end, it is useful to also speculate about some of the university paradigms shifts that may be required to adapt to an unpredictable future.

Game-Changers

Restructuring of the Higher Education Enterprise

Universities serve as the gatekeepers not only for the definition of the academic disciplines and membership in the academy, but, as well, controlling entry to the professions that so dominate contemporary society. While there has been competition among institutions for students, faculty, and resources—at least in the United States—the extent to which institutions control the awarding of degrees has led to a tightly controlled competitive market. Furthermore, most colleges and universities serve primarily local or regional areas, where they have particularly strong market positions. In a sense, some would even suggest that today's university is provider-centered, essentially functioning to serve the needs and desires of the faculty rather than the students they teach or the broader society that supports them.

However, clearly today faculty influence is weakening, both because of intellectual and organization issues. No university can control the growth of knowledge or the educational needs of a society. Information technology is rapidly eliminating the barriers of space and time that have largely shielded campus activities from competition. As the need for advanced education becomes more intense, there are

already signs that some institutions are responding to market forces and moving far beyond their traditional geographical areas to compete for students and resources. There are hundreds of colleges and universities that increasingly view themselves as competing in a national or even international marketplace. Even within regions such as local communities, colleges and universities that used to enjoy a geographical monopoly now find that other institutions are establishing beachheads through extension services, distance learning, or even branch campuses. With advances in communication, transportation, and global commerce, several universities in the United States and abroad increasingly view themselves as international institutions, competing in the global marketplace.

Beyond competition among universities, there are new educational providers entering the marketplace. Sophisticated for-profit entities such as the Apollo Group (i.e., University of Phoenix) and Laureate are moving into markets throughout the United States, Europe, and Asia. Already hundreds of Internet-based institutions are listed in college directories with millions of students enrolled in their programs, including major efforts such as the Western Governors University. It has been estimated that today there are over one thousand corporate training schools in the United States providing both education and training to employees at the college level. Industry currently spends over $200 billion per year on corporate training. And, of course, the MOOC movement and resources such as the Open Courseware Initiative are providing free access to Internet-based courses to millions around the world.

Although traditional colleges and universities enjoy competitive advantages based upon long-standing reputations and control of accreditation and credentialing, these could be eroded quite rapidly by the vast resources from capital markets that the industrial sector is capable of focusing on these efforts. Furthermore, the higher comfort level of industry with technology, intensely competitive marketplaces, strategic alliances, and rapid decision making could prove to be decisive advantages. Finally, with access to the vast resources of capital markets and unhindered by other social commitments or public governance, for-profit providers could cherry pick the best faculty and most attractive products (learning software, courses,
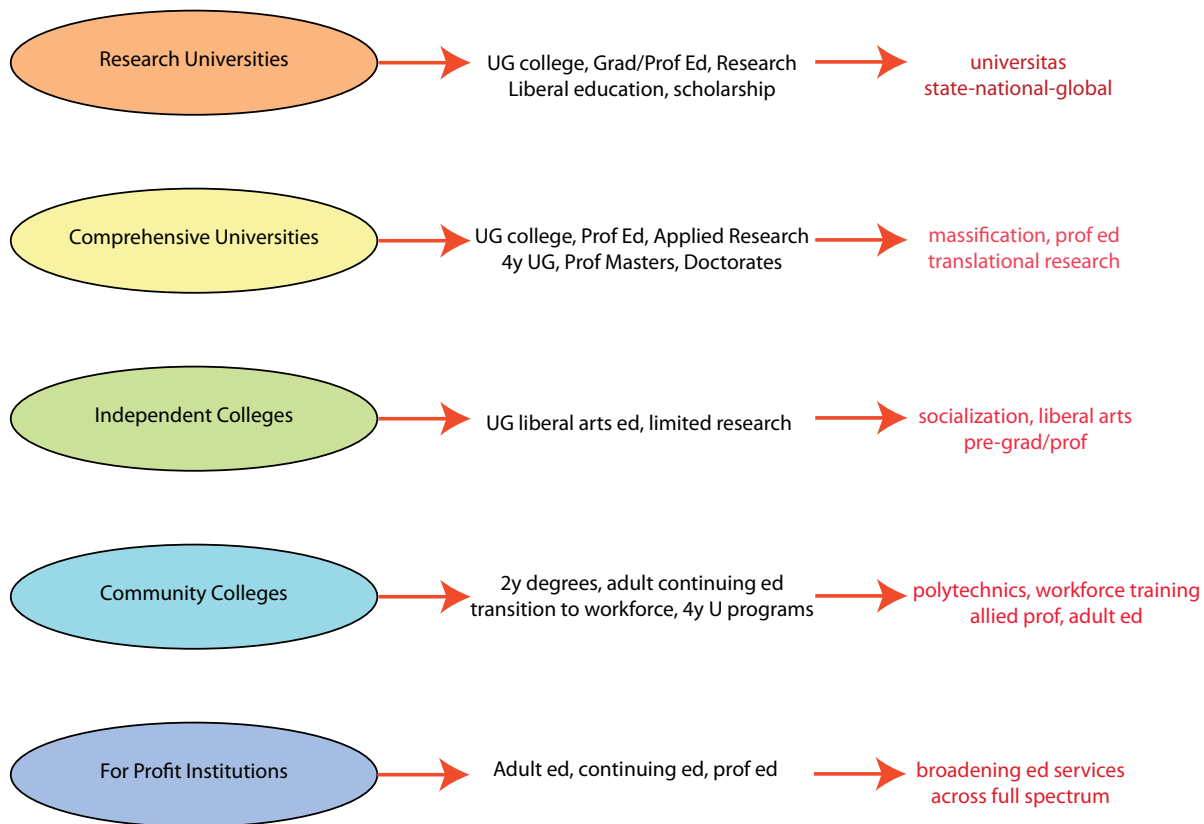
or programs) from traditional educational institutions. The competitive threat is very real

The faculty has long been accustomed to dictating what it wishes to teach, how it will teach it, and where and when the learning will occur. Students must travel to the campus to learn. They must work their way through the bureaucracy of university admissions, counseling, scheduling, and residential living. And they must pay for the privilege, with little of the power of traditional consumers. If they navigate through the maze of requirements, they are finally awarded a certificate to recognize their experience—a college degree. This process is sustained by accrediting associations, professional societies, and state and federal governments.

This carefully regulated and controlled enterprise could be eroded by several factors. First, the great demand for advanced education and training cannot be met by such a carefully rationed and controlled enterprise. Second, the expanding marketplace will attract new competitors, exploiting new learning paradigms, and increasingly threatening traditional providers. And perhaps most important of all, newly emerging information technology has not only eliminated the constraints of space and time, but it is also transforming students into learners and consumers. Open education resources are providing learners with choice in the marketplace—access to learning opportunities, knowledge-rich networks and digital libraries, collections of scholars and expert consultants, and other mechanisms for the delivery of learning.

The evolution from faculty-centered and -controlled teaching and credentialing institutions to distributed, open learning environments is already happening. The new learning services are increasingly available among many providers, learning agents, and intermediary organizations. Such an open, network-based learning enterprise may be more capable of responding to the staggering demand for advanced education, learning, and knowledge. It also seems certain not only to provide learners with far more choices but also to create far more competition for the provision of knowledge and learning services.

As a result, higher education could evolve from a loosely federated system of colleges and universities serving traditional students from local communities

Research Universities	→	UG college, Grad/Prof Ed, Research Liberal education, scholarship	→	universitas state-national-global
Comprehensive Universities	→	UG college, Prof Ed, Applied Research 4y UG, Prof Masters, Doctorates	→	massification, prof ed translational research
Independent Colleges	→	UG liberal arts ed, limited research	→	socialization, liberal arts pre-grad/prof
Community Colleges	→	2y degrees, adult continuing ed transition to workforce, 4y U programs	→	polytechnics, workforce training allied prof, adult ed
For Profit Institutions	→	Adult ed, continuing ed, prof ed	→	broadening ed services across full spectrum

Evolution of current institutional forms

to, in effect, a global knowledge and learning industry, with major implications for the role and power of the faculty.

Many in the academy would undoubtedly view with derision or alarm the depiction of the higher education enterprise as an "industry" or "business." After all, higher education is a social institution with broader civic purpose, *lux et veritas,* and not traditionally driven by concerns about workforce training and economic development. Furthermore, the perspective of higher education as an industry raises concerns that short-term economic and political demands will dominate broader societal responsibilities and investment. Yet, in an age of knowledge, the ability of the university to respond to social, economic, and technological change will likely require new paradigms for how we think about postsecondary education. No one, no government, is in control of the emerging knowledge and learning industry; instead it responds to forces in the marketplace. Universities will have to learn to cope with the competitive pressures of this marketplace

while preserving the most important of their traditional values and character. And the faculty will inevitably have to reconsider not only how they are organized but as well how they influence the direction of their institutions.

Lifelong Learning

The needs for lifelong learning opportunities in a knowledge society are manifold. The shelf life of education early in one's life, whether K-12 or higher education, is shrinking rapidly in face of the explosion of knowledge in many fields. Today's students and tomorrow's graduates are likely to value access to lifelong learning opportunities more highly than job security, which will be elusive in any event. They understand that in the turbulent world of a knowledge economy, characterized by outsourcing and off-shoring to a global workforce, employees are only one paycheck away from the unemployment line unless they commit to continuous learning and re-skilling to adapt to ever

changing work requirements. Furthermore, longer life expectancies and lengthening working careers create additional needs to refresh one's knowledge and skills from time to time. And, just as students increasingly understand that in a knowledge economy there is no wiser personal investment than education, many nations now accept that the development of their human capital through education must become a higher priority than other social priorities, since this is the only sure path toward prosperity, security, and social well-being in a global knowledge economy.

Just as in earlier critical moments in our nation's history when federal initiatives expanded the role of education, e.g. the Land Grant Acts in the 19th century to provide higher education to the working class, universal access to secondary education in the early 20th century, and the G. I. Bill enabling the college education of the returning veterans of World War II, today a major expansion of educational opportunity could have extraordinary impact on the future of the nation. It is time for the United States to take bold action, completing in a sense the series of these earlier federal education initiatives, by providing all American citizens with universal access to lifelong learning opportunities, thereby enabling participation in the world's most advanced knowledge society.

Of course, establishing as a national goal the universal access to lifelong learning would require not only a very considerable transformation and expansion of the existing postsecondary education enterprise, but it would also require entirely new paradigms for the conduct, organization, financing, leadership, and governance of higher education in America. For example, most of today's colleges and universities are primarily designed to serve the young–either as recent high school graduates or young adults early in their careers. Yet achieving the objective of universal access to lifelong learning would expand enormously the population of adult learners of all ages. Traditional university characteristics such as residential campuses designed primarily to socialize the young with resources such as residence halls, student unions, recreational facilities, and varsity athletics would have marginal value to adult learners with career and family priorities. Such universal lifelong learning could change dramatically the higher education marketplace,

providing for-profit institutions already experienced in adult education with significant advantages. Furthermore it seems likely that the only way that such ubiquitous access can be provided to lifelong learning to adults with career and family responsibilities will be through technology-mediated distance learning.

Globalization

There is a strong sense that higher education, long international in participation, may now be in the early stages of globalization, through the efforts of an increasing number of established universities to compete in the global marketplace for students, faculty, and resources; through the rapid growth in international partnerships among universities; and through for-profit organizations (e.g., Apollo, Laureate) that seek to expand through acquisition into global enterprises. New types of universities may appear that increasingly define their purpose beyond regional or national priorities to address global needs such as health, environmental sustainability, and international development. As a new world culture forms, a number of universities will evolve into learning institutions serving the world, albeit within the context of a particular geographical area (e.g., North America).

While universities must be responsive to the imperatives of a global economy and attendant to their local responsibilities, they must also become responsible members of the global community. Many of the challenges facing our world such as poverty, health, conflict, and sustainability continue to become more serious through the impact of the human species–global climate change being foremost among them. The global knowledge economy requires thoughtful, interdependent and globally identified citizens. Institutional and pedagogical innovations are needed to confront these challenges and insure that the canonical activities of universities – research, teaching and engagement – remain rich, relevant and accessible.

The Changing Nature of Discovery,
Learning, and Innovation

The fundamental intellectual activities of discovery and learning enabling these goals are being

Higher education is rapidly globalizing..

transformed by the rapid evolution of information and communications technology. Rapidly evolving digital technology, so-called cyberinfrastructure, consisting of hardware, software, people, and policies, has become an indispensable platform for discovery, innovation, and learning. This technology is continuing to evolve very rapidly, linking people, knowledge, and tools in new and profound ways, and driving rapid, unpredictable, and frequently disruptive change in existing social institutions. But since cyberinfrastructure can be used to enhance learning, creativity and innovation, intellectual span, and collaboration, it presents extraordinary opportunities as well as challenges to an increasingly knowledge-driven society. To quote the conclusion of the NSF Blue Ribbon Advisory Panel on Cyberinfrastructure (Atkins, 2003):

"A new age has dawned in scientific and engineering research, pushed by continuing progress in computing, information, and communication technology, and pulled by the expanding complexity, scope, and scale of today's challenges. The capacity of this technology has crossed thresholds that now make possible a comprehensive cyberinfrastructure on which to build new types of scientific and engineering knowledge environments and organizations and to pursue research in new ways and with increased efficacy. Such environments and organizations, enabled by cyberinfrastructure, are increasingly required to address national and global priorities. The emerging vision is to use cyberinfrastructure to build more ubiquitous, comprehensive digital environments that become interactive and functionally complete for research communities in terms of people, data, information, tools, and instruments and that operate at unprecedented levels of computational, storage, and data transfer capacity. Increasingly, new types of scientific organizations and support environments for science are essential, not optional, to the aspirations of research communities and to broadening participation in those communities. They can serve individuals, teams, and organizations in ways that revolutionize what they can do, how they do it, and who participates. This vision has profound broader implications for education, commerce, and social good."

Clearly, today cyberinfrastructure continues not only to reshape but actually create new paradigms for learning and discovery not only in the sciences but increasingly also in the humanities and arts. This is particularly true for emerging technologies such as always-on, ubiquitous connectivity (anywhere, anytime, everyone); social networking, crowd sourcing, collaborative learning and discovery, functionally complete cyberinfrastructures, emerging learning paradigms such as massively open online courses (MOOCs), cognitive tutors, gaming, immersive experiences; big data, data-intensive discovery, learning analytics, intelligent software agents, and possible surprises such as cognitive implants. Of particular concern is the impact of emerging technologies to transform learning institutions (schools, colleges, workplace training, lifelong learning, open learning) and paradigms (from learning about, to learning to do, to learning to become).

The evolution of powerful cyberinfrastructure is driving significant change in the paradigms for discovery and research. Data mining has been added to the traditional scientific processes of observation, hypothesis, and experiment, becoming more data driven rather than hypothesis driven. Both fundamental research and product development are increasingly dependent on simulation from first principles rather

MIT's OpenCourseware Project

Coursera MOOCs

than experimental measurement testing, requiring massive supercomputers. If one subscribes to the view that there is a paradigm shift from hypothesis driven to data driven discovery and simulation, then it is clear that the entire conduct and culture of learning, discovery, and innovation is changing as a result of access to data, technology and social networks. We are going to need new models for sharing data, software, and computational resources.

The impact of rapidly evolving cyberinfrastructure on research and scholarship has been experienced across all of the academic disciplines, e.g., the natural and social sciences, the arts and humanities, and particularly the professional discipline. New paradigms are rapidly emerging for learning and education as well as innovation and professional practice.

Universal Access to Knowledge and Learning

Ironically, while we generally think in terms of this in terms such as terabit/sec networks and exaflop supercomputers, the most profound changes in our institutions may be driven not by the technology itself but rather the philosophy of openness and access it enables–indeed, imposes–on its users. Of particular importance are efforts to adopt the philosophy of open source software development to create new opportunities for learning and scholarship for the world by putting previously restricted knowledge into the public domain and inviting others to join in both its use and development. MIT led the way with its

OpenCourseWare (OCW) initiative, placing the digital assets supporting almost 2,000 courses into the public domain on the Internet for the world to use. (Vest, 2006) Today, over 1,000 universities have adopted the OCW paradigm to distribute their own learning assets to the world, with over 15,000 courses now available online. New resources such as Apple's iTunes U and Amazon are providing access to such open educational resources.

Furthermore, universities and corporations have joined together to develop open-source middleware to support the instructional and scholarly activities of higher education, already used by hundreds of universities around the world. (e.g., Moodle, Sakai, Canvas) Others have explored new paradigms for open learning and engagement, extending the more traditional yet highly successful models provided by open universities. There are increasing efforts to open up both data collection and scholarly publication by both individual institutions and university organizations, including the European University Association and the Association of American Universities. More recently major federal research agencies such as NIH, NSF, DOE have implemented new requirements that both the data and publications resulting from their research grants be placed in the public domain on a timely basis.

To this array of open educational resources should be added efforts to digitize massive quantities of printed material and make it available for search and eventual access. For example, the Google Book project is currently working with a number of leading libraries

Google Books

Hathi Trust

(26 at last count in 35 languages) around the world to digitize a substantial portion of their holdings (22 million volumes in 2013, with a goal of 30 million by 2020), making these available for full-text searches using Google's powerful internet search engines.

A number of United States universities (60 thus far) have pooled their digital collections to create the Hathi Trust ("Hathi" means "elephant" in Hindi), adding over 400,000 books a month to form the nucleus (already at 14 million books, with 4 million of these already open for full online access) of what could become a 21st century analog to the ancient Library of Alexandria. While many copyright issues still need to be addressed, it is likely that these massive digitization efforts will be able to provide full text access to a significant fraction of the world's written materials to scholars and students throughout the world within a decade.

We should add into this array of ICT-based activities a few more elements: mobile communication, social computing, and immersive environments. We all know well the rapid propagation of mobile communications technology, with over 4 billion people today having cell-phone connectivity and 1.2 billion with broadband access. It is likely that within a decade the majority of the world's population will have some level of cell-phone connectivity, with many using advanced 3G and 4G technologies.

Finally, the availability of new learning resources such as massively open online learning (MOOC) consortia (Udacity, Coursera, EdX, and Unizen), intelligent AI-based tutor software (Carnegie Mellon's
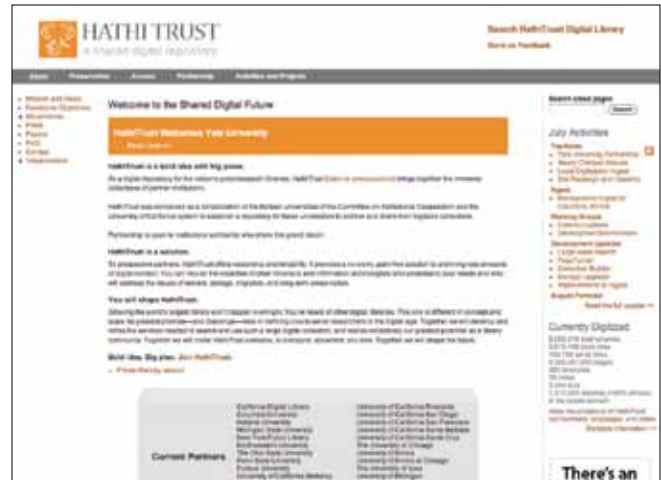
Open Learning Initiative), and immersive learning environments similar to those developed in the massively player gaming world (World of Warcraft) are providing resources that not only open up learning opportunities for the world but furthermore suggest new learning paradigms that could radically challenge and change existing higher education paradigms.

Preparing for Unknowable Futures

There are other possibilities that might be considered for the longer-term future. Balancing population growth in some parts of the world might be new pandemics, such as a new avian flu virus or air-borne Ebola, which appear out of nowhere to ravage our species. The growing divide between rich and poor, the developed nations and the third world, the North and South hemispheres, could drive even more serious social unrest and terrorism, perhaps armed with even more terrifying weapons.

Then, too, the unrelenting–indeed, accelerating pace of technology could benefit humankind, extending our lifespan and quality of life (although perhaps aggravating population growth in the process), meeting the world's needs for food and shelter and perhaps even energy, and enabling vastly new forms of communication, transportation, and social interaction. Perhaps we will rekindle our species' fundamental quest for exploration and expansion by resuming human spaceflight and eventually colonizing our solar system and beyond.

Sustained progress in the development of new technologies has been the central feature of the past century and is likely to be even more so in the century ahead. But technology will also present new challenges that almost seem taken from the pages of science fiction. Clearly if digital technology continues to evolve at its current pace for the next decade, creating machines a thousand, a million, a billion times more powerful than those which are so dominating our world today, then phenomena such as the emergence of machine consciousness and intelligence become very real possibilities during this century.

John von Neumann once speculated that "the ever accelerating progress of technology and changes in the mode of human life gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue." The acceleration of technological progress has been the central feature of the past century and is likely to be even more so in the century ahead. Some futurists have even argued that we are on the edge of change comparable to the rise of human life on Earth. The precise cause of this change is the imminent creation by technology of entities with greater than human intelligence. For example, as digital technology continues to increase in power a thousand-fold each decade, at some point computers (or, more likely, large computer networks) might "awaken" with superhuman intelligence. Or biological science may provide the means to improve natural human intellect. (Kurzweil, 2005)

When greater-than-human intelligence drives technological evolution, that progress will be much more rapid, including possibly the creation of still more intelligent entities, on a still shorter timescale. To use Von Neumann's terminology, at such a technological "singularity", our old models must be discarded and a new reality appears, perhaps beyond our comprehension. We probably cannot prevent the singularity, since driven as it is by humankind's natural competitiveness and the possibilities inherent in technology, we are likely to be the initiators. But we have the freedom to establish initial conditions, make things happen in ways that are less inimical than others–if we have the wisdom to do so. (Kurzweil, 2005)

Clearly phenomena such as machine consciousness,

contact by extraterrestrial intelligence, or cosmic extinction from a wandering asteroid are possibilities for our civilization, but just as clearly they should neither dominate our attention nor our near-term actions. Indeed, the most effective way to prepare for such unanticipated events is to make certain that our descendants are equipped with education and skills of the highest possible quality.

Paradigm Shifts

The Common Denominators

As knowledge and educated people become key to prosperity, security, and social well-being, the university, in all its myriad and rapidly changing forms, has become one of the most important social institutions of our times. Yet many questions remain unanswered. Who will be the learners served by these institutions? Who will teach them? Who will administer and govern these institutions? Who will pay for them? What will be the character of our universities? How will they function? When will they appear? The list goes on.

It is difficult to suggest a particular form for the university of the 21st Century. The ever-increasing diversity of American higher education makes it clear that many types of institutions will serve our society. Nonetheless, a number of themes will almost certainly characterize at least some part of the higher education enterprise:

- Universities will shift from faculty-centered to *learner-centered* institutions, joining other social institutions in the public and private sectors in the recognition that we must become more focused on those we serve.
- They will be more *affordable*, within the resources of most citizens, whether through low cost or societal subsidy.
- They will provide *lifelong learning,* requiring both a willingness to continue to learn on the part of our citizens and a commitment to provide opportunities for this lifelong learning by our institutions.
- All levels of education will be a part of a *seamless web*, as they become both interrelated and blended

together.

- Universities will embrace *asynchronous learning*, breaking the constraints of time and space to make learning opportunities more compatible with lifestyles and needs, anyplace, anytime.
- We will continue to develop and practice *interactive and collaborative learning*, appropriate for the digital age, the "plug and play" generation.
- Universities will commit to *diversity* sufficient to serve an increasingly diverse population with diverse needs and goals.
- Universities will need to build learning environments that are both *adaptive and intelligent*, molding to the learning styles and needs of the students they serve.

There is one further modifier that may characterize the university of the future: *ubiquitous*. Today, knowledge has become the coin of the realm. It determines the wealth of nations. It has also become the key to one's personal standard of living, the quality of one's life. We might well make the case that today it has become the responsibility of democratic societies to provide their citizens with the education and training they need throughout their lives, whenever, wherever, and however they desire it, at high quality, and at a cost they can afford.

Of course, this has been one of the great themes of higher education in America. Each evolutionary wave of higher education has aimed at educating a broader segment of society—the public universities, the land-grant universities, the normal and technical colleges, and the community colleges. But today we must do even more to serve an even broader segment of our society.
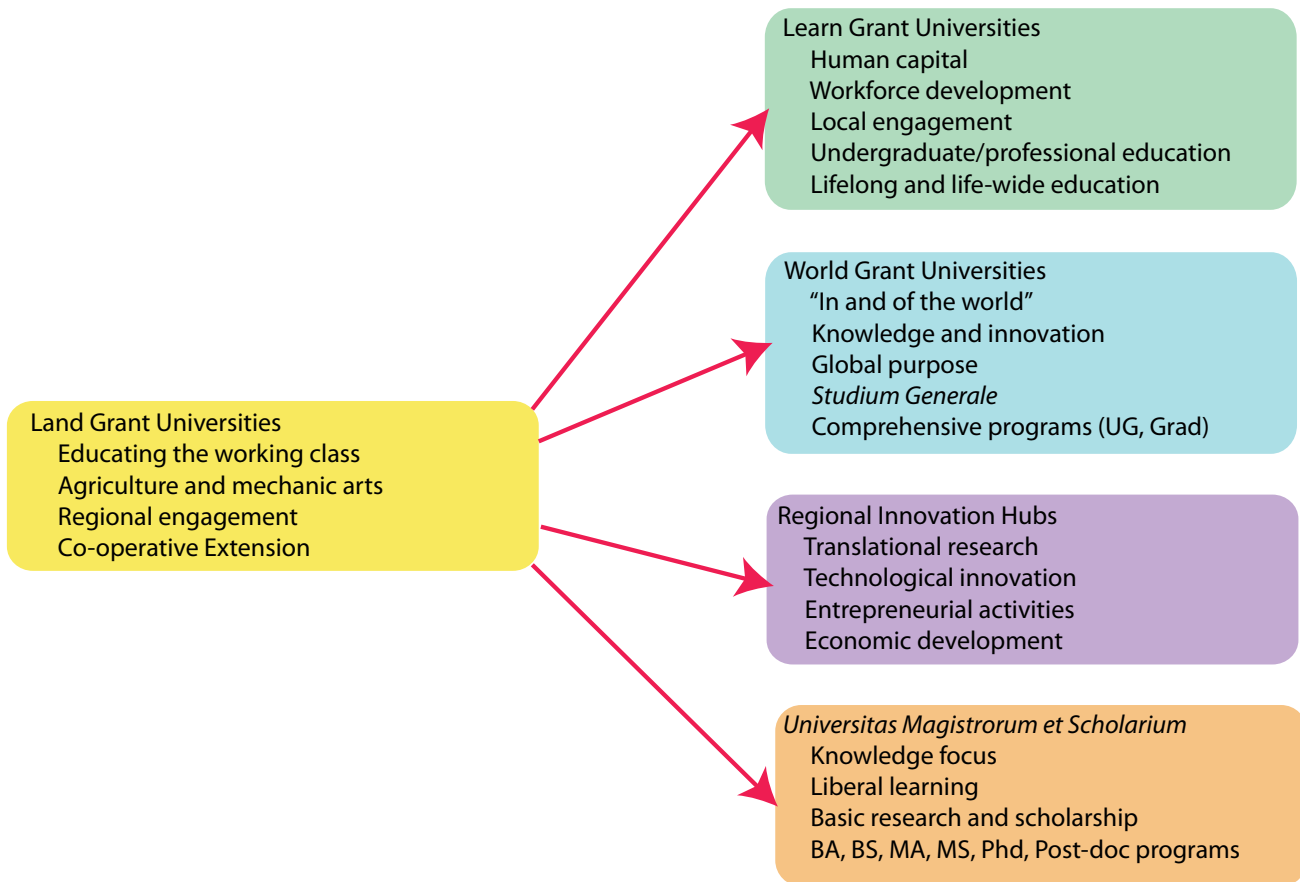
Learn Grant Universities

Perhaps we need new types of institutions that better address the importance of new knowledge and learning opportunities for a 21st century world. Of course our nation has done this before. The land-grant acts of the 19th and 20th centuries created new institutions focused on developing the vast natural resources of our nation to build a modern agricultural and industrial economy.

Today, however, we have come to realize that our most important resources for the future will be our people, their knowledge, and their skills and innovation. At the dawn of the age of knowledge, it is clear that learning and innovation are replacing earlier assets such as natural resources, geographical location, or cheap labor as the key to economic prosperity and national security. Perhaps a new social contract based on developing and maintaining the abilities and talents of our people to their fullest extent could well transform our schools, colleges, and universities into new forms that would rival the earlier land-grant university in importance. In a sense, the 21st Century analog to the land-grant university might be a *learn-grant university*.

Such a university would be designed to develop our most important resource, our human resources, as its top priority, along with the infrastructure necessary to sustain a knowledge-driven society. The field stations and cooperative extension programs–perhaps now as much in cyberspace as in a physical location–could be directed to regional learning and innovation needs. While traditional academic disciplines and professional fields would continue to have major educational and service roles and responsibilities, new interdisciplinary fields such as sustainable technologies and innovation systems might be developed to provide the skills, knowledge, and innovation for a region very much in the land-grant tradition.

Other national priorities such as health care systems, environmental sustainability, globalization, and entrepreneurship might be part of an expanded mission for universities. Institutions and academic researchers would then commit to research and professional service associated with such national priorities. To attract the leadership and the long-term public support needed for a valid national public service mission, faculties would be called upon to set new priorities, collaborate across campus boundaries, and build upon their diverse capabilities. This is just one example of many. But the point seems clear. Such a social contract, linking together federal and state investment and interests with higher education and business to serve national and regional needs, could become the elements of a 21st century analog to the land-grant university.

Learn Grant Universities
- Human capital
- Workforce development
- Local engagement
- Undergraduate/professional education
- Lifelong and life-wide education

World Grant Universities
- "In and of the world"
- Knowledge and innovation
- Global purpose
- *Studium Generale*
- Comprehensive programs (UG, Grad)

Land Grant Universities
- Educating the working class
- Agriculture and mechanic arts
- Regional engagement
- Co-operative Extension

Regional Innovation Hubs
- Translational research
- Technological innovation
- Entrepreneurial activities
- Economic development

Universitas Magistrorum et Scholarium
- Knowledge focus
- Liberal learning
- Basic research and scholarship
- BA, BS, MA, MS, Phd, Post-doc programs

Alternative forms of the land-grant philosophy

World Grant Universities

Many of our leading universities have evolved over time from regional or state universities to, in effect, national universities. Because of their service role in areas such as agriculture and economic development, some universities (particularly land-grant institutions) have gone even beyond this to develop a decidedly international character. Furthermore, the American research university dominates much of the world's scholarship and research, currently enrolling over 1.13 million international students and attracting faculty from throughout the world. In view of this global character, some suggest that we may soon see the emergence of truly global universities that not only compete in the global market place for students, faculty, and resources but are increasingly willing to define their public purpose in terms of global needs and priorities such as environmental sustainability, public health, wealth disparities, poverty, and conflict.

Such "universities in the world and of the world" might form through consortia of existing institutions (e.g., the U.K.'s Open University), new paradigms, or perhaps even existing institutions that evolve beyond the public agenda or influence of their region or nation-state to assume a truly global character. (Weber, 2008)

Lou Anna Simon, president of Michigan State University, one of the nation's earliest land-grant universities, coins the term "world grant university" to describe an extension of the principles inherent in the land-grant tradition adapted to address the global challenges of the twenty-first century and beyond. Such institutions would not be "granted" access to the world in the sense that states were granted tracts of land by the Morrill Act as a resource to support the establishment of land-grant institutions in the United States. Rather, the "world grant" ideal recognizes that fundamental issues unfolding in one's own backyard link directly to challenges occurring throughout the nation and the world. It not only recognizes this seamless connection

Patrons	Mission	Purpose
Private donors Foundations →	Higher Purposes (culture, social critic) →	Civilized society
Federal Government →	Research and Scholarship →	Security, health, prosperity
Federal Government →	Graduate/Professional Education →	Security, health, prosperity
States, Parents →	Undergraduate Education →	Workforce Skills
Parents →	Socialization of Young →	Growing up

Aligning support (and pehaps governance) with the various patrons of the university

but also actively grants to the world a deeply ingrained commitment to access and utilization of the knowledge required to address these challenges. (Simon, 2010)

The evolution of a world culture over the next century could lead to the establishment of several world universities (Europe, Asia, Africa, and Latin America) as the focal point for certain sorts of study of international order—political, cultural, economic, and technological. Since the genius of higher education in America is the research university, perhaps these are the institutions destined to play this role for North America.

As *The Economist* notes, "The most significant development in higher education is the emergence of a super-league of global universities. The great universities of the 20th century were shaped by nationalism; the great universities of today are being shaped by globalization. The emerging global university is set to be one of the transformative institutions of the current era. All it needs is to be allowed to flourish."

Hybrid Public/Private/State/ National/Global Universities

At a time when the strength, prosperity, and welfare of a nation demand a highly educated citizenry and institutions with the ability to discover new knowledge, develop innovative applications of discoveries, and transfer them into the marketplace through entrepreneurial activities, such vital national needs are no longer top state priorities. The model of

state-based support of graduate training and research made sense when university expertise was closely tied to local natural resource bases like agriculture and manufacturing. But today's university expertise has implications far beyond state boundaries. Highly trained and skilled labor has become more mobile and innovation more globally distributed. Many of the benefits from graduate training—like the benefits of research—are public goods that provide only limited returns to the states in which they are located. The bulk of the benefits are realized beyond state boundaries.

Hence, it should be no surprise that many states have concluded that they cannot, will not, and probably should not invest to sustain world-class quality in graduate and professional education—particularly at the expense of other priorities such as broadening access to baccalaureate education. Today, not only is state support woefully inadequate to achieve state goals, but state goals no longer accumulate to meet national needs. The declining priority that states have given to public higher education makes sense for them but is a disaster for the nation. The growing mismatch between state priorities and national needs suggests that it is time once again to realign responsibilities between the state and the nation for higher education and provide adequate resources to sustain American leadership.

We write "once again" because this is not a brand new issue. The success of university research in winning World War II—with innovations such as radar and electronics—and Vannevar Bush's seminal report,

"Science, the Endless Frontier: A Report to the President on a Program for Postwar Scientific Research" (1945), convinced national leaders that university research is too important for national security, public health, and economic prosperity to allow it to be entirely dependent upon the vicissitudes of state appropriations and philanthropy. Hence, the federal government assumed the primary responsibility for the support of research, now at a level of $30 billion each year—an effort that has been estimated to have stimulated roughly half of the nation's economic growth during the latter half of the 20th century, while sustaining the nation's security and public health. (Augustine, 2005)

Once more, it is time for the federal government to step in and provide the support necessary to keep our crucial graduate programs among the best in the world. Educating scientists and engineers, physicians and teachers, business leaders and entrepreneurs is vital to developing the human capital that is now key to national prosperity and security in the global, knowledge-driven economy. It cannot be left dependent on shifting state priorities and declining state support.

So how might this work? A new structure would distribute the primary responsibilities for the support of the nation's flagship public research universities among the states, the federal government, and private donors. The states, consistent with their current priorities for enhancing workforce quality, would focus their limited resources on providing access to quality education at the associate and baccalaureate levels, augmented by student tuition and private philanthropy. The federal government would become, in addition to a leader in supporting university research, the primary patron of advanced education at the graduate and professional level. Private patrons, including foundations and individual donors, would continue to play a major role in support of the humanities, the arts, the preservation of knowledge and culture, and the university's role in serving as an informed critic of society—all roles of great importance to the nation. Those functions would also continue to receive state support, because they are essential to high-quality baccalaureate education. (Courant, 2010)

How much additional federal investment will this new approach require? We suggest a magnitude roughly comparable to those of other major federal programs for the support of higher education such as university research ($32 billion per year), the Pell Grant program ($36 billion per year), tax-based aid ($34 billion) , or the foregone federal tax revenues associated with the beneficial tax treatment of charitable giving and endowment earnings ($26 billion per year).

Those additional resources would best be allocated to universities based on a combination of merit and impact. For example, competitive graduate traineeship programs might be used in some disciplines, while grants for other fields might be based on graduation rates or the size of graduate faculties or student enrollments. Other grants could be designed to stimulate and support newly emerging disciplines in areas of national priority, like nanotechnology or global sustainability. In all cases, the key objective would be the direct support of graduate programs through sustained block grants to universities—rather than grants to individual faculty members or students. What matters now is that, more than ever before, America needs to develop a strategy for building and sustaining a system of research universities that is the best in the world.

The Broadening Mission of Public Universities

An important theme throughout the history of American higher education has been the evolution of the public university. The nation's vision and commitment to create public universities competitive in quality with the best universities in the world were a reflection of the democratic spirit of a young America. With an expanding population, a prosperous economy, and imperatives such as national security and industrial competitiveness, the public was willing to make massive investments in higher education. While elite private universities were important in setting the standards and character of higher education in America, it was the public university that provided the capacity and diversity to meet our nation's vast needs for post-secondary education and research.

Today, however, in the face of limited resources and the pressing social priorities of aging populations, this expansion of public support of higher education has slowed. While the needs of our society for advanced education and research will only intensify as we continue to evolve into a knowledge-driven global

society, it is not evident that these needs will be met by further expansion of our existing system of state universities. The terms of the social contract that led to these institutions are changing rapidly. The principle of general tax support for public higher education as a public good and the partnership between the states, the federal government, and the universities for the conduct of basic research and education, established in 1862 by the Morrill Act and reaffirmed a century later by post-WWII research policies, are both at risk.

These forces are already driving major change in the nature of the nation's public research universities. One obvious consequence of declining state support has been the degree to which many leading public universities may increasingly resemble private universities in the way they are financed, managed, and governed, even as they strive to retain their public character. Public universities forced to undergo this privatization transition–or, in more politically acceptable language, "self-sufficiency"–in financing must appeal to a broader array of constituencies at the national—indeed, international—level, while continuing to exhibit a strong mission focused on state needs. In the same way as private universities, they must earn the majority of their support in the competitive marketplace, that is, via tuition, research grants, and private giving, and this will require actions that come into conflict from time to time with state priorities. Hence, the autonomy of the public university will become one of its most critical assets, perhaps even more critical than state support for many institutions.

Indeed, today many states are encouraging their public universities to reduce the burden of higher education on limited state tax revenues by diversifying their funding sources, e.g., by becoming more dependent upon tuition–particularly that paid by out-of-state students–by intensifying efforts to attract gifts and research contracts, and by generating income from intellectual property transferred from campus laboratories into the market-place. Some states are even encouraging experimentation in creating a more differentiated higher education structure that better aligns the balance between autonomy and accountability with the unique missions of research universities. Examples include Virginia's effort to provide more autonomy in return for accountability

for achieving negotiated metrics, Colorado's voucher system, performance funding in South Carolina, and cohort tuition in Illinois. (Breneman, 2005)

Yet, such efforts to "privatize" the support of public universities through higher tuition or increasing out-of-state enrollments can also encounter strong public and political opposition, even though there is ample evidence that, to date, tuition increases at most public institutions have not been sufficient to compensate for the loss in state appropriations. (Desrochers, 2011) Furthermore, since state support is key to the important public university mission of providing educational opportunities to students regardless of economic means, shifting to high tuition funding, even accompanied by increased financial aid, usually leads to a sharp decline in the socioeconomic diversity of students. (Haycock, 2008, 2010)

The privatizing strategy is flawed for more fundamental reasons. The public character of state research universities runs far deeper than financing and governance and involves characteristics such as their large size, disciplinary breadth, and deep engagement with society through public service. These universities were created as, and today remain, public institutions with a strong public purpose and character. Hence the issue is not whether the pubic research university can evolve from a "public" to a "private" institution, or even a "privately funded but publicly committed" university. Rather, the issue is a dramatic broadening of the "publics" that these institutions serve, are supported by, and become accountable to, as state support declines to minimal levels.

In view of this natural broadening of the institutional mission, coupled with the increasing inability (or unwillingness) of states to support their public research universities at world-class levels, it is even possible to conclude that the world-class "state" research university may have become an obsolete concept. Instead, many of America's leading public research universities may evolve rapidly into "regional," "national," or even "global" universities with a public purpose to serve far broader constituencies than simply the citizens of a particular state who no longer are able or willing to provide sufficient support to sustain their programs at world-class levels. In fact, one might well argue that states today would be better off if they encouraged

their flagship public research universities to evolve into institutions with far broader missions (and support), capable of accessing global economic and human capital markets to attract the talent and wealth of the world to their regions.

How might institutions embark on this path to serve far broader public constituencies without alienating the people of their states—or risking their present (albeit low) level of state support? One constructive approach would be to attempt to persuade the public—and particularly the media—that public research universities are vital to states in a far more multidimensional way than simply education alone—through health care, economic development, the production of professionals (doctors, lawyers, engineers, and teachers), talent magnets attracting talent from around the world, and for some a source of pride (particularly in college sports). The challenge is to shift the public perception of public research universities from that of a consumer to that of a producer of state resources. One might argue that for a relatively modest contribution toward their educational costs, the people of their states receive access to the vast resources, and benefit from the profound impact, of some of the world's great universities. It seems clear that we need a new dialogue concerning the future of public higher education in America, one that balances both its democratic purpose with economic and social imperatives.

Today, we face the challenges of a hypercompetitive global, knowledge-driven society in which other nations have recognized the positive impact that building world-class public universities can have. America already has them. They are one of our nation's greatest assets. Preserving their quality and capacity will require not only sustained investments but also significant paradigm shifts in university structure, management, and governance. It also will likely demand that public research universities broaden their public purpose and stakeholders far beyond state boundaries. Preserving the quality and capacity of the extraordinary resource represented by our public research universities must remain a national priority, even if the support required to sustain these institutions at world-class levels is no longer viewed as a priority by our states.

The "No-Frills" University

In recent years there has been growing discussion about the possibility of accelerated three-year baccalaureate programs in U.S. higher education. In part this has been stimulated by the broad adoption by European universities of the three-year degree programs associated with the Bologna Process. But it has also been proposed as a way to reduce the cost of a college education, or as Senator Lamar Alexander puts it, viewed as "the higher ed equivalent of a fuel-efficient car".

In fact, one might go even further and imagine introducing into U.S. higher education streamlined universities more similar to those in Europe. Most European universities enroll adult students directly in three-year disciplinary majors after longer and more intense secondary educations. In contrast, American colleges and universities have inherited from their British antecedents the mission of the socialization of young students. Not only does this require a very substantial investment in supporting infrastructure such as residence halls, community facilities, and entertainment and athletic venues, but it can also distract the university from its more fundamental knowledge-based mission. Nevertheless it has become the expectation of American parents that "college is the place where we send our children to grow up". Furthermore, U.S. colleges and universities are expected to compensate for the significant weaknesses currently characterizing primary and secondary education in the United States, even if that requires providing remedial programs for many under-prepared students.

In sharp contrast, European universities focus their activities on teaching and scholarship for adult students. Entering students enroll in focused three-year discipline-based baccalaureate programs without the preliminary general education experience and socialization programs characterizing American universities. Students are expected to arrange for their own living and social activities, while the university focuses on its "knowledge and learning" mission, thereby avoiding many of the costs associated with socializing young students.

There have been numerous suggestions that the United States explore the "no-frills" approach of

Most European universities are designed for upper division (adult) students (here at the Sorbonne U. Paris).

European universities by focusing the activities of some of their universities entirely upon disciplinary teaching and scholarship for upper-division students, thereby greatly reducing costs and tuition. This would allow the universities to focus their extensive—and expensive—resources where they are most effective: on intellectually mature students who are ready to seek advanced education and training in a specific discipline or profession. It would relieve them of the responsibility of general education and parenting, roles for which many large universities are not very well suited in any event. It might also allow them to shed their activities in remedial education, a rather inappropriate use of the costly resources of the research university. Focusing universities only on advanced education and training for academically mature students could actually enhance the intellectual atmosphere of the campus, thereby improving the quality of both teaching and scholarship considerably. Adult learners would be far more mature and able to benefit from the resources of these institutions.

Ironically, such a focusing of efforts might even reduce public criticism of higher education. Most students—and parents—appear quite happy with the quality of both upper-class academic majors and of professional education. Furthermore, they seem quite willing to pay the necessary tuition levels, both because they accept the higher costs of advanced education and training, and because they see more clearly the benefits of the degree to their careers, "the light at the end at the tunnel." In contrast, most of the concern and frustration expressed by students and parents with respect to quality and cost are focused on the early years of a college education, on the general education phase, since they perceive this style of pedagogy very similar to that of secondary education.

Yet the current quality and character of secondary education in the United States probably will not allow this for most students. Secondary education in Europe and much of the rest of the world is characterized by a more extended and intensive pre-college education, e.g., the German gymnasium, the British Sixth-Form, and the Canadian "college", which provide much of the general education preparation that currently comprises the first two-years of American college education. Hence a major shift to three-year baccalaureate programs or no-frills adult universities would likely require a major restructuring of secondary education in the United States more along the lines of Europe and Canada.

Open and "Open Source" Universities

For many years, the educational needs of many nations have been addressed by open universities, institutions relying on both televised or Internet-based courses and local facilitators to enable students to study and earn degrees at home. Perhaps most notable has been the British Open University, but this is only one of many such institutions that now enroll over three million students worldwide.

These institutions are based upon the principle of open learning, in which technology and distance education models are used to break down barriers and provide opportunities for learning to a very broad segment of society. In these models, students become more active participants in learning activities, taking charge of their own academic program as much as possible. Most of these open universities are now embracing information technology, particularly the Internet, to provide educational opportunities to millions of students unable to attend or afford traditional residential campuses (e.g., the University of the People, which aims to provide tuition-free education to developing economies).

The motivation behind open universities involves cost, access, and flexibility. The open university

paradigm is based not on the extension of the classroom but rather the one-to-one learning relationship between the tutor and the student. It relies on very high-quality learning materials, such as learning software and digital materials distributed over the Internet, augmented by facilitators at regional learning centers and by independent examiners. Using this paradigm, for example, the British Open University has been able to provide high-quality learning opportunities (currently ranked among the upper 15 percent of British universities) at only a fraction of a cost of residential education ($7,000 compared to $20,000 per student year in North America).

To date most open universities rely heavily on self-learning in the home environment, although they do make use of interactive study materials and decentralized learning facilities where students can seek academic assistance when they need it. However, with the rapid evolution of virtual distributed environments and learning communities, these institutions will soon be able to offer a mix of educational experiences.

Clearly, the open university will become an increasingly important player in higher education at the global level. The interesting question is whether these institutions might also gain a foothold in the United States. During the 1990s the British Open University attempted to establish a beachhead in the United States, but the financial model did not work. More recently emerging institutions such as the Western Governors' University and the University of Phoenix are now exploiting many of the concepts pioneered by the open university movement around the world, although recently the for-profit higher education sector has been experiencing declining enrollments.

Beyond the open university paradigm admitting all applicants but setting firm requirements for graduation, some universities are embracing other aspects of the open philosophy in their educational activities. The explosion of online educational materials being made available through the OpenCourseWare and iTunes U paradigms, coupled with access to massive digital libraries such as the HathiTrust, is transforming the knowledge infrastructure of universities–and bringing the marketplace into the classroom, since many of these online courses compete very effectively with the instruction provided by oncampus faculty. A

number of universities including the University of Michigan are playing leading roles in providing access to knowledge and learning tools through such open learning resources (e.g. MIT's OpenCourseware and Carnegie Mellon's Open Learning Initiative.) Some institutions are even preparing to explore the possible emergence of "open source" universities, committed to providing extraordinary access to knowledge and learning tools through open learning resources. In fact, some universities might decide to remove entirely the restrictions imposed by intellectual property ownership by asking all of their students and faculty members to sign a Creative Commons license for any intellectual property they develop at the University (at first copyright but eventually possibly even exploring other intellectual properties such as patents). Perhaps this would even redefine the nature of a "public" university, much in the spirit of the "public" library!

MOOCs, Learning Analytics, and
Other "New" Learning Paradigms

The current strong interest (and hype) concerning massively open online courses (MOOCs) provides an example of how the merging of ubiquitous connectivity, social networking, and sophisticated pedagogy can create new forms of learning that access massive markets. Developed originally by computer scientists, the MOOC paradigm has rapidly been extended in numerous disciplines to massive markets by many universities working through integrators such as Udacity, Coursera, and EdX. While there are still many questions both about the rigor of the MOOC pedagogy and its capacity to generate revenues for the host institutions, it nevertheless provides an example of how robust connectivity leveraged through social networks can create massive learning communities at a global level.

Of course, today's MOOCs do have some new elements, aside from the massive markets they are able to build through the Internet and their current practice of free access. (Waldrop, 2013) They augment online broadcast of canned lectures and automated grading of homework with social networks to provide teaching support through message boards and discussion groups of the students themselves. Their semi-synchronous

structure, in which courses and exams are given at a specific time while progress is kept on track. Here one might think of MOOCs as a clever combination of UK's Open University (online education) and Wikipedia (crowd sourcing of knowledge)! Furthermore, MOOCs, like Carnegie Mellon's far-more sophisticated Open Learning Initiative, are able to use data mining (analytics) to gather a large amount of information about student learning experiences. When combined with cognitive science, this provides a strong source of feedback for course improvement.

Some believe that today higher education is on the precipice of an era of extraordinary change as such disruptive technologies challenge the traditional paradigms of learning and discovery. (Friedman, 2011) They suggest that new technologies could swamp the university with a tsunami of cheap online courses from name-brand institutions, or adaptive learning using massive data gathered from thousands of students and subjected to sophisticated analytics, or even cognitive tutors that rapidly customize the learning environment for each student so they learn most deeply and efficiently.

But are these really something new or rather simply old wine in new bottles? After all, millions of students have been using online learning for decades (estimated today to involve over one-third of current students in the United States). There are many highly developed models for online learning, including the UK Open University, the Western Governor's University in the United States, and the Apollo group's global system of for-profit universities. Adaptive learning has been used in Carnegie Mellon's cognitive tutor software for years in secondary schools and more recently in the Open Learning Initiative. Many of the buzzwords used to market these new technologies also have long established antecedents: Experiential learning? Think "laboratories" and "internships" and "practicums"… and even "summer jobs"! Flipped classrooms? Think "tutorials" and "seminars" and "studios". Massive markets of learners? Many American universities were providing free credit instruction to hundreds of thousands of learners as early as the 1950s through live television broadcasts!

Certainly the MOOC paradigm is characterized by a powerful delivery mechanism. But it is just one model. There are also other models to explore and rich collaboration opportunities to share such as the data analytics and adaptive learning used in Carnegie Mellon's Open Learning Initiative or the artificial intelligence-based cognitive tutor technology, developed again by Carnegie Mellon, and used in K-12 and lower division college education for the past decade, open knowledge initiatives such as Google Books, the HathiTrust, and open scholarly data and publication archives; massively player gaming (e.g., Minecraft and the World of Warcraft) and immersive media (e.g., Second Life, and Enders Game). Automated assessment and evaluation could turn the whole education business upside down because we will have access to massive data sets that potentially will give us some insight in not how we deliver content but rather how people learn.

It is likely that MOOCs are a disruptive technology, and that analytics on learning data holds considerable promise. But it is also very important to separate the fundamental character of a college education from the specific resources used to achieve that, e.g., courses and curricula, textbooks and course notes, faculty and laboratory staff, and, of course, the complex learning communities that exist only on university campuses. After all, MOOCs are marketed as courses, not as a college education. We must remember the current university paradigm of students living on a university campus, completely immersed in an exciting intellectual and social physical environment and sophisticated learning communities, provides a very powerful form of learning and discovery. MOOCs are interesting, but they are far from the vibrant, immersive environment of a college education, at least as we understand it today.

Of course, there are highly disruptive scenarios. Suppose Stanford, Harvard, or MIT, the purveyors of for-profit ventures such as Coursera, Udacity, and EdX, were to begin to sell "Harvard-lite" credits or badges to students who successfully completed their MOOCs. Then many colleges would be compelled to accept these credentials for degree-credit, thus undermining their oncampus offerings. It would be ironic indeed if the same rich universities that are most guilty of driving up college costs by using their vast wealth to compete for the best faculty and students would now thrown in yet another hand grenade consisting of brandname-driven

cheap online education that could make them even wealthier while undermining the quality of education offered by traditional campus-based institutions.

What do we know about the effectiveness of these technology-based approaches? Where are the careful measurements of learning necessary to establish the value of such forms of pedagogy? Thus far, promoters have relied mostly on comparisons of performances by both conventional and online students on standard tests. The only serious measurements have been those that Ithaka has conduced on the learning by cognitive tutor software in a highly restricted environment. (Bowen, 2012)

Of course, it eventually comes back to the questions of "What is the most valuable form of learning that occurs in a university…and how does it occur?" Through formal curricula? Through engaging teachers? Through creating learning communities? After all, the graduate paradigm of *Universitas Magistrorum et Scholarium* involving the interaction of masters and scholars will be very hard to reproduce online…and least in a canned video format!!!

As William Bowen, former president of Princeton and the Mellon Foundation and a founder of Ithaka suggests, it is time to "Walk, Don't Run" toward the use of cyberlearning. We need lots of experimentation, including rigorous measurement of education–before we allow the technology tsunami to sweep over us! (Bowen, 2013)

A Return to *Universitas Magistrorum et Scholarium*–in Cyberspace

It is ironic that the cyberspace paradigm of learning communities may actually return higher learning to the medieval tradition of the master surrounded by scholars in an intense learning relationship. The term "university" actually originated during the Middle Ages with the appearance of "unions" of students or faculty members who joined together to form communities of teachers or students. The Latin origin, *universitas*, meant "the totality" or "the whole" and was used by medieval jurists as a general term to designate communities or corporations such as guilds, trades, and brotherhoods. Eventually the term university was restricted to these unions of masters and scholars and given the more

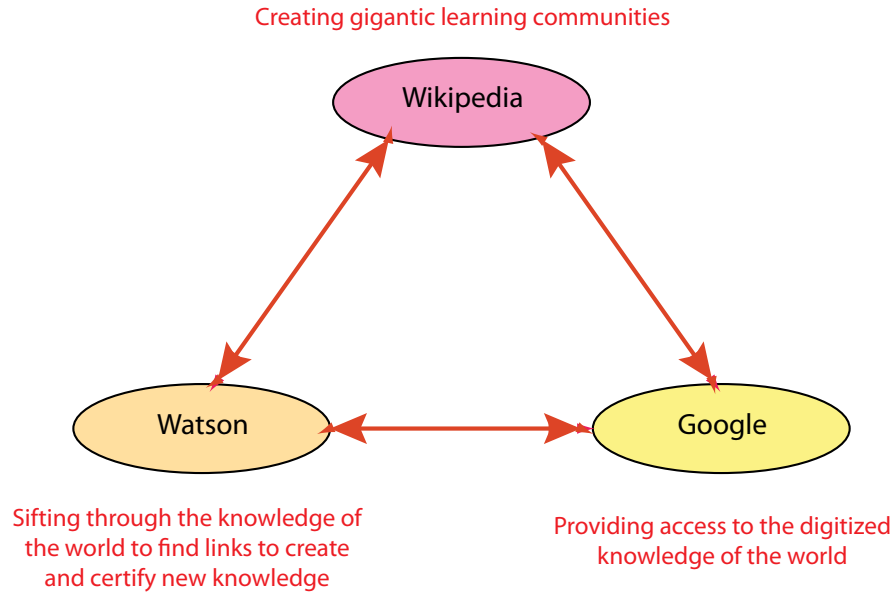formal Latin title: *Universitas Magistrorum et Scholarium*.

From time to time, educators have attempted to define the university in more intellectual terms. John Henry Newman stressed instead an alternative interpretation of the word: "The university is a place of teaching universal knowledge." In fact, the earliest European universities were designated as *stadium generale* by church or state to indicate their role to provide learning of a broad, universal nature to all of the known world (enabled, of course, by the use of Latin as the universal language of the academy).

We tend to prefer a simpler synthesis of these definitions of the university:

A university is a community of masters and scholars, a school of universal learning (Newman) embracing every branch of knowledge and all possible means for making new investigations and thus advancing knowledge (Tappan).

In a sense, this recognizes that the true advantages of universities are in the educational processes, in the array of social interactions, counseling, tutorial, and hands-on mentoring activities that require human interaction. In this sense, information technology will not so much transform the purpose of higher education—at least in the early phases—as enrich the educational opportunities available to learners. In a sense, technology is enabling the most fundamental character of the medieval university to emerge once again, but this time in cyberspace!

There is an important implication here. Information technology may allow—perhaps even require—new paradigms for learning organizations that go beyond traditional structures such as research universities, federal research laboratories, research projects, centers, and institutes. If this is the case, we should place a far higher priority on moving to link together our students and educators both among themselves and with the rest of the world. The necessary cyberinfrastructure would be a modest investment compared with the massive investments we have made in the institutions of the past—university campuses, transportation, and urban infrastructure. It is not too early to consider an overarching agenda to develop deeper understanding of the interplay between advanced information technology and social systems. We may soon have the

Creating gigantic learning communities

Wikipedia

Watson

Google

Sifting through the knowledge of
the world to find links to create
and certify new knowledge

Providing access to the digitized
knowledge of the world

A puzzle: Is this a possible future for the university?

knowledge to synthesize both in an integrated way as a total system.

Learning Ecologies

John Seely Brown suggests that we might think of the contemporary university as an interconnected set of three core competencies: *learning communities, knowledge resources, and the certification of knowledge skills.* (Brown, 2000) Social computing will empower and extend learning communities beyond the constraints of space and time. Open knowledge and education resources will clearly expand enormously the knowledge resources available to our institutions. And immersive environments will enable the mastery of not simply conventional academic knowledge but tacit knowledge. A fundamental epistemological shift in learning is occurring from individual to collective learning; from a focus on development of skills to instead dispositions, imagination, and creativity; and enabling the acquisition of both explicit and tacit knowledge.

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. Emerging ICT technologies that enable social networking to form learning communities and immersive virtual environments for simulation and play facilitate the "deep tinkering" that provides the tacit knowledge necessary to "learn to do", "learn to create", and "learn to be", tools already embraced by the young if not yet the academy. In a sense, learning has become a "culture", in the sense of the Petri dish that is in a state of constant evolution.

Once we have realized that the core competency of the university is not simply transferring knowledge, but developing it within intricate and robust networks and communities, we realize that the simple distance-learning paradigm of the virtual university is inadequate. The key is to develop computer-mediated communications and communities that are released from the constraints of space and time.

Distance learning based on computer-network-mediated paradigms allows universities to push their campus boundaries outward to serve learners anywhere, anytime. Those institutions willing and capable of building such learning networks will see their learning communities expand by an order of magnitude. In this sense, the traditional paradigm of "time-out-for-education" can be more easily replaced by the "just in time" learning paradigms, more appropriate for a knowledge-driven society in which work and learning fuse together.

To illustrate the implications of such a re-definition

The emergence of new learning ecologies

of the university, consider a learning ecosystem represented by the diagram of three elements: Wikipedia, Google, and Watson (the IBM computer that used artificial intelligence to beat the champions of the game-show Jeopardy). Each of these elements addresses a key core competency of the university:

Wikipedia represents the capacity 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 represents the capacity to use artificial intelligence to analyze information, trillions of transactions per second, identifying correlations,

curating information, authenticating knowledge, certifying learning, and providing ubiquitous access.

What is this? A postmodernist university? A new epistemology for the 21st Century? The foundation for a 21st analog to the Renaissance or even the Age of Enlightenment? A technological singularity...

Or perhaps...

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, high 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); and ubiquitous information and communications technology (e.g., inexpensive network appliances such as iPhones, iPads, or netbooks). 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 (perhaps even through immersive environments such as Second Life).

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 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.

Chapter 6

A Vision for the University of Michigan's Future

Developing a vision for the future of the University of Michigan is a challenging exercise, both because of the unusual size, breadth, and complexity of the institution and because of the important leadership role it is expected to play as a pathfinder in American higher education. During the past two centuries of its history, Michigan has responded time and time again to the changing needs of an evolving nation by transforming itself and higher education more generally.

Today the University of Michigan faces yet another pivotal moment in its history, a fork in the road. Taking one path can, with dedication and commitment, preserve the University as a distinguished–indeed, a great–university, but only one among many such institutions. There is another path, a path that will require bold visions, courage, and creativity in addition to dedication and commitment. By taking this second path, the University would seek not only to sustain its quality and distinction, but it would seek to achieve leadership as well, embracing its long history–its saga– as a pathfinder and trailblazer for higher education.

Of course, there are always those who believe that Michigan should settle for achieving excellence and leadership within the confines of the current American research university paradigm. The University of Michigan, they argue, should take the necessary steps to preserve its options, to create flexibility, to develop the capacity to adapt to and control change, and to open up opportunities during the decades. They prefer more modest strategies to clearly identify the goals that would enable the University of Michigan to adapt to a changing world in a far more organic, evolutionary manner.

But such a laissez-faire approach to the future is not the Michigan style. The University tends to flourish when it has been enlivened and emboldened by challenging visions of the future. While acknowledging the difficulties and the risks inherent in long-range planning exercises, the University's heritage as a leader in higher education demands the development and articulation of a bold vision for it's third century. It is a fitting exercise for an institution aspiring to become "the leader and best."

Hence we contend that as the University approaches its third century, it should embrace once again its heritage as a pathfinder, a saga established two centuries ago in the late 19th century when the University of Michigan became a primary source for much of the innovation and leadership in higher education. Once again Michigan has the opportunity to influence the emergence of a new paradigm of what the university should become in our 21st Century world to respond to the changing needs of our society. But this will require a bold vision, an unusual commitment to excellence, a challenge and engaging strategy, and strong and dedicated leadership.

Earlier chapters in this report have provided the foundation for this effort, scanning the environment

The Knowledge Economy
Demographic Change
Globalization
Technology
Innovation
Global Sustainability

Societal Needs
Technology Drivers
Financial Imperatives
Market Forces

Evolution?
Revolution?
Extinction?

The forces driving change in higher education

in which the University now (or soon will) finds itself and assessing our current assets and challenges. In this chapter we turn our attention toward developing an appropriate vision for the University of Michigan as it begins its third century of service to the state, the nation, and the world. It is true that formidable challenges of our time understandably frame current priorities, e.g., the loss of state support, the need to restore Michigan's public purpose, the effort to control costs while competing with leading private institutions characterized by great wealth. But a vision for the future must be built upon a message of hope, optimism, excitement, and empowerment, just as it has been at important moments in Michigan's past, e.g., the 19th Century vision to provide "an uncommon education for the common man" or the late 20th Century vision to "re-invent the university to better serve a rapidly changing society and world".

And, like Michigan's earlier visions, a vision for the University's third century should flow up from the imagination and inspiration of the faculty, students, and staff who are deeply engaged in the University's academic mission. A vision for Michigan's future should not be a marketing ploy from staff nor an edict from on high.

Evolution or Revolution?

In spite of the growing awareness of the powerful forces driving change in today's world, the "game changers" and possible paradigm shifts suggested in Chapter 5, many within the academy still believe that change will occur only at the margins of higher education. They stress the role of the university in stabilizing society during a period of change rather than leading those changes. This too shall pass, they suggest, and demand that the university hold fast to its traditional roles and character. And they will do everything within their power to prevent change from occurring.

Yet, history suggests that the university must change and adapt in part to preserve its ancient values and traditional roles. Many accept this reality, both within and outside the academy, since they realize that significant change must occur not simply in the higher education enterprise but in each and every one of our

Developing a vision for a hazy future

institutions. Yet, even most of these people see change as an evolutionary, incremental, long-term process, compatible with the values, cultures, and structure of the contemporary university.

There are a few voices, including from some of the University's most respected faculty members, who believe that both the dramatic nature and compressed time scales characterizing the changes of our times will drive not evolution but revolution. They have serious doubts about whether the challenges of our times will allow such gradual change and adaptation. They point out that there are really no precedents to follow.

The forces driving change in higher education, both from within and from without, may be far more powerful than most people realize. It could well be that both the pace and nature of change characterizing the higher education enterprise both in America and worldwide will be considerably beyond that which can be accommodated by business-as-usual evolution. While there is certainly a good deal of exaggeration and hype about the changes in higher education for the short term—meaning five years or less—it is difficult to overstress the profound nature of the changes likely to occur in most of our institutions and in our enterprise over the longer term—a decade and beyond. The waves of change lapping on the beach may not be simply the tide coming in once again but instead the first warning of an approaching tsunami.

While some colleges and universities may be able to maintain their current form and market niche, others will change beyond recognition. Still others will

```
2000s Paradigms
        University of the Common Man? No!
        University of the State of Michigan? No!
        Harvard of the West? Similar culture for excellence, but too rich
        Stanford of the East? Similar culture of innovation, but too rich
        University of America? Yes, a strong possibility
        University in and OF the World? Yes, eventually
```

```
2010 Paradigms?
        Current Trajectory: UM -> MSU/OSU
        Financial Vision: UM -> GM (Ponderous, Change-Adverse)
        Auxiliaries: Michigan Athletics, Medical Center >>Academic Core
        Michigan Politics: UM -> Alabama (or Wayne State University)
        Donors: UM -> Midwestern U
        Regents: UM -> Free UM for State; USC for everybody else
```

```
Third Century Possibilities?
        UM -> National "public" university
        UM -> Hybrid: state/nation/world public; law/bus/med services private
        UM -> University of the Heartland
        UM -> University of America
        UM -> University of the World
        UM -> University FOR the World
```

Simplistic models of the future of the University of Michigan

disappear entirely. New types of institutions—perhaps even entirely new social learning structures—will evolve to meet educational needs. In contrast to the last several decades, when colleges and universities have attempted to become more similar, the years ahead will demand greater differentiation. There will be many different paths to the future.

So, where to begin? What are some alternatives to the historical model of the University of Michigan? For purposes of discussion, we might first consider several highly simplistic—indeed, cartoonish—possibilities captured by the titles suggested by the figure above. These models, while amusing, actually represent extreme cases of existing paradigms of the 20th Century. However, they do not provide much guidance about where the University of Michigan should head in the century ahead.

An alternative is to begin with the core values and characteristics of the university and then identify a series of experiments that might be launched to explore various possible futures of the University, e.g., as a cyberspace university, a world university, a creative university, or a university characterized by great social diversity. This was the approach taken in the 1990s and led to some of the most interesting initiatives of that era

(e.g., the Molecular Medicine and Genetics Program, Internet 2, the School of Information, the Media Union, the JSTOR Project, and the Michigan Mandate).

Yet, in this study, we have taken a more structured approach–strategic roadmapping–in part because we believe it important to consider even bolder visions for the future of the university. However, we begin, as before, with the key values and characteristics of the University.

The Foundations of a Vision for the University of Michigan's Future

So, how might we construct an appropriate vision for the University as it enters its third century? Clearly this exercise must begin by articulating the most important values of the institution:

Excellence

Leadership

Critical and Rational Inquiry

Liberal Learning

Diversity

Community

Innovation

The Vision 2017 diagram developed during the 1990s planning activities
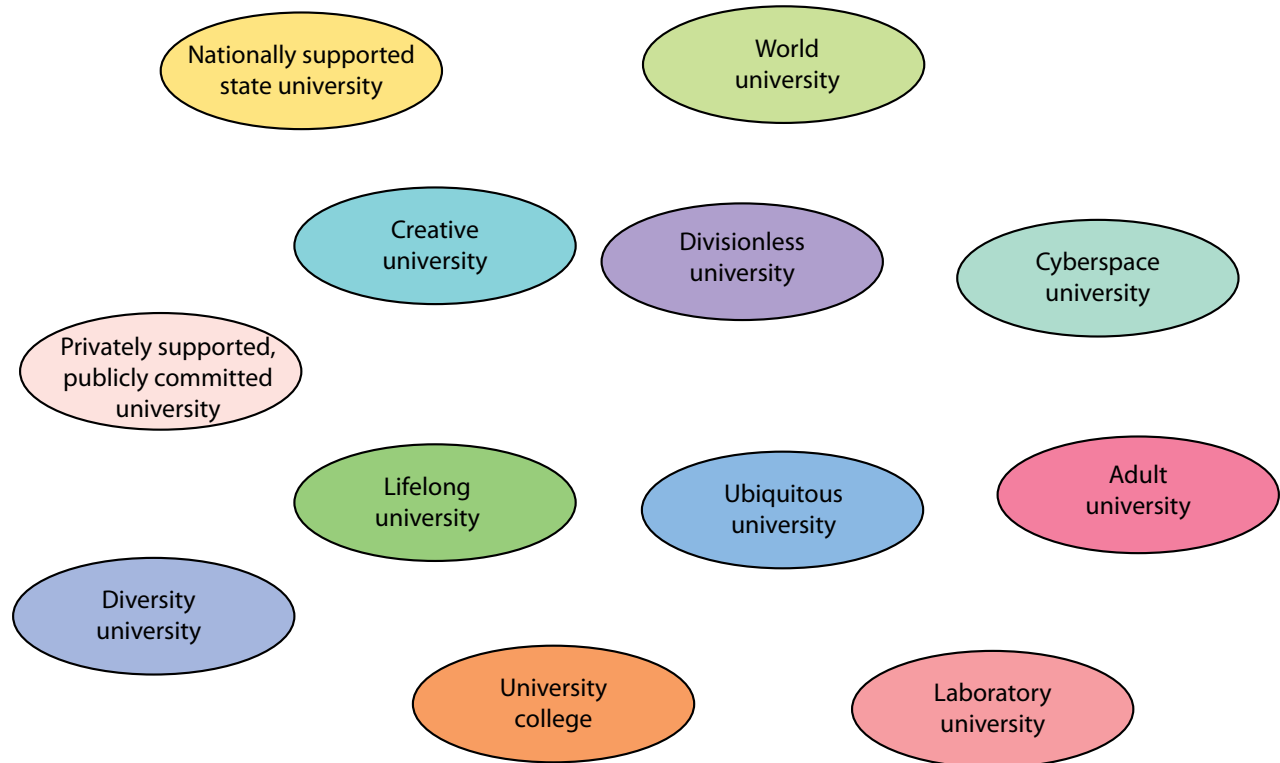
Excitement
Spirit

Key, as well, are our fundamental aspirations for the future of the University, those actions and goals that must receive high priority to achieve our vision. From Michigan's history we might suggest characteristics such as the following:

"The leaders and best"
"An uncommon education for the common man"
"A broad and liberal spirit"
 "Diverse, yet united in a commitment to academic
 excellence and public service"
"A center of critical inquiry and learning"
"An independent critic and servant of society"
 "A relish for innovation and excitement"
"Freedom tempered by responsibility for students
 and faculty"
 "Control of our own destiny comparable to

private universities"

During the planning effort of the 1990s, we took a somewhat different approach by turning to the late Michigan Professor of Business Administration, C. K. Prahlahad, for his concept of *strategic intent.* (Prahlalad, 1994) The traditional approach to strategic planning focuses on the fit between existing resources and current opportunities; strategic intent is a stretch vision that intentionally creates an extreme misfit between current resources and future objectives that requires institutional transformation to build new capabilities.

The Strategic Intent (Vision 2017): To provide the university with the capacity to re-invent itself as an institution more capable of serving a changing state, nation, and world.

Vision 2017 depended for its success upon sustaining our most cherished values and our hopes for

Paradigms based on particular missions or aspirations of the University

the future: excellence, leadership, critical and rational inquiry, liberal learning, diversity, caring and concern, community, and excitement. In addition, we paid particular attention to those elements of the university's institutional saga that were important to preserve, as well as those values and characteristics that were our fundamental aspirations.

Around the core of values and characteristics are arranged a number of possible paradigms, actually cartoonish characterizations exaggerating particular missions of the university, e.g.

the world university
the diverse university
the creative university
the divisionless university
the adult university
the university college
the lifelong university
the ubiquitous university
the laboratory university

While none of these alone would appropriately describe the university as it enters its third century, each was a possible component of our institution, as seen by various constituents. Put another way, each of these paradigms was a possible pathway toward the University of the 21st Century. Each was also a pathway we believed should be explored in our effort to better understand our future.

Finally, and most important, during a time of great change in society, Michigan's most important saga will once again be that of a pathfinder, a trailblazer, building on its tradition of leadership, and relying on its unusual combination of quality, capacity, and breadth to re-invent the university, again and again, for new times, new needs, and new worlds.

With this foundation, we now introduce the key themes of the vision we suggest for the future of the University of Michigan, arranged in three time epochs: *now*, *soon* (the next decade), and the University's *third century*.

The Theme for the Near Term: *Reflection*

For the near term, from now through the Bicentennial Year 2017-2018, we suggest the University of Michigan would benefit from a period of *reflection* upon its remarkable history and accomplishments. The University community should not simply prepare to celebrate two centuries of leadership in higher education, but it first should strive to understand and secure those values and characteristics that have played such an important role throughout its history:

Academic quality: The reputation of Michigan as one of the world's great universities has been based primarily on the quality of its academic programs. While there are many sources of superficial rankings (e.g., US News & World Report, the London Times, Shanghai Jiao Tong, and the QS World Rankings), the most reliable rankings has been an ongoing internal assessment of the "ebb and flow" of faculty recruitment and retention, along with faculty awards and reputations.

Establishing and sustaining the academic core of the University as its highest priority: Sometimes in the face of the substantial assets and growth characterizing auxiliary activities of the University (e.g., hospitals, housing, athletics), it is all to easy to forget that Michigan's impact on the state, nation, and world is determined primarily by the quality of its academic programs and the achievements of its faculties. This must always be clearly established and understood as the University's highest priority. The University of Michigan is not primarily a hospial, a hotel, or a football team, although we certainly manage all three. It is one of the great learning institutions of the world.

Diversity: The University has long been distinguished by its strong and sustained commitment to providing educational and faculty opportunities to underrepresented racial and ethnic populations. From its earliest efforts to enroll minority students in the 19th century to the BAM activism of the 1960s, to the Michigan Mandate of the 1990s, the University has long been viewed as, and must remain a national leader in the achievement of diversity. Despite the challenges it faces, the University simply must renew its commitment

to regain this leadership. Failure is not an option.

Public Purpose: So too, the University's long-standing commitment to providing "an uncommon education for the common man" demands that it provide educational opportunities for students from all economic circumstances. While this has become increasingly difficult in the face of eroding state support, it nevertheless is both a core value of the University and a critical element of its public purpose. It simply must take those actions necessary to restore a more equitable socioeconomic balance in its student body.

Spirit: Michigan's "broad and liberal spirit" has been an important characteristic of our students, faculty, and staff. While this may at times annoy or antagonize the politics that swirl about the institution, such activism is not only an important element of our heritage but at times represents the conscience of the nation on controversial issues. This spirit must always be not only respected and tolerated but furthermore encouraged on the part of the University community.

Leadership: The University of Michigan has long taken pride in its "leaders and best" heritage, seeking both leadership and excellence in its achievements. Key in establishing and sustaining this element of our character is setting bold goals where the University not only aspires to excellence but can have great impact on society, where it can change the world!

The Michigan Saga: Finally, the role of the University in serving as both a pathfinder and trailblazer for all of higher education remains one of its most important roles. To sustain this role requires attracting to the University students, faculty, staff, and leadership of unusual initiative, creativity, and determination.

While renewing the effort (or restoring our commitment) to achieve these characteristics seems obvious, particularly as we prepare for the University's bicentennial by reviewing its history and honoring its heritage and saga, it is nevertheless in the spirit of the near term vision that we suggest the University should set out to challenge itself.

The Theme for the Next Generation: *Renaissance*

The world is changing rapidly, driven by the role played by educated people, new knowledge, innovation, and entrepreneurial skill. While these forces challenge us and our social institutions, they also contain the elements of what could become a *renaissance* of creativity and innovation in the 21st century. Since universities will play a critical role as the source of these assets of the age of knowledge, our vision for the early 21st century involves stressing similar characteristics among our people and our programs, e.g., creativity, innovation, ingenuity, invention, and entrepreneurial zeal. Put another way, the future university must add to its traditional motto of *lux et veritas*, the scholarship to discover *truth* and the learning to *enlighten* society, the mission of *genius* itself, of the creativity demanded by an ever changing world.

In fact, Ralph Waldo Emerson suggested the importance of creativity to the university's mission almost two centuries ago in his 1837 Address to Phi Beta Kappa that to the traditional missions of *veritas* (the search for truth) and *lux* (the enlightenment provided by learning), one should add *genius*, the power of creativity:

> "Colleges have their indispensable office, to teach elements. But they can only serve us when they aim not to drill but to create; when they gather from far every ray of various genius to their hospitable halls, and by the concentrated fires, set the hearts of their youth aflame..".

Of course while learning and scholarship have long been viewed as missions of the university, so too has been the creation of new knowledge across all intellectual and professional disciplines. Developing new approaches to scholarship, great works in literature and the arts, ingenious approaches to investigating physical and social phenomenon, these have long been the goal of most scholars. Not just to preserve and transmit knowledge, but to actually create it.

The professions that have dominated the late 20th Century—and to some degree, the late 20th Century 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." (Jacques Attali, 2000)

But today new tools of creativity are appearing that are characterized by extraordinary power. We have the capacity to create new objects literally atom by atom. With new methods in molecular biology such as CRISPR and gene drive, we can not only precisely modify the DNA code for a living organism, but actually cause it to propagate through a species to change future generations (a frightening thought when human gene editiing is considered). The dramatic pace of evolution of information technology shows no sign of slowing, continuing to advance in power from 100 to 1000 fold a decade, enabling not only new forms of analysis such as augmenting the traditional tools of experiment and theory with the sophisticated tools of data analysis (big data). Indeed, the tools of artificial intelligence not only are rapidly progressing but have stimulated fears of eventual sentient behavior of machines. These tools also have changed the opportunities available in literature, performace, and art, with powerful tools of investigation and display (e.g., the CGI techniques increasingly dominating the film industry.)

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" 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.

Since universities will play such a critical role as the source of these assets of the age of knowledge, perhaps the university of the 21st century will also shift its intellectual focus and priority from the preservation or transmission of knowledge to the process of creation itself. 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 creation itself. Thus, our vision for the early 21st century should stress the following characteristics among our people and our programs:

Creativity
Innovation
Ingenuity and Invention
Entrepreneurial Zeal

But here lies a great challenge. As noted earlier, creativity and innovation are key not only to problem solving but more generally to achieving economic prosperity, social well being, and national security in a global, knowledge-driven economy. Yet, 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, those who 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 creation 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 mission 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 "hacker havens".

Actually, as John Seely Brown points out, 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. But beyond that, they look for meaning not just in what they create or own but in addition through what they contribute back to society-at-large. They are engaged, first and foremost, in fostering what might be called the creative class. Not only do they want to create for themselves, but they also want others to build on their creations.

The platforms they use are mostly digital: instant messaging to keep in constant contact with one's own intimate community; blogging to let one experiment by exposing their ideas to others and getting rapid feedback; by participating in the rapidly expanding worlds of open source, open content (e.g., Wikipedia), and remixing the work of others; rich media capable of expressing complex ideas; and a vast network characterizing cyberinfrastructure that lets one access communities, instruments, and databases all over the world (an infrastructure that the University of Michigan has played a key role in creating). These are the power tools of the Net Generation.

Here, the University of Michigan provides an interesting example of how academic programs characterized by technology-driven creative activities might evolve. On the University's North Campus, we already are fortunate to have several schools–music, dance, and the performing arts; art and design; architecture; and engineering–that focus on the creative activities that increasingly require new tools. The Media Union (aka Duderstadt Center) and Walgreen Center on the North Campus provide unique "commons" facilities, gathering places that support interdisciplinary activities in "making things"–e.g., 3-D objects, virtual reality simulations, new art forms, CGI-based performances, responding to a growing need for both student learning and faculty participation in such activities. In fact, the North Campus schools are recapturing the original vision of the Media Union as an innovation commons or creation space where students, faculty, and staff from multiple disciplines gather to create, invent, design, and even make things

School of Music, Theatre, and Dance

College of Engineering

Duderstadt Center.

Walgreen Center

School of Architecture and Urban Planning

School of Art and Design

The Renaissance Campus: Music, Art, Architecture, and Engineering

(whether objects of art, performances, buildings, or new technologies). The four deans of these schools who created the concepts for the Media Union and Walgreen Center in the 1990s used to refer to the North Campus as the University's "Renaissance Campus.

Drawing together aspects of hardware and software, inquiry and discovery, tinkering and invention, and creativity and innovation, experimentation and performance, the Duderstadt Center and Walgreen Center provide tremendous interactive playground for imaginative scholars and students. The tools in these facilities are so easy to use that ideally they become natural extensions to everyday activity. For example, an artist , an engineer, and a choreographer should be able to think up a new staging for a performance together, sketch it out in three dimensions on a computer, then show it off and discuss it in real time with colleagues both here and across the world, all without noticing the complex technology that allows them to collaborate.
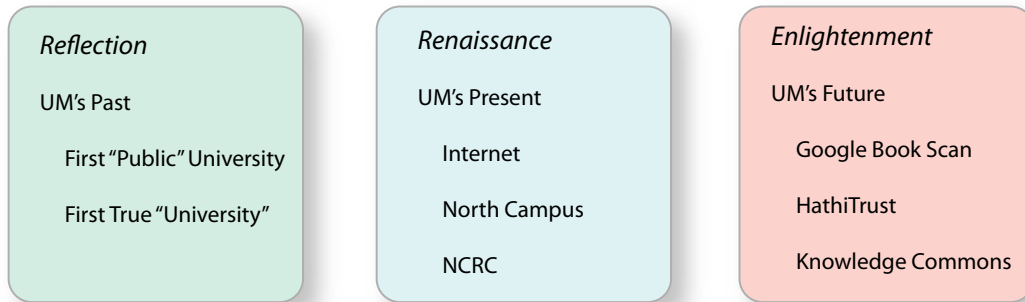
This model of "creativity and innovation" commons facilities that enable faculty members and students from diverse schools to work together is now being propagaged to other parts of the University, including the arts and humanities and social sciences of the Central Campus and the natural sciences and biomedical programs.

This vision of renaissance aligns well with several other aspects of the University's institutional saga such as its commitment to excellence and leadership and its belief that this rests upon building diverse learning communities. But achieving such a vision will also likely require a culture change that encourages risk taking and tolerates occasional failure as the price one must frequently pay for setting and accomplishing challenging goals.

To adapt its pedagogy to the challenge of a "renaissance" education, universities may form strategic alliances with other groups, organizations, or institutions in our society whose activities are characterized by great creativity, for example, the art world, the performing arts, and high-tech industry.

Particularly key in this effort is the earlier goal of diversity. As Tom Friedman noted in a 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? 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, 2011) Just what a world-class research university characterized by great socioeconomic diversity such as the University of Michigan can offer!

Reflection	Renaissance	Enlightenment
UM's Past	UM's Present	UM's Future
First "Public" University	Internet	Google Book Scan
First True "University"	North Campus	HathiTrust
	NCRC	Knowledge Commons

Linking Future Themes to Past Accomplishments

The Theme for the Third Century: *Enlightenment*

Any vision proposed for the University's third century 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 cognitve 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. In such an era of rapid change, it has become the responsibility of democratic societies to provide their citizens with the learning opportunities they need throughout their lives, at costs they can afford, as a right rather than a privilege.
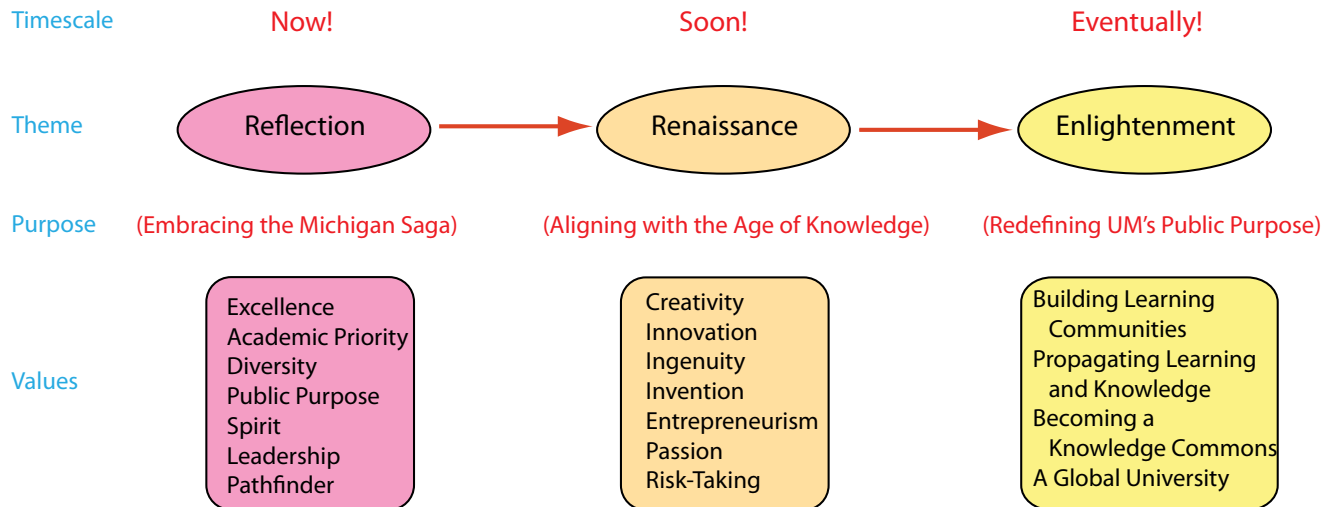
What the nation (and the world) needs today is a 21st century version of the Enlightenment movement of the 17th and 18th century that swept aside the divine authority of kings by educating and empowering the public, stimulating revolution, and creating the liberal democracies that now characterize most developed nations. Our nation and 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.

More specifically, the goals of the Enlightenment 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, L*iberte, Egalite, and Fraternite* for the French Revolution–or perhaps better articulated by Jefferson's opening words from our 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.

Our proposition is that the Enlightenment theme would be a particularly compelling and appropriate goal for the University of Michigan's third century. After all, our future will continue to be one in which freedom and prosperity depend upon widespread distribution of "the light of learning and knowledge", and hence this should become a key component of our

Timescale	Now!	Soon!	Eventually!
Theme	Reflection →	Renaissance →	Enlightenment
Purpose	(Embracing the Michigan Saga)	(Aligning with the Age of Knowledge)	(Redefining UM's Public Purpose)

Values	Excellence
	Academic Priority
	Diversity
	Public Purpose
	Spirit
	Leadership
	Pathfinder
		Creativity
		Innovation
		Ingenuity
		Invention
		Entrepreneurism
		Passion
		Risk-Taking
			Building Learning
			  Communities
			Propagating Learning
			  and Knowledge
			Becoming a
			  Knowledge Commons
			A Global University

A Vision for the Third Century of the University of Michigan

extended public purpose.

Actually, this theme traces its origin to the earliest days of the University of Michigan, since its original incarnation as "the Catholepistemiad or University of Michigania" was a utopian vision stimulated by the principles of the Enlightenment that undergirded the Northwest Ordinance of 1787, e.g., "religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged".

Michigan's early evolution was heavily influenced by Henry Tappan's efforts to build a true university, based not simply on learning but on scholarship laid the foundation for the research university in America. And, perhaps most important, its public character was shaped by the Jeffersonian ideal of education for all to the extent of the individual's capacity, i.e., "providing an uncommon education for the common man". These fundamental principles, along with its unusual secular character, established Michigan as one of the nation's first and most prominent "public" "research" universities and continues to define its public purpose today in terms of both creating and distributing learning and knowledge to society. Hence, it is most appropriate that any vision for the University's future embrace and extend its character as a truly "public university" to address the nature of our changing world.

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., cyberinfrastrucure) 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. 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
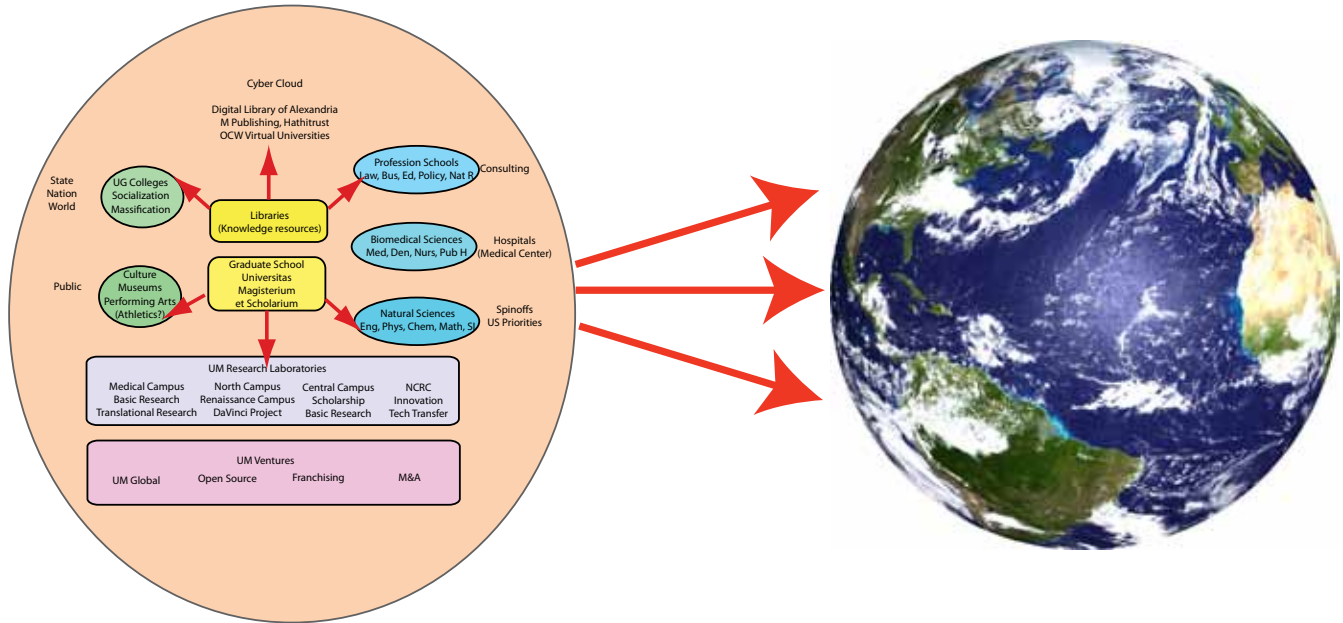
A Public Purpose for the Third Century: Providing the light of knowledge and learning to the world!

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)

Germano continues on to suggest that "these two dreams–the universal and the collective–should sound very familiar since they are fundamentally the latest entries in Western culture's utopian tradition."

In a sense, then, the concept of a 21st century analog to the Enlightenment combines several themes that we suggested earlier might characterize the university of the future:

- The emergence of a *Universitas Magistrorum et Scholarium* in cyberspace.
- The power of network architectures in distributing knowledge and learning
- The increasing access to knowledge and learning resources through the massive digitization and

access to printed materials and other sources of information
- The perspective of learning organizations as ecologies that evolve and mutate into new forms
- The university as the prototype of an emergent global civilization

Today, the University of Michigan is already playing a leadership role in achieving just such a vision. Its efforts during the 1980s (together with IBM and MCI) to build and manage the backbone of the Internet, its role in creating Internet2, and most recently the early effort to create a "national learning, research, and innovation network" linking together the nation's research universities, national laboratories, federal agencies, and industry with advanced cyberinfrastructure all provide strong evidence of the leadership role it plays in linking together people and institutions around the world.

The University of Michigan has also played a leadership role in redefining the nature of the "library" for a digitally connected world, first with the NSF digital library project in the 1990s–a consortium of universities that stimulated the development of the Page Rank search algorithm and the creation of Google, and helping to build the JSTOR project, the first major effort to digitize a massive collection of scholarly publications in disciplines such as economics and

history. Today, Michigan serves as the lead partner in the Google Books project, to provide search access to the printed knowledge of the world, and the HathiTrust, a collection of 80 leading libraries with the futher goal of providing full-text access to large inventories of scholarly materials. Furthermore, as a participant in the OpenCourseWare and MOOC movements to provide global access to learning resources, the University has firmly established its leadership role in providing both knowledge and learning on an unprecedented global scale. Its leadership in promoting open access to research data and intellectual property through efforts such as the Creative Commons has potential for redefining the public university as a "knowledge commons" serving the world.

Hence, it is appropriate (and provocative) to suggest that the University is well-positioned to participate in a contemporary version of the Enlightenment, spreading knowledge and learning throughout the world. We suggest that this might become the primary mission of the University for its Third Century!

Achieving the Vision

We have suggested three visions for the future of the University of Michigan:

1. A vision for today of *Reflection* upon the past accomplishments, values, and key characteristics of the University's institutional saga;

2. A near-term vision of a *Renaissance* as the University aligns itself to better engage with a world dependent upon learning, knowledge, creativity, and innovation by spanning the broad range of learning from simply "to know", "to do", "to create" and "to become; and

3. A longer term vision of *Enlightenment* as the University commits itself to expand its public purpose to provide "the light of learning and knowledge" to the world in the new forms enabled by rapidly evolving information and communications technologies.

Although bold, we believe these visions to be consistent both with the University's heritage and the challenges and opportunities it will face as it begins its third century. As the nation's first true experiment in public higher education, its first attempt to build a true "university" in the European sense, with a public purpose of providing "an uncommon education for the common man", and "creating a community of scholars across the full range of disciplines", such a vision aligns well with the University's history and heritage. But, these visions also seem consistent with both the recent and ongoing activities of the university and its culture of innovation and risk-taking to not only address the challenges of our times but to create the future.

Of course these visions remain somewhat abstract at this point, suggesting a destination but with little guidance on just how to proceed. But, of course, this is the objective of strategic roadmapping. Now that we know where we want to go, we need to develop a map to our chosen destination. But, there is one more step before constructing the roadmap. We must first understand how far we must travel, the distance between the University of Michigan today and the visions of Reflection, Renaissance, and Enlightenment for the University's future. Hence, we turn next to the process of *gap analysis*, to determine how far we currently fall short of the vision proposed for Michigan's third century.

Chapter 7

How Far to Go? A Gap Analysis

Today, much of American higher education is still reeling from the impact of the Great Recession of 2008 and 2009. Endowments are still recovering; state support remains at the lowest levels in decades; and faculty and staff layoffs and furloughs are still all too common. Yet, the University of Michigan appears to be enjoying a period of relative peace, prosperity, and growth. New buildings are appearing across the campus–North Quad, the new Mott Pediatrics Hospital, a massive renovation of Michigan Stadium to add sky boxes and premium seating, new buildings for the Ross Business School and Law School, and a privately-funded (and very controversial) residence hall for graduate students. In contrast to the rest of higher education, Michigan seems financially secure, completing a $3.2 billion fundraising campaign in the 2000s and in the midst of an even larger $4 billion campaign. The administration boasts a highly successful program of cost reductions in its business activities to keep its top AAa credit rating intact. Student applications and enrollments continue to grow, as do research expenditures, now exceeding $1.3 billion per year. To be sure, some highly visible University programs are enduring hard times, e.g., the Michigan football has lost 12 of its last 14 games to Ohio State and 6 of its last 7 to Michigan State. But it has an exciting new coach in Jim Harbaugh and has benefitted enormously from an interim athletic director in Jim Hackett. In every other area the spirit of the campus seems upbeat, confident, and secure. Or at least so we are told by the ever-optimistic and ever-present communications machinery of the University.

Yet, if one looks more closely, there are numerous warning signs that suggest that below the surface the University community should not be so sanguine. State support per student remains at its lowest levels since the 1960s. While there has been significant new construction in debt-financed auxiliary units (notably the Medical Center, student housing, and athletics),

academic units have seen only a handful of projects financed by gifts, debt financing, or reallocation, but not with significant state support. Much of cost savings have come from constrained faculty / staff salaries and benefits programs (although unfortunately not for senior administrators whose compensation has soared beyond that of even most private universities) and assigned cost cutting targets for academic units. While research expenditures continue to lead the nation, externally sponsored research has declined while University subsidies of sponsored research projects have now grown to over 30% of research volume. Student applications have increased to almost 50,000 largely because of the Common Application now used in higher education, but the University's yield rate from admitted students remains below many of its peer universities.

Faculty quality has been challenged by the University's struggle to retain top faculty in the face of increasing instructional loads, modest compensation, and aggressive offers from competing institutions. In recent years the University has suffered a serious erosion in its public purpose with the tragic decline in enrollments of underrepresented minority and low income students. Compared to earlier decades, the University's pathfinding achievements appear to be lagging both in number and impact.

Beyond these early signals of possible problems, a broader investigation suggests that Michigan is clearly facing many of the challenges currently experienced by the rest of higher education, e.g., the unsustainability of its traditional sources of financial support, the increasing competition for the best students and faculty, and mission creep in auxiliary activities that dilutes the priority given to the academic core of the university. Cracks are beginning to appear in our façade of confidence. There is a growing fear we may be whistling through the graveyard, ignoring serious issues and

concerns that could threaten our most fundamental goals of quality, public purpose, leadership, and even our institutional saga as a pathfinder for American higher education.

In this chapter we will examine these challenges in more detail through the fourth stage of the strategic roadmapping process, the *gap analysis*, where we compare the current status of the university with the vision of Reflection, Renaissance, and Enlightenment we have proposed for its third century. Through such a process, we will identify the actions, resources, and transformations required to achieve this vision in the broadest sense as they involve our people, finances, facilities, quality, values, and spirit. These will form the basis of the development in the next chapter of the *roadmap* to the University's third century.

Warning Signs

All too frequently we tend to measure progress of a university by inputs (e.g., funds raised, buildings built, students enrolled, events hosted, etc.) rather than outputs (e.g., academic quality, faculty and student achievement, impact on society, etc.). If we were to measure progress of the University over a period of time, we might construct a university "business dashboard" comprised of indicators such as academic quality, diversity, faculty achievement, student quality, reputation, financial strength, and societal impact that are relatively straightforward. There are also more subjective measures such as values (integrity), innovation (excitement), and alignment with institutional saga (for Michigan, pathfinder and trailblazer), more difficult to measure but nevertheless extremely important to track.

While the analysis in Chapter 3 has noted many of the current strengths of the University, there are numerous warning signs that raise concerns.

Quality

There are many measures of institutional quality, some highly visible, such as the various rankings of academic programs, and some more subtle indicators, such as the ability of the university to recruit and retain outstanding faculty members and students. Most of

the popular rankings or "league tables" continue to place the overall academic reputation of the University among the leading public research universities in the nation and the world, but well below many of the elite private institutions. For example, in 2014 US News & World Report ranks the University of Michigan 29th among all national universities, public and private, and 4th among public universities, behind UC-Berkeley, UCLA, and the University of Virginia. At the international level, Michigan is ranked 19th by the London Times rankings, 22nd by Shanghai Jiao Tong, and 23rd in the QS rankings. A more definitive analysis of the change in the USNews & World Report graduate rankings for UM programs (see table) suggests there has been some erosion in many programs over the past decade. (Ulaby, 2014)

Although entering student quality remains strong, at least as measured by high school grade point averages and scores on standardized entrance examinations such as the SAT and ACT, both the University's selectivity in admissions and yield rates lag considerable behind those of many peer public and private universities. For example, in 2014 the University admitted 51% of instate applications, with a yield rate of 68%, while out-of-state selectivity was 27%, with a yield rate of 27%, suggesting that for many of these students, Michigan is viewed as a "safety" school backup to Ivy League applications. Furthermore, as the University has become increasingly dependent on students from affluent backgrounds capable of paying high out-of-state tuition, there is some indication that student academic work habits have weakened somewhat in favor of social and extracurricular activities.

There are growing concerns that the combination of heavier instructional loads driven by increasing enrollment in larger academic units (LS&A and Engineering) and eroding faculty salaries relative to well-endowed private universities have made both the recruiting and retention of high quality faculty more difficult. More specifically over the period 2004 to 2011, the University lost 40% of faculty receiving offers from other institutions, including 55 to Harvard, 54 to UC Berkeley, 46 to Stanford, and 37 to Chicago, and 24 to Columbia. Of course, it has always been challenged to compete with peer private institutions, particularly these days when the gap between faculty salaries at

University (Privates in italics)	2008	2009	2010	2011	2012 All	2012 Public
Harvard University	1	1	1	1	1	–
Princeton University	2	1	2	1	1	–
Yale University	3	3	3	3	3	–
Columbia University	8	8	4	4	4	–
University of Chicago	8	8	9	5	4	–
Stanford University	4	4	5	5	6	–
University of Pennsylvania	6	4	5	5	8	–
Northwestern University	12	12	12	12	12	–
Cornell University	14	15	15	15	15	–
University of California-Berkeley	21	21	22	21	21	1
University of Virginia	23	24	25	25	24	2
University of California-Los Angeles	25	24	25	25	24	2
MICHIGAN	26	27	29	28	29	4
University of North Carolina	30	28	30	29	30	5
University of Wisconsin	35	39	45	42	41	10
University of Washington	41	42	41	42	46	13
University of Illinois	40	39	47	45	46	13
University of Minnesota	61	61	64	68	68	25
Indiana University	71	71	75	75	83	36

USN&WR Rankings of Undergraduate Programs

University (Privates in italics)	2009	2010	2011	2012	2013
Stanford University	16	4	5	2	2
Harvard University	1	1	1	2	4
Princeton University	8	5	7	5	6
University of California Berkeley	39	8	4	10	9
University of Chicago	7	12	15	9	10
Yale University	3	10	9	11	11
University of California Los Angeles	32	11	12	13	13
Columbia University	11	18	23	12	14
University of Pennsylvania	12	19	22	16	15
Cornell University	15	14	16	20	18
Northwestern University	32	25	40	26	19
University of Michigan	19	15	13	18	20
University of Washington	80	23	26	25	24
University of Wisconsin	61	43	25	27	31
University of Illinois	63	33	21	31	33
University of North Carolina	78	30	41	43	42
University of Minnesota	105	52	43	42	47
University of Virginia	128	72	–	135	118

London Times (THE) Rankings

University (Privates in italics)	2008	2009	2010	2011	2012
Harvard University	1	1	1	1	1
Stanford University	2	2	3	3	2
University of California-Berkeley	3	3	2	2	4
Princeton University	8	8	7	7	7
Columbia University	7	7	8	8	8
University of Chicago	9	9	9	9	9
Yale University	11	11	11	11	11
University of California-Los Angeles	13	13	13	13	12
Cornell University	12	12	12	12	13
University of Pennsylvania	15	15	15	15	14
University of Washington	16	16	16	16	16
University of Wisconsin	17	17	17	17	19
MICHIGAN	21	22	22	22	22
University of Illinois	26	25	25	25	25
University of Minnesota	28	28	28	28	29
Northwestern University	30	30	29	29	30
University of North Carolina	38	39	41	41	41
Indiana University	92	93	90	90	84
University of Virginia	95	91	96	96	101-150

Shanghai Jiao Tong Rankings

University (Privates in italics)	2008	2009	2010	2011	2012
Harvard University	1	1	2	2	3
Yale University	2	3	3	4	7
University of Chicago	8	7	8	8	8
Princeton University	12	8	10	13	9
Columbia University	10	11	11	10	11
University of Pennsylvania	11	12	12	9	12
Cornell University	15	15	16	15	14
Stanford University	17	16	13	11	15
MICHIGAN	18	19	15	14	17
University of California-Berkeley	36	39	28	21	22
Northwestern University	33	32	26	24	27
University of California-Los Angeles	30	32	35	34	31
University of Wisconsin	55	61	48	41	38
University of Illinois	71	63	63	61	56
University of North Carolina	102	78	57	55	57
University of Washington	59	80	55	56	59
University of Minnesota	87	105	96	102	104
University of Virginia	96	128	130	126	123
Indiana University	170	193	227	216	210

Quacquarelli Symonds (QS) Rankings

	Program	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Abs. Change	Norm. Change
2	Business	13	10	11	11	11	12	13	12	14	13	14	11	-1.33	-6%
3	Public Policy	7	8			8	7	7	7	7					
4	Education	8	10	9	9	6	9	14	14	9	12	11	8	-1.33	-7%
5	Engineering	6	8	6	6	9	9	9	8	9	8	9	8	-1.67	-11%
6	Medicine	8	7	11	11	10	11	11	6	10	10	8	12	-1.33	-7%
7	Nursing	3	3	3	3	5	5	5	5	6	6	6	6	-3	-33%
8	Pharmacy	4	4	4	4	4	5	5	5	5	7	7	7	-3	-27%
9	Public Health	5	5	5	5	5	5	5	5	4	4	4	4	1	11%
10	Social Work	1	1	1	1	1	2	2	2	2	1	1	1	0	0%
11	Law	7	7	8	8	8	9	9	9	7	10	9	10	-2.33	-14%
12	Economics	11	11	11	11	11	11	12	12	12	12	13	13	-1.67	-7%
13	English	11	11	11	12	12	12	13	13	13	13	13	13	-2	-8%
14	History	5	5	6	7	7	7	7	7	7	7	7	7	-1.67	-14%
15	Pol. Sci.	2	2	2	3	3	3	4	4	4	4	4	4	-2	-33%
16	Psychology	2	2	2	2	2	2	3	3	3	3	4	4	-1.67	-29%
17	Sociology	3	3	3	3	3	3	3	3	3	3	4	4	-0.67	-10%
18	Biol. Sci.	14	14	13	12	15	15	15	20	20	20	20	19	-6	-18%
19	Chemistry	21	21	19	17	16	16	16	16	16	16	16	15	4.67	13%
20	Comp. Sci.	14	14	14	15	15	13	13	13	13	13	13	13	1	4%
21	Earth Sci.	5	5	5	5	5	5	5	9	9	9	9	8	-3.67	-27%
22	Math	8	8	8	7	7	9	9	8	8	8	8	9	-0.33	-2%
23	Physics	13	13	13	13	13	13	13	11	11	11	11	11	2	8%

C1=Average ranking over 2004 to 2006. C2=Average ranking over 2013 to 2015.
AC=Absolute Change=C1-C2. NC=Normalized Change=(C1-C2)/(C1+C2).

USN&WR Rankings of UM Graduate Programs (Courtesy of F. Ulaby)

public and private universities have grown to over 20%. But perhaps even more serious are the growing losses to public universities, such as 33 to U Texas, 28 to U North Carolina, 25 to Maryland and 23 to Ohio State. Viewed from the perspective of many of our peers, Michigan has now become a major supplier of many of their very best faculty members… and the loss to this University has been immense.

One of the most serious signs of the weakening influence of the faculty is the disturbing loss of many of our most talented junior faculty. During the last 15 years, the University has lost over 600 young faculty to peer institutions. Of particular concern here is the loss of hundreds of recently tenured junior faculty, just as they are moving into the most productive part of their career.

Several of the University's schools and colleges (e.g., LS&A) have long had effective programs for successful mentoring of junior faculty members. In fact, Michigan has long had a strong reputation for building an outstanding faculty through the recruiting and development of young talent, in contrast to many private institutions, which tend to recruit faculty at more senior levels after they have achieved tenure and established reputations elsewhere. For Michigan to have its young faculty members recruited away just as they have successfully achieved promotion and tenure not only raises the perception that the institution is serving as a "farm club" for other institutions, but furthermore raises a serious question about its continued capacity to build and retain its senior faculty through faculty development.

Social Diversity

During the 1990s the University launched one of the most ambitious efforts in the nation to address the social diversity of the campus both in terms of the presence of underrepresented minorities as students, faculty, and leaders as well as to create a campus climate supporting of all members of the University. This effort, known as the Michigan Mandate, was based on two goals: 1) To recognize that diversity and excellence are complementary and compelling goals for the university and to make a firm commitment to their achievement. 2) To commit to the recruitment, support, and success

of members of historically underrepresented groups among our students, faculty, staff, and leadership. 3) To build on our campus an environment that sought, nourished, and sustained diversity and pluralism and that valued and respected the dignity and worth of every individual.

A series of carefully focused strategic actions was developed to move the University toward these objectives. These actions were framed by the values and traditions of the University, an understanding of our unique culture characterized by a high degree of faculty and unit freedom and autonomy, and animated by a highly competitive and entrepreneurial spirit. The strategy was both complex and pervasive, involving not only a considerable commitment of resources (e.g., fully funding all financial aid for minority graduate students) but also some highly innovative programs such as the Target of Opportunity program for recruiting minority faculty. It also was one of those efforts that we believed required leadership on the front lines by the president, since only by demonstrating commitment from the top could we demand and achieve comparable commitments throughout the institution.

By the mid 1990s Michigan could point to significant progress in achieving diversity. The representation of underrepresented minority students, faculty, and staff more than doubled over the decade of the effort. But, perhaps even more significantly, the success of underrepresented minorities at the University improved even more remarkably, with graduation rates rising to the highest among public universities, promotion and tenure success of minority faculty members becoming comparable to their majority colleagues, and a growing number of appointments of minorities to leadership positions in the University. The campus climate not only became more accepting and supportive of diversity, but students and faculty began to come to Michigan because of its growing reputation for a diverse campus.

Perhaps most significantly, as the campus became more racially and ethnically diverse, the quality of the students, faculty, and academic programs of the University increased to their highest level in history. This latter fact reinforced our contention that the aspirations of diversity and excellence were not only compatible but, in fact, highly correlated. By every

Student Access and Success

    Undergraduate Student Access

        Wade McCree Incentive Scholarship

        King/Chavez/Parks Program

        Summer programs (e.g., DAPCEP)

        College Day visitation for families

        Tuition grants to all Native American students from Michigan.

    Special Undergraduate Programs

        Undergraduate Research Opportunity Program

        21st Century Program

        CRLT Programs

        Leadership 2017

        Office of Academic Multicultural Initiatives

    Graduate Student Support

        Fully funding minority graduate support

        Rackham Graduate Merit Fellowship Program

Special Programs

    Tapped grass-roots creativity and energy using $1 M/y Presidential Initiatives Funds for competitive proposals from faculty and student groups.

Results

    Enrollments:

        83% increase in students of color (to 28%)

        90% increase in underrep min (to 15%)

        57% increase in AA (to 2,715 or 9.1%)

        126% increase of Latinos (to 4.3%)

        100% increase in Native Americans (to 1.1%)

    Graduation rates for African Americans highest among public universities.

    UM ranked 27th in nation in minority BA/BS

        8th for M.S. degrees, 7th for PhD degrees

        1st in African American PhDs (non HBCU's)

    Graduate education

        Increased minority fellowships by 118%

        Of 734 Rackham Fellows in 1994,

           51% were African American,

           29% were Latino

    Professional Schools:

    Business: 12% AA, 28% color

    Medicine: 11% AA, 39% color

    Law: 10% AA, 21% color

Faculty

    Target of Opportunity Program

    Faculty Development (Faculty Awards Program for minority faculty)

    Cluster hiring

    Creating a welcoming and supportive culture (networks, centers, surveys)

    Enlarging candidate pool by increasing PhD enrollments

Results

    +62% for African Americans (128)

    +117% for Latinos (52)

    +75% for Native Americans (7)

    Senior academic leadership (URM): from 14 to 25

Staff

    Demanded accountability in hiring and promotion

    Human Resources and Affirmative Action programs

    Consultation and Conciliation Services
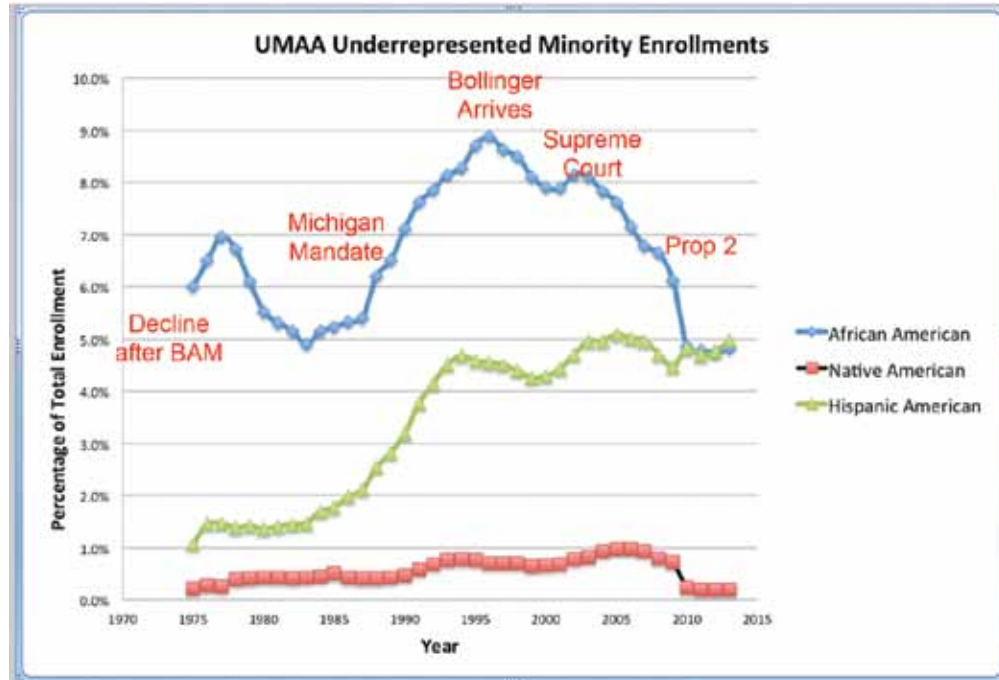
Results

    Top managers: +100% (to 10% of management)

    P&A: +80 (from 449 to 816)

More Generally

    Building University-wide commitments

    Office of Minority Affairs, Vice-Provost for Minority Affairs

    Demanding accountability

    Included in compensation review

    Included in budget review

    Included in appointment review

Leadership

    Half of Executive Officers were African American

    Executive VP Medical Center (Rita Dumas)

    Secretary of University (Harold Johnson)

    VP Research (Homer Neal)

    UM Flint Chancellor Charlie Nelms

    UM Dearborn Chancellor James Renick

JJD's Successor was African American (Homer Neal)

Some Actions and Results of the Michigan Mandate by 1996

UMAA Underrepresented Minority Enrollments

The dramatic reversal of the progress in racial diversity made by
the Michigan Mandate strategic plan over the past 20 years.

measure, the Michigan Mandate was a remarkable success, moving the University beyond our original goals of a more diverse campus.

But, of course, this story does not end with the successful achievements of the Michigan Mandate in 1997 when a new president arrived. Perhaps because of Michigan's success with the Michigan Mandate, the University soon became a target for those groups seeking to reverse affirmative action with two cases filed against the University in 1997, one challenging the admissions policies of undergraduates, and the second challenging those in our Law School. Even as the Bollinger administration launched the expensive legal battle to defend the use of race in college admissions, it discontinued most of the effective policies and programs created by the Michigan Mandate, in part out of concern these might complicate the litigation battle, but also because such action was no longer a priority of the new administration. Indeed, even the mention of the name "Michigan Mandate" became a forbidden phrase in its effort to erase the past.

As a consequence of this neglect, the enrollment of underrepresented minorities began almost immediately to drop at Michigan, eventually declining from 1997 to 2010 by over 50% for African American students overall

and by as much as 80% in some of UM's professional schools. In 1996 half (5) of the Executive Officers were minority, but by the early 2000s, only one out of 11 executive officers and one out of 18 deans in the new administration were underrepresented minorities.

Although the 2003 Supreme Court decisions were split, supporting the use of race in the admissions policies of our Law School and opposing the formula-based approach used for undergraduate admissions, the most important ruling in both cases stated, in the words of the court: "Student body diversity is a compelling state interest that can justify the use of race in university admission. "While an important battle had been won with the Supreme Court ruling, we soon learned that the war for diversity in higher education was far from over.

In 2006, Michigan voters approved a constitutional referendum similar to that of California's Proposition 209 to ban the use of affirmative action in public institutions. Although most of the decline in minority enrollments had occurred by this time, this referendum prevented Michigan colleges and universities from using even the narrowly tailored prescriptions of the 2003 Supreme Court decision, and the decline in the enrollments of underrepresented minority students,

Change in Minority Enrollments

Minority	1996	2015	Change
African Am	2,824	1,801	-36%
Hispanic	1,473	2,018	+37%
Native Am	227	92	-60%
Underrep	4,524	3,921	-14%

Change in Minority Percentages

Minority	1996	2015	Change
African Am	9.3%	4.8%	-48%
Hispanic	4.5%	5.4%	+20%
Native Am	1.1%	0.25%	-64%
Asian Am	11.6%	13.5%	+13%
Underrep	14.1%	10.1%	-32%
Fresh Afric	9.3%	5.1%	-45%

The drop in underrepresented minorities
over the past 15 years.

Michigan's ranking in Pell Grant students
lags badly behind other public universities.

erasing most of the gains with the Michigan Mandate strategy in the 1990s and returning this measure of diversity to the levels of the 1960s. More specifically (as shown in several charts depicting the enrollments of underrepresented minorities over the past 40 years), total African American enrollments have dropped from a peak of 9.4% in 1996 to 4.8% in 2015, and the enrollments in key professional schools such as Medicine, Law, and Business dropped from 10%-12% to less than 3%.

Economic Diversity

Throughout the last decade, there has been an increasing concern that many public universities, particularly flagship research universities such as Michigan, were also losing the economic diversity that characterized their public purpose. A 2010 report by the Education Trust, *Opportunity Adrift*, stated: "Founded to provide 'an uncommon education for the common man', many flagship universities have drifted away from their historic mission". (Haycock, 2010) Analyzing measures such as access for low-income and underrepresented minority students and the relative success of these groups in earning diplomas, they found that the University of Michigan and the University of Indiana received the lowest overall marks for both progress and current performance among all major public universities in these measures of public purpose. For example, Michigan's percentage of Pell Grant students in its freshman class (the most common measure of access for low-income students) has fallen to 11%, well below most other public universities including Michigan State (23%) and the University of California (42%); it even lags behind several of the most expensive private universities including Harvard, MIT, and Stanford. (Campbell, 2015)

Yet, another important measure of the degree to which public universities fulfill their important mission of providing educational opportunities to a broad range of society is the degree to which they enroll first generation college students. It is disturbing that today less than 6% of the University's enrollment consists of such students, compared to 16% by its public university peers and 14% of the enrollments of highly selective private universities.

What was happening? To be sure, the State of Michigan ranks at the bottom of the states in the amount of need-based financial aid it provides to college students, requiring the University to make these commitments from its own internal funds. But it is also due to the decision made in the late 1990s to compensate

Growth of student high-rise apartments in Ann Arbor.

Another demonstration of enrollment growth.

for the loss of state support by dramatically increasing enrollments with a bias toward out-of-state students who generate new revenues with high tuition. Clearly students who can pay annual tuition-room & board at the out-of-state rates of $60,000 come from highly affluent families. Indeed, the average family income of Michigan undergraduates now exceeds $150,000 per year, more characteristic of the "top 5%" than the "common man".

Scale

The University of Michigan has continued to grow over the past two decades, with a total budget now exceeding $7 billion/year (of which $3 billion/year is for academic programs), a campus continuing to expand both with new buildings and the acquisition of the 200 acre site for research and office facilities of the adjacent Pfizer Global Research Laboratories, and a research budget now in excess of $1.3 billion/year, one could well claim that the Ann Arbor campus of the University of Michigan has become the largest, most comprehensive, and most complex university campus in the world. Of particular note here has been the growth in student enrollments, from 35,000 in the 1990s to almost 44,000 today, a 25% growth occurring mostly at the undergraduate level with a particular recent emphasis on enrolling wealthy out-of-state students in an effort to increase tuition revenue to compensate for the loss of state support.

Unfortunately, the recent expansion in University enrollments has had a significant impact both on the character of the University's academic programs and the nature of the Ann Arbor community. Since tenure-track faculty size has increased only modestly in those units undergoing major expansion (e.g., LS&A and Engineering), this has shifted lower division instruction toward an increasing dependence on part-time or nontenure-track faculty (who now provide over 50% of lower division undergraduate instruction). Teaching loads, as measured by students per full-time faculty member, are the highest in the University's history.

Enrollment growth has driven a major expansion of student housing (on the part of both the University and private developers), and threatens to overload other academic infrastructure such as libraries, study space, academic and student life facilities , course availability, and cyberinfrastructure, pushing UM increasingly in the direction of other massive campuses such as MSU, OSU, and UT. It has also triggered a massive building boom of high-rise apartment complexes about Ann Arbor, designed to accommodate more affluent out-of-state students, many of who are "paying for the party" rather than seeking a rigorous undergraduate education. (Armstrong, 2013) Beyond the concern that Michigan's recent enrollment growth may be taking it toward the characteristics of very large, undergraduate campuses such as Michigan State and Ohio State, there is also a serious financial concern as to whether academic quality is sustainable with such enrollments as state support continues to dwindle. Essentially all leading private universities are much smaller, typically one-
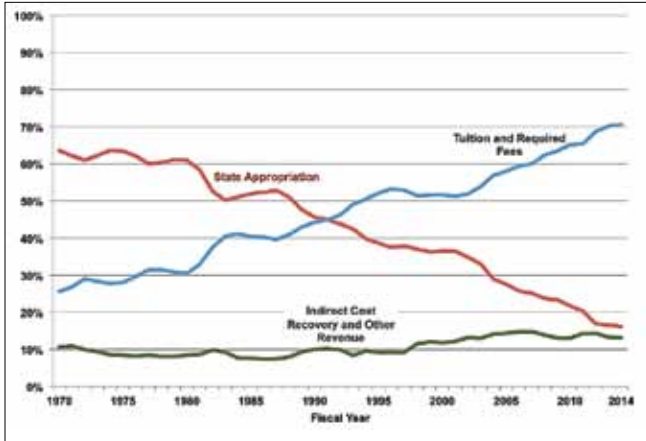
General contribution of state support to
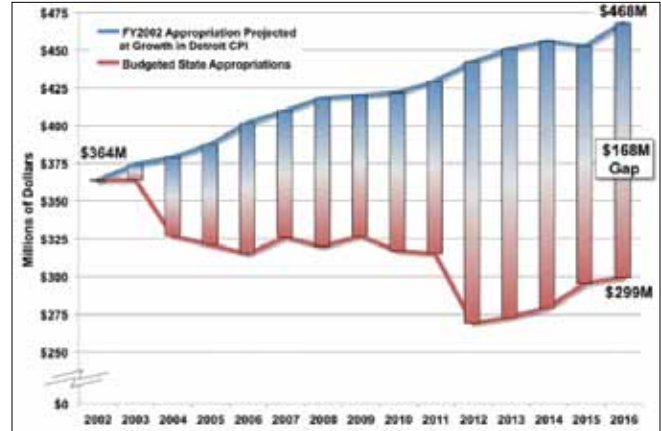the UMAA General Fund budget

The "Jaws" diagram showing the erosion in
state support compared to the CPI

third the size of the University's Ann Arbor campus.

While overwhelming size commands respect, it also demands serious thought be given to how one organizes and manages such scale. In fact, we have many disturbing examples of how size and complexity can lead to disaster (e.g., the dinosaurs and General Motors). Yet, now that the University has walked out on this limb of massive enrollments, it will be very difficult financially to return to more historical enrollment levels should evidence of deterioration in academic quality become apparent.

Financial Strength

As state support has declined over the past three decades, the University of Michigan now finds itself a predominantly "privately-supported" public university, in the sense that roughly 95% of its revenues come from non-state sources such as student tuition, clinical fees, research grants, and private gifts that are determined by competitive markets. Actually, it is more enlightening to separate off the $3.26 billion auxiliary functions of the University including the UM Health System, student residential housing, and athletics and to consider only the $3.32 billion revenues that support the academic missions of the university.

While the University's state appropriation is still important today at $300 M/y, (UMAA), the State of Michigan's support has fallen behind all of the University's other patrons including students (tuition), the federal government (research grants and student financial aid), and private contributions (gifts and

endowment income). This erosion in state support is demonstrated convincingly by charts showing the elements of the General Fund (academic) budget as well as an estimate of the loss in state support over the past decade (the so-called "jaws" diagram).

These charts make it apparent that the University has been able to adjust revenues to compensate for the loss of state support largely by increasing enrollments (by 25% since the 1990s), increasing student tuition (particularly for non-resident students, now in excess of $40,000/year), and shifting the student mix of instate to out-of-state students. This combination of actions has generated a revenue increase of roughly $400 million/y, more than enough to compensate for declining state appropriations.

Yet here, there are worries about the future. While once the state appropriation was viewed as providing the tuition discount provided instate students, this is clearly no longer the case. A very rough estimate of the annual cost of education at Michigan (across all undergraduate and graduate/professional programs) would range between $25,000 to $30,000 per student, a cost similar to other leading public universities such as UC Berkeley, U Wisconsin, and U Virginia. State support of the roughly 27,000 instate students enrolling in the University averages out roughly to $7,000, which when combined with instate tuition still falls roughly $10,000 short of the actual cost. Hence, it seems clear that the higher tuition charged out-of-state students ($40,000 and up) generates a sufficient surplus over actual costs to partially subside instate students and financial aid. Yet, these high tuition levels are now approaching

Gifts to the University
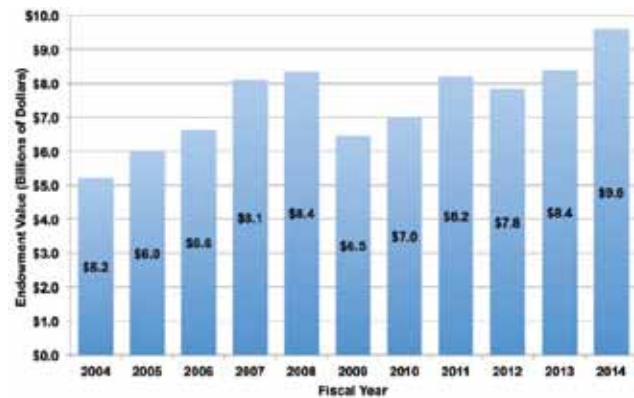
Growth in Endowment

the ceilings experienced by private universities, while enrollment growth (now 44,000 students) has exceeded the capacity of current faculty and facilities.

Other revenue streams face similar challenges. While the University faculties have been extraordinarily successful in attracting sponsored research grants, to maintain the level of research funding (not to mention UM's leadership in research expenditures) in the face of federal budget challenges, the University has increased its subsidy of campus sponsored research to $380 million/year, roughly 30% of its $1.32 B/y total expenditures. Currently this subsidy comes from sources such as clinical income for biomedical research and tuition revenue from academic units.

Finally, a word about private support: Clearly this has been essential to the University, since, as state support for major capital facilities disappeared in the 1990s, this provided a critical source of funding for new buildings. It has also been critical for ongoing operations, bringing in roughly $100 M/y to $150 M/y for this purpose. But its most critical impact is building an endowment, which has now grown beyond the critical point at which investments become more important that further contributions from private giving. For example, with a 4.5% annual payout from the endowment for university activities, a $10 B endowment will grow through wise investment at a rate of $450 M/y, considerably beyond Michigan's experience in receiving gifts designated for endowment. Put another way, the large endowment Michigan created during the 1990s (when it was increased 10-fold, from $200 M to $2.5 B) has now reached the size when it is managed

more like an investment bank rather than a fund-raising priority, similar to those of other well-endowed institutions such as Harvard and Yale. In fact, Michigan today has the 7th largest endowment among American universities, public and private, largely due to VPCFO Farris Womack's efforts during the 1990s!

But there are several other important caveats here: First, while Michigan's fund-raising efforts in major campaigns are impressive, its ongoing annual gifts received on a cash basis have lagged behind many other peer universities over the past several years, including several of its public university peers. Despite major increases in staffing and marketing, the University still failed to rank in the top 20 of institutions in annual fundraising in 2010-2012. Second, most gifts for capital facilities fail to cover either the full construction or operating costs of the building, requiring substantial additional University expenditures. This is a particularly serious issue for those naming gifts (i.e., "the edifice complex") for facilities that are not among the University's highest priorities, e.g., a gift to build a new graduate residence with an unusual design demanded by the donor (including seven student suites, a pub, and no parking) that has been strongly opposed by graduate students. Third, most of the University's endowment is for specified purposes and is not available for general program support.

Finally, although Michigan's endowment is impressive, its impact is limited by the size of the University. As a rule of thumb, the wealthiest private institutions achieve endowments capable of sustaining their institutions when their endowments reach a level

of $1 million per student (since this generates sufficient payout at 4.5% to 5% to cover tuition levels). With the rapid growth in Michigan's enrollment, its endowment for academic purposes amounts to only $227,000 per student, which at 4.5% payout would generate only $10,215 per student. Hence, while impressive, the University's endowment falls far short of that required to provide independence from state support with our current enrollment.

On the other side of the ledger, the University has launched a highly ambitious cost reduction effort during the past decade, aiming to trim roughly 1.5% to 2.0% each year off the base budget. While this has resulted in part, from more efficient management of energy and supply acquisition, and administration, much of these savings has been achieved by constraining faculty and staff salaries, increasing employee and retiree contributions to staff benefits, and demanding academic units achieve targeted savings. The University has compounded this top-down approach to cost containment by entering expensive contracts with external consultants (e.g., Accenture) that have attempted to impose corporate practices (centralizing all service activities), which has not only demoralized staff and enraged faculty, but it has also been found to generate savings of less than 0.1% of the University's budget (e.g., "penny wise but pound foolish"). To date administrative efforts have largely ignored the unprecedented expansions in administrative staffing and cost of growing peripheral activities such as public relations, marketing, and "institutional advancement" as well as the unusually high levels of compensation of senior administrators, now approaching extreme levels and practices (e.g., hidden bonuses and deferred compensation) more appropriate for the corporate setting than higher education.

Intensifying Competitive Forces

The intensely competitive nature of higher education in America, where universities compete aggressively for the best faculty members, the best students, resources from public and private sources, athletic supremacy, and reputation, has created an environment that demands achievement. However, while competition within the higher education marketplace can drive quality, if not always efficiency, it has an important downside. When serious imbalances arise in available funding, policy restrictions, and political constraints, such competition can deteriorate into a damaging relationship that not only erodes institutional quality and capacity, but also more seriously threatens the national interest. It can create an intensely Darwinian winner-take-all ecosystem in which the strongest and wealthiest institutions become predators, raiding the best faculty and students of the less generously supported and more constrained public universities and manipulating federal research and financial policies to sustain a system in which the rich get richer and the poor get devoured.

This ruthless and frequently predatory competition poses a particularly serious challenge to the nation's public research universities. These institutions now find themselves caught with declining state support and the predatory wealthy private universities competing for the best students, faculty, and support. Of course, most private universities have also struggled through the recent recession, though for some elite campuses this is the first time in decades they have experienced any bumps in their financial roads. Yet their endowments and private giving are recovering rapidly with a recovering economy, and their predatory behavior upon public higher education for top faculty and students has returned to an aggressive level.

The reality is that over the longer term, the rich private universities are once again becoming richer at an accelerating rate. Perhaps five or ten universities already have massive endowments that will continuec to double in size every seven to ten years. If Harvard's endowment is roughly $40 B, in 7-10 years it will be $80 B, then $160 B. Stanford's endowment of $22 B doubles to $44 B then $88 B. Their capacity to raid top students and faculty from other insitutions will be formidable.

This reinforces the fact that current federal tax policy is allowing the endowment-rich private institutions to decouple from the rest of higher education, including not only major public universities but also those private universities with far smaller endowments. Will the public universities or smaller private universities simply become farm systems for a handful of universities that will become the Oxfords and Cambridges? Will real competition be lost, especially in expensive fields such

as biomedical science or physical sciences?

Campus Expansion

The University of Michigan campus has continued to evolve over the past two decades, despite the disappearance of state support for major capital facilities. The two major complexes designed by architect Robert Stern, Weill Hall (for the Ford School) and North Quad, provide elegant entrances to the Central Campus. The major building of the Ross School of Business Administration and expansion of the Law School are also important academic projects. While Venturi's Life Sciences complex is actually a somewhat smaller version of a buildings he designed for Yale and UCLA, the biomedical research complex on Huron and Observatory is important for the continued expansion of research activity in the life sciences, as will be the recently acquired North Campus Research Center (the former Pfizer R&D Center). The University has taken advantage of exceptionally low interest rates to launch a massive series of renovations of residence halls ($650 million) that will be important for the growing student enrollment. The addition of skyboxes and club facilities has brought in additional revenue for Michigan athletics, albeit at possible risk because of its dependence on generous federal tax treatment and its serious impact on the morale of long-time campus and community fans who can no longer afford to attend events. Finally, the clinical facilities for the University Hospitals have grown very significantly with the addition of the Frankel Cardiovascular Center and the new Mott Pediatrics Hospital, along with planned expansion of the Medical School, although there are already warning signs about the costs of these very large new clinical facilities in view of the current health care market in Michigan and the future restructuring of federal health care policies such as the Affordable Care Act (with recent operating losses in the $100 M to $200 M per year).

Yet, here there are also more general concerns. Most of the campus growth (75%), at least in terms of investment ($4 B), has occurred in auxiliary units (i.e., clinical activities, housing, athletics) and are funded by auxiliary revenue streams, albeit with debt secured by student fee revenues. Those buildings responding to academic needs have generally depended upon anticipated federal research support (e.g., Public Health Annex) or private funding (Ross Business School, Weill Hall). This raises a serious question as to just how, in the absence of state support, the University will meet the future capital facilities needs of those academic units that have no donors or other external revenue sources (e.g., federal R&D).

The budget growth of auxiliary units (hospitals, housing, athletics) also raises the important issue of university priorities and balance. At Michigan there is some truth to the old saying that the academic core of the contemporary university is a quite fragile institution struggling to survive between the pressures exerted by the football stadium on one end of the campus and the university hospital on the other. But more serious is the issue of how one sustains the highest priority for the academic core of the university in an increasingly resource-driven (and for many academic units, resource-starved) environment constrained by "fund accounting", in which it is increasingly difficult to provide cross-subsidies from one unit to another (and particularly from auxiliary units to academic units).

Cyberinfrastructure

Today, the primary missions of the University, its teaching, research, and service activities (or alternatively, its activities of learning, discovery, and engagement with society) are increasingly dependent on cyberinfrastructure, i.e., information and communications technology. The rapid advances in these technologies are not only reshaping but creating entirely new paradigms for research, education, and application not only in science and engineering but in all of the academic and professional disciplines. It has been clear for some time that to maintain world-class academic programs, the University must also achieve leadership in the quality and relevance of the cyberinfrastructure it provides at the level of each of its highly diverse teaching and research programs.

This is particularly challenging since the features of information technology such as processing speed, memory, and bandwidth, have been increasing in power at rates of 100 to 1,000 fold per decade since WWII. This is one of the major reasons for the continued surprises

North Quad

Weill Hall

Life Sciences Institute

Biomedical Sciences Building

Ross School of Business Administration

Law School South Hall

Michigan Stadium Expansion

Chrisler Center Expansion

Mott Children's Hospital

Frankel Cardiovascular Hospital

Hill Dining Hall

Munger Graduate Residence Hall

Central Campus Biosciences Complex

Central Campus Weiser Dennison Building

North Campus Architecture Wing

North Campus Diag "landscaping" project

North Campus Research Center

Athletics Campus Ross Olympic Complex

The University has provided state-of-the-art computing resources for students.

we get from the emergence of new applications–the Internet, social networks, big data, machine learning–appearing in unexpected ways at a hyper exponential pace. We have learned time and time again that it makes little sense to simply extrapolate the present into the future to predict or even understand the next "tech turn". These are not only highly disruptive technologies, but they are highly unpredictable. Ten years ago nobody would have imagined Google, Facebook, Twitter, etc., and today, nobody really can predict what will be a dominant technology even five years ahead, much less ten!

Fortunately, the University of Michigan has been able to respond to such rapid technological change in the past–and, indeed, achieved leadership–because it has functioned as a loosely coupled adaptive system with many of our academic units given not only the freedom, but also the encouragement, to experiment and to try new things. It is at the level of academic units rather than the enterprise level where innovation and leadership must occur. Why? Because they are driven by learning and discovery, by experimentation, by tolerance for failure, and by extraordinarily talented faculty, students, and particularly, staff. While perhaps locating a computing cluster in every closet is not very efficient, it has made MIT, Carnegie Mellon, and Stanford leaders, as well as Michigan with CAEN and MERIT (i.e., NSFnet and then the Internet).

At a recent NSF sponsored conference on the role of cyberinfrastructure in discovery and learning hosted by the University, many participants stressed the importance of "craft", of the contributions of truly talented staff who drive innovation in units where they are most competent. (Atkins, 2013). These people are attracted to universities such as Michigan to work in academic units with faculty and students where they are highly valued and have the freedom to do exciting work. In fact, its great strength and contribution to society arises from this very unusual diversity in ideas, experiences, and people. Again, this argues for an organic plan, essentially a diverse ecosystem that will continue to mutate and evolve in ways that we cannot anticipate.

In the past, the University has intentionally avoided the dangers of centralizing these activities, although every once in awhile the central administration will launch attempts to centralize what is inherently a highly decentralized technology. Most recently the University has retained Accenture to impose an "IT rationalization" scheme that would attempt to shift Michigan to a centralized IT services relying on commodity products and cloud services, largely crippling innovation in instructional and research activities. While such practices can be cost-effective in the corporate world (and perhaps in University business and hospital operations), they can be not only highly constraining but disastrous for teaching and research and must be strongly resisted.

Shifting Cultures

In recent years there has been a growing concern,

particularly on the part of the faculty, that as the University has become larger, more extended, and more complex, it has become less guided by academic priorities. Earlier the concern was raised about the erosion of the University of Michigan's long-standing public purpose of providing "an uncommon education for the common man". Clearly its leadership in providing exceptional educational opportunities to low income and underrepresented minority students has already declined as its state support has eroded. But there are other signs of an increasing imbalance in the priority given to wealth, e.g., responding to the whims of generous donors, the private boxes and clubs characterizing Michigan athletics, wealthy students who attend Michigan "paying for the party," all activities, ironically, subsidized in part by the "common man" through the generous tax treatment of the payments for these premium services.

So too, one might well worry that the increasing scale and complexity of the University might inhibit the grass-roots innovation and experimentation that so energizes the trailblazing character of the institution. While becoming too big to fail is always a misconception–witness the collapse of General Motors and Chrysler–this perspective can sometimes inhibit the willingness to embark on high-risk activities so essential to the Michigan spirit.

The final warning flag has to do with the use of initiatives at the presidential or executive officer level to lead or steer the university, since Michigan throughout its history has been very much a bottom-up driven institution. It is not just that most top-down initiatives are soon rejected by the Michigan grassroots culture and fade away into obscurity, but more important, the true creativity, wisdom, and drive flourishes best at the grass-roots level with outstanding faculty members, students, and staff rather than administrators. Contrast the limited success of the earlier presidential initiatives such as the repertory theater planned to be originally sited next to the Power Center, the Venturi-Scott-Brown master plan for the campus, the brief (and expensive) tenure of the Royal Shakespeare Theatre group, the "Halo" design of Michigan Stadium, and even the Life Sciences Institute. Some have sunk beneath the waves, some have been bailed out and still float (at considerable expense), but none is a dramatic success. Contrast these

with grass-roots initiatives such as NSFnet (later to become the Internet), the Molecular Medicine Institute (a precursor to the Human Genome Project), and the Digital Library Project (leading eventually to the PageRank algorithm, Google, and the HathiTrust).

In fact, it is probably best to approach leadership in such a decentralized bottom-up environment much as a farmer would approach growing crops, by planting seeds to encourage innovation; watering, fertilizing, and nurturing exciting grassroots initiatives (and occasionally weeding out failures), and then harvesting the success for all to share.

Shifting Policies and Practices

Centralization vs. Decentralization

The key to Michigan's successful adaptation to a rapidly changing era while sustaining both its public purpose and its institutional saga of pathfinding has been a decentralization of authority over resources and personnel to the lowest level where resources are generated and costs are incurred. As state support declined during the 1970s and 1980s, Harold Shapiro embraced this philosophy of decentralization to the level of deans and directors. This philosophy was continued throughout the 1990s by implementing the practice of many leading private universities by adopting *responsibility center management*, and appointing deans and directors of the highest quality who were capable of leading their units in such an environment.

Yet, despite the fact that today over 95% of the resources of the University are generated by academic and auxiliary units, in recent years there has been an alarming effort to "recentralize" the University by pulling back key administrative staff from the units and weakening the authority of deans and directors. External consultants have been retained (at great expense) to apply corporate management methods to an academic institution, with devastating impact on faculty and staff morale as resources and staff critical to research and teaching have been withdrawn from academic units.

Auxiliaries vs. Academics

We have noted many signs of the erosion of the academic priorities of the University: the rapid expansion (and expenditures) of auxiliary units relative to academic programs, the relative priority given administrative and auxiliary needs relative to academic needs in investment decisions such as cyberinfrastructure, the rapid growth of administrative salaries during a period of stagnant faculty and staff salaries (now lagging 20% below leading private universities), the extraordinary growth in staffing in nonacademic functions such as communications, marketing, and "advancement" (now numbering well over 1,000 employees), largely at the expense of adequate staffing for faculty academic needs such as teaching and research (compounded by the negative impact of the "shared services" initiative).

It is probably not surprising that at a time when the academic programs continue to be seriously constrained by available funds and overloaded by the rapid enrollment growth, the University leadership has turned its attention instead to the auxiliary units (hospitals, housing, and athletics), which not only have the advantage of a price-insensitive market unconstrained by Regent politics, but can use the unusually low interest rates charactering the University's top credit rating earned during the 1990s to go on a debt-financed building spree amounting to billions of dollars.

There is also the related issue as to whether the aggressive growth of the auxiliary units actually competes with and draws resources away from the academic core. To be sure, the strong influence of the clinical units in the medical center on fund raising is understandable and probably beneficial to the Medical School. However the aggressive fund-raising of the Athletics Department through devices such as skyboxes and seat taxes clearly draws private giving that in the past has benefited academic units. So too, the recent aggressive fundraising activities of the UM-related units such as the Athletics Department, the Alumni Association, and the University Musical Society almost certainly competing with the academic units for donors. While there is disagreement about how damaging this has been to academic priorities, it

is certainly appropriate to raise the policy issue of the priority given auxiliary unit fund-raising activities relative to that given academic units.

An Erosion of Academic Priorities

This concern about the erosion of academic priorities applies not only to resource allocation but even more to the attention of governance (the Regents), leadership (the Executive Officers), and management. Too many universities have seen the quality of their academic programs deteriorate through the distraction of important but clearly secondary activities such as fund-raising and marketing (e.g., donor cultivation and influence), the management of billion-dollar enterprises such as health systems, and, of course, the politics and public visibility of intercollegiate athletics.

While much of this is driven both by the differing financial opportunities and challenges facing academic, auxiliary, and administrative activities, it is also due to an erosion of the academic voice in University leadership. For example, there has been a decided shift away from long tradition of appointing senior administrators (including the Executive Officers of the University) with significant faculty experience. So, too, the long-standing practice of achieving a balance between the appointment of internal and external candidates for senior leadership positions such as deans in an effort to balance both the continuity provided by long-standing University employees with new viewpoints from outside seems to have been abandoned, with a decided preference toward external candidates in recent years.

But perhaps most important has been the weakening of the voice and influence of the University's deans in recent years. The University of Michigan has long been known as a "deans' university", in which the authority and responsibility of deans as academic leaders is unusually strong. Deans are the key academic leaders most responsible for the priority, quality, and integrity of the University's academic programs. They select department chairs, recruit and evaluate faculty, seek resources for their school both within the university (arguing for their share of university resources) and beyond the campus (through private fundraising or research grantsmanship). As the key line officers for the faculty of the university, they have rather considerable authority that usually aligns well with their great

responsibilities. Good things happen in the University's academic programs because of good deans, at least over the long term–and vice-versa, of course.

Yet, despite this dispersal of power, Michigan is also an institution where team building and cooperation is greatly valued. Deans come together quite easily as teams, particularly if encouraged by the provost and president, and willingly work together on university-wide priorities. Although technically the deans report to the provost, the wise provost will join the deans' team as a member and captain rather than as its coach–and certainly not as its owner!

Since the influence of faculty governance at the University is primarily concentrated in powerful elected faculty executive committees at the school, college, and department level rather than with a University-wide faculty senate, the deans also have primary responsibility for making certain that academic priorities dominate the attention of the University administration and governing board. To weaken the access and influence of the deans relative to both the Executive Officers and Regents of the University is tantamount to weakening the academic priorities of the institution.

Financial Sustainability

Despite the success of the University during the past decade in compensating for the loss of over 50% of its state support through major expansion of enrollments since the 1990s (10,000 students, most of whom are paying out-of-state tuition), private fund-raising and endowment management, cost containment and staff benefits reductions, there are growing concerns about both the sustainability of the current financial model and their impact on the quality of the University.

Ratings agencies such as Moody's have warned higher education about serious trends such as a ceiling on public acceptance of tuition increases, continued weakness in state appropriations, constraints on federal spending on research and student financial aid, volatility of the capital markets characterizing endowments, weakening of philanthropic support, and risks to health care revenues.

But there are also several concerns specific to the current financial model characterizing the University of Michigan:

1) Since much of the State of Michigan's tax revenue base has been eliminated by the tax policies of recent conservative state governments, it is unlikely that there will be significant restoration of state appropriations for higher education for many years, that is, unless the University recommits itself to a leadership role in making the case for adequate investment in higher education across the state (similar to the "treetops" campaign of the 1990s).

2) Although there will likely be strong pressures to continue to grow enrollment while holding tenure-track faculty size constant, the concerns about the negative impact on academic quality of further enrollment growth, the adequacy of current University facilities (classroom and study space), the pressure on faculty retention driven by increasing instructional load, and the fact that out-of-state tuition rates are approaching the ceilings experienced by private universities, suggests that this option may be limited.

3) Much of the recent savings of the University have come largely out of faculty-staff benefits, cutting health care, retirement benefits, salary programs, and budget cuts imposed on academic and administrative units. Hence there is a serious concern that further cuts in benefits could cripple UM's efforts to attract and retain outstanding faculty and staff.

4) Although the UM has launched a major $4 billon fund-raising campaign associated with the Bicentennial, this will largely provide only marginal resources and could well result in launching new initiatives demanded by donors that not only increase University costs but actually dilute academic programs. Furthermore, in recent years Michigan has been able to achieve only an average annual fund-raising activity, lagging not only leading privates but several publics as well (Wisconsin, UC, etc.) While it is understandable that a very large university like Michigan would not attract the deep loyalty and commitment of Ivy League institutions, it also does not seem to be attracting the support characterizing other leading public institutions. The most successful fund-raising is by clinical units,
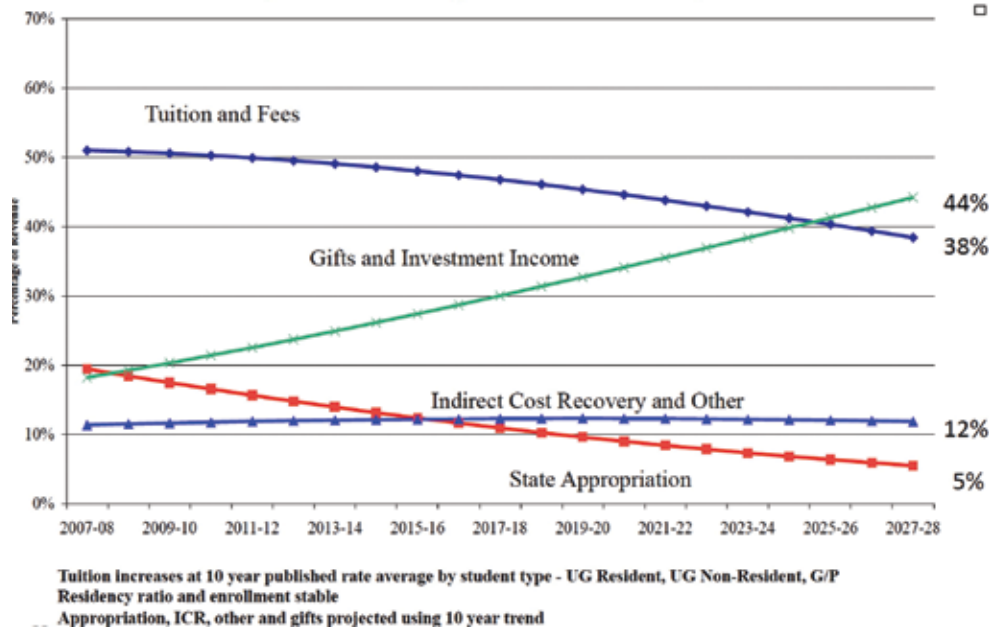
Projections of the changing financials of the academic budget (Hanlon)

understandable because of the personal impact they have on donors. Perhaps the problem is that there are just not enough exciting opportunities happening on other parts of the campus to attract the interest of donors.

5) On a much more positive note, the effort of the 1990s that created one of the largest endowments in public higher education (and led to the University's exceptional AAa credit) has now become one of the primary resources supporting the University. In 2016 its current size of $10 B ranks highest among public universities and 7th among all universities. At current payout policies of 4.5% per year, the endowment is now generating considerably more than state support ($300 M/y) and cash gifts received ($250 M/y). Although it still falls far short of the wealthiest private instituitons, particularly on a per student basis, it is certainly one of the bright spots in an otherwise questionable financial future.

In summary, the University's current financial model looks increasingly unsustainable: Its academic programs are largely sustained by high tuition revenues from out-of-state students, which are approaching both enrollment and tuition ceilings. Fund-raising seems increasingly suspect, inadequately aligned with university priorities and insufficient to have the major impact characterizing private universities. Although the University faculty remains highly successful in attracting sponsored research support, roughly 30% of the $1.3 billion of annual research expenditures is currently provided by the University itself. While the University has taken advantage of its high credit rating low interest rates to enable massive investments in auxiliary enterprises ($650 million of resident hall renovations, $2 billion of medical center expansions, and $500 million in new or renovated athletic facilities), the capacity of longer term revenues to support both the debt and operating costs of these facilities is questionable. Only its large endowment stands out as a key positive feature.

Issues of Scale

The rapid growth in student enrollments coupled with the unbridled expansion of auxiliary activities (hospitals, housing, and athletics) has triggered concern that the University is on a determined path toward becoming big, bigger, and biggest at the expense of the quality of its academic program. Comparisons with the size of the highest rated public research universities (UC-Berkeley at 35,000, UC-Virginia at 21,000, and UNC-Chapel Hill at 30,000) and private universities

(Harvard at 21,000, Stanford at 23,000, and Yale at 12,000) suggest that as the size of Michigan swells to 45,000 or greater, its peer group will shift to large campuses such as Michigan State, Ohio State, and U Texas) rather than the elite public and private institutions that have sustained a commitment to focus resources to achieve excellence rather than disperse them to drive scale.

There are other "phase transitions" that occur with changing institutional scale. On the positive side, once endowments reach the $1 M/student, a university becomes essentially independent of traditional revenues (tuition, gifts, etc.), although clearly this goal moves farther away with each increase in enrollment. However more generally, one can imagine that there is another phase transition should the endowments of the rich private institutions become so large (e.g., Harvard passing $100 B) that the "tax expenditures" become sufficiently large to attract the attention of Congress.

A similar phase transition may occur when a university becomes sufficiently large that centralized leadership and governance becomes impossible, requiring a highly decentralized structure to withstand stresses that might cripple smaller institutions. Here the University of Michigan may become a good test case (as has the University of California at the system level).

A third scale issue concerns the relative balance between undergraduate and graduate/professional enrollments. Leading private universities (Harvard, Stanford) typically have a majority of graduate and professional students. For most of its recent history, Michigan led all public universities with 40% grad/prof compared to 25% to 30% for other leading public research universities. But with the recent dramatic increase in undergraduate enrollments, this has dropped to 35%, suggesting a shift in academic focus.

Management Culture and Priorities

The budget growth of auxiliary units (hospitals, housing, athletics) raises the important issue of university priorities and balance. But more serious is the issue of how one sustains the highest priority for the academic core of the university in an increasingly resource-driven (and for many academic units, resource-starved) environment, particularly when there is a very significant difference in management philosophy characterizing auxiliary (centralized) and academic (decentralized) units.

To be sure, the tension between centralization (e.g., "rationalization") and decentralization (where cacophony leads to innovation) can be very threatening, particularly to those parts of the University that need to make sure that the trains run on time (e.g., financial services, hospitals, etc.) They prefer a coordinated approach at the enterprise level, a so-called "rationalization" of services that seeks to reduce redundancy. Yet this approach has generated great concerns within the academic community. In fact, many academic units are under the impression that as the University's rationalization juggernaut moves ahead, it will attempt to pluck out the top talent in their units and relocate it to the enterprise level through "shared services" operations. Were this to occur, it would be both an absolute disaster to the academic units and seriously undermine the confidence of faculty and staff in the role played by the central administration itself.

The spirit of "rationalization" that may work quite well in some areas of corporate management could turn into a disaster if it pulls our best staff away from the academic units where the real innovation is driven by the interests of faculty and students working closely with outstanding staff with extraordinary skills. Similarly, to impose on the University's academic programs an enterprise-level of shared services unable to respond rapidly to the unique needs and technologies required for cutting-edge learning and discovery would cripple the University's leadership as a research university. The recent petition in which the majority of Michigan faculty opposed the efforts of the University administration to impose a shared services plan on academic units revealed the faculty concern about such corporate approaches, a reaction seen in other peer institutions.

The Importance of Communication in
Loosely-Coupled, Adaptive Ecosystems

This report has stressed the importance of Michigan's organizational culture as a loosely coupled, adaptive ecosystem that evolves and excels based on the extraordinary talents, dreams, and commitment of faculty, staff, and students. During my inauguration

Yesterday	Today
UM Values	Publically committed?
	Privately supported?
Excellence	State governed (lay, politically governed)
Leadership	Nationally supported
Critical Inquiry	Decentralized, distributed leadership
Liberal Learning	Misunderstood (from within, from without)
Diversity	Ponderous, risk adverse
Innovation	Distracted (lost in forest for the trees)
Excitement	Trapped in sinking state
Spirit	Large, larger, largest in the land
	Campus
Characteristics	Budget
	Michigan Stadium
Leaders and Best	Medical Center
Control of its destiny (constitutional autonomy)	Trajectories
Freedom and responsibility	UG up
Broad and Liberal Spirit	Out-of-state up
Critical inquiry and learning	Rich students up
Diverse in character, united in spirit	Research volume up
Uncommon education for the common man	Graduate education down
Critic and servant of society	Tenure-track faculty declining
Relish for innovation and excitement	Part-time faculty up
Pathfinder, Trailblazer, Pioneer	Priorities
	Academic programs benign neglect
	Quantity up
	Quality down
	Auxiliaries up
	Medical Center up
	Housing up
	Athletics way up
	Resources
	State ignored
	Federal leveraged
	Donors up (but inadequate)
	Investments stable

A summary of concerns expressed in faculty workshops held in 2011-2012.

address in 1988, I repeated what I had learned from my predecessors, particularly Harold Shapiro, Robben Fleming, Frank Rhodes, Billy Frye, and Chuck Vest, that the true secret of leading an academic institution is simple. "You recruit outstanding people. You provide them with the resources to achieve their dreams. And then you get out of their way!!!" We must never forget this basic principle, particularly when we select those for leadership roles. We must also take care that those joining our institution are not only educated about but also accepting the principles of the Michigan's historical character of decentralization to tap the great strength and energy of faculty, students, and staff engaged in academic activities.

But there are other important principles that must be present for the success of the Michigan approach. And perhaps none is more important that the availability of open, accurate, pervasive, and accessible information throughout the entire University. After all, a university is the ultimate knowledge organization, and any attempt to hide, distort, or manipulate information can seriously damage its most fundamental activities of discovery, learning, and engagement.

To be sure, such an open form of communications can be alien to those from backgrounds such as advertising, marketing, public relations, fund raising, and politics. Yet without complete access to accurate information, both good news and bad news, universities are seriously hindered. Any attempt to sequester information, replacing truth with fiction, or attempting to propagate myths or distortions to further a particular agenda should be challenged and revealed as damaging to the academic process. This is particularly important in these times when the role of the traditional media supporting investigative journalism and openness has been challenged by the pervasive character of electronic media and social networking.

Therefore it is with a sense of both frustration and

warning that we must recognize that the massive recent investment in communications, public relations, marketing, and branding effort (almost 600 staff strong) that has emerged at Michigan over the past decade to manipulate both internal and external opinions is both highly inappropriate and damaging to the long-standing traditions and quality of one of the world's great academic institutions. While such media manipulation is common in the world of commerce or politics, it has no place on this camp–or any university campus, for that matter. Both the leadership of the university and its governing board must accept their responsibility to restore truth and openness to Michigan before the most fundamental missions and values of this university are distorted and weakened.

The Vision Thing

It has been suggested throughout this document that the Michigan saga can best be described as a pathfinder and trailblazer. The University has been a leader, not a follower. It succeeds by launching new initiatives, by taking risks at scale to lead higher education and serve the state, the nation, and the world.

Looking back over the history of the University, one can clearly see this leadership role in the vision and priorities of each of its presidents. Yet such priorities are rarely stimulated or achieved through top-down initiatives. Rather they are harvested from the grassroots interests and inspiration of faculty and students.

To be sure, initiatives launched from on high in areas such as "sustainability", "entrepreneurship", "internationalization", and "interdisciplinary scholarship" get public relations visibility, but they are of a "same old, same old" variety and unlikely to provide leadership for the University. Contrast these with significant initiatives in the past such as creating the Institute for Social Research or launching NSFnet and the Internet or the Molecular Medicine program in the Medical School, which had a "change the world" character. Each of these involved placing very large bets on high-risk ventures involving our very best faculty where the University had established strength and leadership. They were clearly not "branding" efforts.

The Bottom Line

So what has been the trajectory of the University over the past 50 years? On the positive side, Michigan has managed to preserve most of its quality and its reputation even while losing over 80% of its state support. In fact, in the 1990s the National Academy ratings of academic quality ranked the University of Michigan 3rd in the nation (and world) behind only Stanford and the University of California Berkeley in the quality across the full spectrum of its graduate programs

This success in sustaining the quality of the University even during its severe loss in state support was due largely to efforts begun in the early 1980s that dramatically increased tuition, provided strong incentives to faculty members for attracting sponsored research grants, and moved to a more decentralized management system in which deans and directors were made responsible for both revenue generation and cost containment. The 1990s saw an aggressive effort to increase both private fundraising and endowment by a factor of ten, to the point where private support and endowment payout each surpassed state support in 2000 and 2010, respectively. Largely as a result of these actions, the University was able to achieve in 1997 the top AAa credit rating and maintain this rating through the past decade and a half.

But there remain serious concerns about the University's financial sustainability, since enrollments have now reached (or in some cases exceeded) instructional and facilities capacity. Nonresident tuition is approaching the ceiling experienced by the top private institutions, while instate tuition continues to be highly constrained by political factors. While endowment has continued to grow, endowment-per student is at only one-tenth the level of leading private institutions.

Equally serious is the fact that the University has failed to sustain its public purpose. While it achieved significant progress in racial diversity during the 1990s, minority enrollments have since fallen back to the low levels of the 1960s. Largely because of the growth in the enrollment of high income nonresident students coupled with the low level of state support (particularly in the absence of state-based financial aid programs), the University has lost much of its economic

diversity. Indeed, some even question whether the University's long-standing commitment to providing "an uncommon education for the common man" has now been replaced by efforts to attract and educate uncommonly rich students.

During the past half century, the auxiliary units (i.e., health system, student housing, and intercollegiate athletics) have thrived. UM's AAa rating coupled with inelastic consumer markets experienced by auxiliary activities has allowed a massive investment in new facilities (e.g., Frankel Cardiovascular Center, the Mott Childrens hospital, and many other new clinical care and research facilities for the medical center; an investment of over $650 million in renovating and building new student residence halls; and comparable investments in Michigan Stadium and other athletic facilities). Yet this massive growth in auxiliaries has also raised a concern about the balance between auxiliary and academic priorities.

Lingering Questions

During the past half century the University has continued to demonstrate significant pathfinding leadership, e.g., establishing the disciplines of quantitative social sciences, building and managing the Internet, pioneering the creation of large digital libraries (JSTOR and the HathiTrust) and becoming a leader in genetic medicine. The challenge today is how to sustain such pathfinding efforts in the century ahead.

From this brief review of the current status and the "gap analysis" of the University of Michigan, a number of more general questions have arisen that must be considered in developing a roadmap for achieving the visions we have suggested for the University's third century.

Question l: What is the fundamental role of the university in modern society? What are its core values to society? If the issue is to get back to fundamentals, to reorganize the institution according to our basic values, then how and where do we begin?

Question 2: How does one preserve the public character of an increasingly privately financed university? How does a "state-related" or "hybrid state-national-global" university adequately represent the varied interests of its majority shareholders (e.g., students, parents, patients, federal agencies, private donors)? Can one sustain an institution the size and breadth of the University of Michigan on self-generated revenues (e.g., tuition, federal grants and contracts, private gifts, auxiliary revenues) alone?

Question 3: Should our balance of missions shift among teaching, research, and service? Among undergraduate, graduate, and professional education? Among service to state, nation, and world?

Question 4: What is the proper balance between disciplinary and interdisciplinary activity? How can we encourage more people to work in truly innovative areas without unduly jeopardizing their academic careers? How can we stimulate a greater risk-taking intellectual culture in which people are encouraged to take bold initiatives?

Question 5: We have an unparalleled opportunity to shape the academy for the future through this generation of graduate students. How should we meet this responsibility? Is the Ph.D. degree the appropriate training for the broadly educated, change-tolerant faculty needed by today's universities?

Question 6: As Michigan enters its third century, it will be facing a major number of faculty retirements, thereby providing the opportunity to attract bright young faculty to the University. How should we select new faculty for brilliance and creativity? How do we assess and enhance teaching ability? How do we evaluate and reward service activities? Indeed, what is the appropriate form of service in the research university?

Question 7: How do we enable the University to respond and flourish during a period of very rapid change? How do we best protect the University's capacity to control its own destiny?

Provocative questions, indeed. And both challenging and appropriate for today if we are to prepare for tomorrow.

Appendix to Chapter 7
A Summary of the UM Gap Analysis

UM Appears to be doing just fine…

UM appears to be enjoying a period of relative peace, prosperity, and growth.

Lots of new buildings North Quad, Law School, Ross School, Munger Hall, Pediatrics Hospital, Athletics

Completed a $3.2 B campaign and in the midst of a $4 B effort

Leading the nation with $1.32 B in research funding

New revenue plus cost control plus AAa ratings

(Not all good news: lost to Ohio State 12 out of last 14 games and Michigan State 6 out of last 7 games…)

But is UM whistling through graveyard?

Unsustainability of its traditional sources of financial support

Increasing competition for the best students and faculty

Mission creep in auxiliaries that dilutes the priority given to the academic core of the university

Are we ignoring serious issues and concerns that could threaten our most fundamental goals of quality, public purpose, leadership, and even our institutional saga as a pathfinder for American higher education?

Cracks are beginning to appear in our façade of confidence.

Threats to student quality

Common Application Online process creates a false sense of student demand

Student selectivity: Instate: 60%; Outstate: 40%

Student yield: Instate: 70%; Outstate: 25%

It is clear that Michigan is still a "safety" school for out-of-state students.

Many out-of-state students come from very affluent families and are "paying for the party" rather than a rigorous education

Sharp drop in low-income and underrepresented minority students

Threats to faculty quality

Heavy instructional loads and weaker salaries have caused both attrition and hiring problems.

Michigan is winning only 50% of the battles to keep key faculty from being raided

Losses over past 7 years: 55 to Harvard, 54 to UCBerkeley, 46 to Stanford, 46 to Chicago, 37 to UTexas, 25 to Columbia…AND 23 to Ohio State!

Of particular concern is the loss of over 600 junior faculty over the past 11 years, many just after achieving tenure at Michigan.

Threats to public purpose

Founded to provide "an uncommon education for the common man", many flagship universities have drifted away from their historic mission (Haycock's *Engines of Inequality*)

Pell Grant percentage: 11% (22% pub U average)

First generation college students: 6% (down from 14%)

Underrepresented minorities: 10.1% (pub U 14% average)

African American enrollments: 4.3% (down from 9.4% in 1996)

Problems of scale

Enrollments are up 10,000 students (25%) over the past two decades!

Good news: tuition revenue up by $400 M/y, roughly comparable to state support.

Bad News: so are teaching loads, student misbehavior, and student high-rise slums (e.g., wealthy students "Paying for the Party")

Fund raising is up! Well…kind of…since annual giving, campaign yields, and endowment are really just extrapolations of activity during the 1990s, but with five times the number of staff (550 in central development alone)

UM is also being pressured to accept and partially fund projects of low priority, e.g., Munger Hall, "The Walk of Champions", the "flower pot" Bus Ad design…

And the deans and chairs are now formced to spend much of their time on the road begging for dollars rather than providing academic leadership

Research is up!

Michigan is still the leader in research dollars.

However we are also the leaders in how much we are spending from institutional funds (e.g., $380 M out of $1.32 B, or 30% of our research activity, compared to 20% for most universities).

Note that much of this subsidy comes from student

tuition and patient fees.

Other problems with scale

Increasing concerns that we may not have the management talent to handle such a gigantic enterprise… (e.g., shared services, IT rationalization…)

We may also not understand the risk of launching larger and larger projects (e.g., Mott Pediatrics Hospital ($750 M) , Michigan Wolverines, Inc. ($152 M/y),

Remember, we have a dramatic nearby example of the dangers of scale: General Motors and Chrysler…

Past decade of campus evolution

New academic buildings: Weill Hall, Ross Hall, Law School, LS&A Science Building.

New or renovated auxiliary buildings: Pediatrics Hospital, Cardiovascular Hospital, Hill Dorms, North Quad, East Quad, South Quad, West Quad, Munger Hall, Michigan Stadium, Crisler Arena, …

NOTE: Most capital expansion has been in auxiliaries (hospitals, housing, athletics). Relatively little has been invested in academic facilities.

Culture

What has happened to Michigan's "public" nature, its "uncommon education for the common man"?

The University has been selling itself to the highest bidder:

Students who can afford $60,000 per year…

Spectators who can pay on the average $230 per game to sit in Michigan Stadium, and students who can afford $50 per game

Donors who can buy almost anything they desire (including a mammoth dormitory with 7-student "suites", few windows, and no parking)

And perhaps a reputation that took two centuries to build!

A summary of the past two decades

Collapse of state with little change of near-term recovery

Unconstrained UM growth threatening academic mission

Driven by auxiliary activities and whims

Inability to focus on academic priorities

Possible erosion of quality and public purpose

Managing and reacting rather than visioning and leading

The University of Michigan Today

Publicly committed, yet privately supported

State governed, yet nationally supported

Priorities: UG up, Grad down; sponsored research up (albeit with University subsidy way up)

Academic reputation (and faculty quality) up? down?

Big, bigger, biggest: budget, campus, stadium

Leadership: decentralized, reactive or strategic

Who is shaping UM's future? Regents? EOs? Donors? Faculty?

Is UM climbing, cruising in level flight, or on a downward glide path?

Major faculty concerns 1

Lack of priority for academic core

Imbalance in priorities (academics vs. auxiliaries)

Erosion of quality (preoccupation with growth, mission creep)

UM's public purpose in jeopardy

"Common man" has been replaced by "uncommonly rich man"

Diversity is dropping rapidly

Unsustainable financial models

Trapped in a sinking state (for at least a generation)

Major faculty concerns 2

Campus culture: complacent, detached, malaise?

Where is the excitement? The creativity? The innovation?

Where is the vision? The strategy? The strategic intent?

Are we drifting away from our heritage?

Uncommon education for the common man?

Leaders and best?

Broad and liberal spirit?

Pathfinder and trailblazer?

UM's ability to change the world?

Vulnerabilities

Financial sustainability
- Out-of-state tuition is approaching a ceiling (e.g., at Ivy League levels); instate tuition is still limited by Regents
- States continue to be under pressure for health care, corrections, retirement, and tax relief
- Federal research support has been eroding (and the costs of research increasing)
- Endowments track with equity markets…up AND down
- Competition for gifts is becoming more aggressive
- Health care revenues will be affected by Obamacare

Intensifying competitive forces
- An intensely Darwinian winner-take-all ecosystem in which the strongest and wealthiest institutions become predators, raiding the best faculty and students of the less generously supported and more constrained public universities and manipulating federal research and financial policies to sustain a system in which the rich get richer and the poor get devoured.
- Over the next decade, Harvard's endowment will grow to almost $100 B, while Stanford's' will grow to $50 B. (Michigan's will be at $20 B)

Cultural changes with scale
- UM or MSU, OSU, UT,…
- Auxiliaries increasingly dominate academics
- Management increasingly dominates faculty
- Leadership (EOs, Deans, Chairs) increasingly distracted by fund-raising
- Technology increasingly dominates campuses (MOOCs, connected learning, cognitive tutors, fiber to the forehead)
- Intercollegiate athletics increasing dominates both university values and academic integrity (as well as common sense…)

Public Purpose
- The current size, financial model, leadership, and governance of the University is incompatible with its public purpose.
- Without the restoration of some level of public support and the commitment of governance and leadership, there is simply no way that the University can achieve an acceptable level of participation by low-income and underrepresented minority students.
- We will become increasingly a university for the rich…

Academic priorities
- The past decade has seen an increasing dominance by auxiliary activities over academic programs, driven both by the revenues available to these enterprises and by exceptionally aggressive leadership.
- The voice of the faculty has been weak, particularly at the level of faculty governance.
- The concept of a dean-driven institution has largely been weakened by both inadequate authority and the distraction of deans by fund-raising demands.

Disconnection with UM's saga
- From time to time the University of Michigan has become disconnected from its history as "leader and best", a pathfinder for higher education.
- During the 1960s, activism and protest destroyed much of the awareness, leading to a "lost decade" of the 1970s, when little of note happened, other than keeping the campus stable.
- Fortunately, the Shapiro administration was populated with long-time Michigan faculty and staff who not only understood the importance of Michigan's historical roles but were determined to restore it.
- The Duderstadt administration strengthened this effort; the Bollinger administration ignored it.

This could happen again!
- Beginning with the Bollinger effort to replace much of the University leadership team (EOs, Deans, key administrators), and continuing throughout the past decade with the recruiting of an increasing number of outsiders into key university positions, the University is threatened once again the loss of connection to its history.
- In a very real sense, this could well become another lost decade, as we abandon our heritage as both a pathfinder and leader.

University of Michigan SWOT Analysis

As a final consideration, we have reassembled the various challenges, responsibilities, and opportunities facing the University of Michigan today into a traditional Strengths, Weaknesses, Opportunities, and Threats.

Strengths
Quality
Intellectual breadth and comprehensiveness
Scale
Spirit
Risk-tolerance
Loosely coupled, adaptive, entrepreneurial system
Constitutional autonomy
Decentralization
Pathfinder saga

Weaknesses
Public support
Public governance
Faculty governance (U wide)
Obsolete (unsustainable) financial models
Obsolete public policies (state, federal)
Mission creep
Unconstrained growth of auxiliaries threatening
    academic priorities
Erosion of
    Public Purpose ("common man")
    Public Character (enrollment, athletics, etc.)
    Community activities
    Student activism
    Academic effort, "paying for the party"
    Racial diversity
    First generation college students
Inadequate capacity for strategic change and
    transformation

Opportunities
Need for UM's leadership as pathfinder
Rebalance competition and cooperation
Redefine core mission
Explore new paradigms
Leadership in key areas of vision
        Open Learning

Connectivity
Open Knowledge
Renaissance Campus

Threats
Warning Signs
    Quality
    Erosion of public purpose
    Unbridled (non-strategic) growth
    Financial challenges
    Priorities
        Cloud > core
        Auxiliary > academic;
    Campus evolution
Trapped in a sinking state next to a struggling city
Political hostility, intrusion, manipulation
Public perception
Aggressiveness of auxiliaries (particularly
        Athletics, UMMC, Housing)
Loss of influence of deans
Opportunistic rather than strategic growth
Disruptive technologies
Public/political awareness
Taken over by PR and marketing; promoting
        myth over reality

What does the SWOT analysis suggest?
Smaller but better?
Restructuring governance, management, leadership
Moving to a federalist model
        Regents --> senate
        Faculty --> house
        EOs --> executive branch
        Deans --> governors
Note: This would require a new constitution!

A summary of the past two decades
Collapse of state with little change of near-term
    recovery
Unconstrained UM growth threatening
    academic mission
Driven by auxiliary activities and whims
Inability to focus on academic priorities
Possible erosion of quality and public purpose
Managing and reacting rather than visioning
    and leading

Chapter 8

A Roadmap for Michigan's Third Century

We now turn to the development of a *strategic roadmap* for the University of Michigan as it approaches its third century. This is designed as an evolving framework of actions aimed to guide the University through its vision trilogy of *Reflection, Renaissance, and Enlightenment*.

Earlier chapters in this report have provided the foundation for this effort, scanning the environment in which the University now finds itself, assessing our current assets and challenges, and proposing a vision for our future, based upon our values, characteristics, and opportunities. In this chapter we begin by suggesting a framework for the recommendations that will comprise the University's roadmap for the third century, drawing from the experience of earlier strategic planning efforts both at Michigan and other venues. Key in this framework effort is the establishment of goals involving the most critical assets of the university: people, resources, culture, and the capacity for change. These will shape the subsequent recommendations of the roadmap.

The roadmap itself will be structured into three time-frames or "event horizons" associated with each element of the vision proposed in Chapter 6: *Reflection*, (to be accomplished by 2020); *Renaissance*, (launched over the next several years but guiding the University as it moves into its third century; and *Enlightenment* phase, launched over the next decade and lasting well into the University's third century.

Clearly, the various phases of the roadmap associated with the trilogy of visions are interdependent. In the sense one might think of the roadmap as a path through a series of mountain ranges. Until one successfully climbs the first range, it is impossible to see far enough to set the course for climbing the next. Hence in the next chapter, we will also suggest a series of plans, processes, and tactics for keeping the roadmap effort on track as we move from one range to the next.

Always Begin with the Basics

So how to begin? How does one grapple with the many issues and concerns swirling about higher education in general, and the University of Michigan in particular, to chart a course toward the visions for its third century? Let us suggest the following framework drawn from experience in higher education and other contexts.

It is critical to first determine those key roles and values of the institution that must be protected and preserved in the years ahead. This begins with engaging the university community at all levels–particularly those faculty, students, and staff engaged in the academic enterprise–in an ongoing discussion of these guiding principles. One might begin with the canonical roles of the research university, namely education of the young, preservation of culture, basic research and scholarship, serving as a critic of society, and so forth. The starting point for a discussion of fundamental values could also be drawn from the academy, e.g., academic freedom, a rational spirit of inquiry, a community of scholars, a commitment to excellence, and shared governance.

The next phase would be to identify actions to help the University better understand and respond to the changing needs of the society we serve rather than defending and perpetuating an obsolete past. Key here is listening carefully to our stakeholders and patrons to learn and understand their changing needs, expectations, and perceptions of higher education, along with the forces driving change.

Since roadmapping is very much an exercise in institutional change, it is important to prepare the academy for change and competition, e.g., by removing unnecessary constraints, linking accountability with privilege, redefining tenure as the protection of academic freedom rather than lifetime employment

security, etc. This includes developing a tolerance for strong leadership at all levels and instituting the best practices of governance, leadership, and management.

When the road ahead becomes uncertain, experimentation becomes an important element of the planning framework. The university should strongly encourage experimentation with new paradigms of learning, research, and service, harvesting the best ideas from within the academy (or elsewhere), implementing them on a sufficient scale to assess their impact, and disseminating their results.

Finally, in today's hyper connected world, universities must place a far greater emphasis on building alliances with other institutions that will allow them to focus on core competencies while relying on alliances to address the broader and diverse needs of society. Here, alliances should be encouraged not only among institutions of higher education (e.g., consortia of peer institutions such as the CIC or AAU universities, partnering research universities with liberal arts colleges and community colleges, and developing relationships with universities abroad) but also between higher education and the private sector (e.g., information technology and knowledge services companies). Differentiation among institutions should be encouraged as an important objective.

The Fundamental Goals

We propose several simply stated goals to provide a foundation for the roadmap that will guide the University toward the vision for its third century:

Goal 1: People

To attract, retain, support, and empower exceptional students, faculty, and staff.

Goal 2: Resources

To provide these people with the resources and environment necessary to push to the limits of their abilities and their dreams.

Goal 3: Culture

To support a University culture and spirit that values adventure, creativity, excitement, risk-taking, leadership, excellence, diversity, caring, concern, and community.

Goal 4: The Capacity for Change

To develop the flexibility, the ability to focus resources necessary to serve a changing society and a changing world.

Of course these have long been key to the success of the academy and the university. But in a world of ever more rapid change, we may need to rethink both how we provide the encouragement and support for faculty and students to achieve these goals in new ways. For example, throughout its history, Michigan's role as a pathfinder has been driven by the unusual creativity and aspirations of its faculty, students, and staf. Its long tradition of developing and selecting leadership from within reinforces this culture of risk taking and taking on big challenges.

To sustain this pathfinding role, the University needs to acquire adequate resources, a challenge at a time when public support is dwindling. Yet this goal also suggests the need to focus resources on the University's not just on the best scholars and teachers but also on those with unusually creative activities. Michigan will need to acquire greater flexibility in resource allocation to respond to new opportunities and initiatives.

While most people and institutions would agree with the values set out in the third goal of cultural change, many would not have assigned such a high priority to building an environment that encourages adventure, excitement, and risk-taking. However, if the University is to sustain its saga as a pathfinder and trailblazer in defining the nature of higher education in the century ahead, this type of culture will be essential. And this, of course, is just the environment that many of our faculty and students not only seek but came to Michigan to enjoy!

Developing the capacity for change, while an obvious goal, will also be both challenging and controversial. We need to discard the status quo as a

viable option, challenge existing premises, policies, and mindsets, and empower our best people to drive the evolution—or revolution—of the University.

This capacity for change, for renewal, is the key objective that we must strive to achieve in the years ahead—a capacity that will allow us to transform ourselves once again as the university has done many times in the past, to become an institution capable of serving a changing society and a changing world. Such institutional transformation has become commonplace in other sectors of our society. We frequently hear about companies "restructuring" themselves to respond to rapidly changing markets. Government is also challenged to transform itself to be more responsive and accountable to the society that supports it. Yet transformation for the university is necessarily more challenging, since our various missions and our diverse array of constituencies give us a complexity far beyond that encountered in business or government. It must be approached strategically rather than reactively, with a deep understanding of the role and character of our institutions, their important traditions and values from the past, and a clear and compelling vision for their future.

The Roadmap to *Reflection*

For the near term, from <u>now</u> until the Bicentennial Year 2017, our vision of *Reflection* suggests the University of Michigan should focus on understanding, assessing, and embracing those values and characteristics that have played such an important role throughout its history:

> Academic quality
> Academic priority
> Diversity
> Public Purpose
> Spirit
> Leadership:
> The Michigan Saga as pathfinder and trailblazer

Renewing our effort (or restoring our commitment if necessary) to achieve these characteristics seems obvious, particularly as we prepare for the University's Bicentennial by reviewing its history and honoring its

Reflecting upon the Michigan saga

heritage and saga. Yet it is nevertheless this near term vision that the University should set out as today's most important challenge. We suggest the following elements of a roadmap to achieve this near term vision:

Celebrating the University's Bicentennial in 2017: We should continue to gather resources that capture the University of Michigan's remarkable history; make these materials available to scholars, the University community, and the public more broadly; and use this history archive to more firmly establish the key elements of the University's significance to both those on the campus (students, faculty, staff) and beyond.

Here it is important to give highest priority to viewing the UM Bicentennial as an opportunity to understand, honor, and build upon the University's history as an academic institution, similar to the historical celebrations mounted by other distinguished institutions such as Harvard, Yale, MIT, and Cambridge. For example, Harvard used its 1936 tercentennial to redefine the purpose of a liberal education; Yale's celebration, at the time of the 9-11 attack, stressed the impact of Yale on the security of the nation; MIT's centennial helped to stimulate and shape federal research policy; while Cambridge's 800th anniversary was a celebration of the extraordinary impact of the university to the development of western civilization.

To this end, the University should develop a bold plan for a series of events and activities during the 2017 Bicentennial Year to enable the University to lead major discussions on the future of the public

university in America and the world more broadly, thereby re-establishing the visibility of the University's role as a pathfinder and trailblazer in American higher education. Possible themes might be:

- What is a public university in the knowledge-driven global society of the 21st century? What is its public purpose? Whom does it serve? Who are its stakeholders and patrons?
- What are the role and responsibility of the flagship state university in a world characterized by increasing connectivity and mobility of people and knowledge?
- What is the appropriate balance in the University among undergraduate, graduate, and professional education in a comprehensive research university, and how should these be interrelated?

Here a caution is appropriate: While such milestones such as a bicentennial also present an opportunity for other agendas such as fund-raising or marketing the institution, it would be tragic if these ancillary activities were to overwhelm a more substantive celebration of the true academic character of the University and a consideration of its future.

Better Engagement of Faculty in University History Projects: It is very important to provide strong encouragement to senior faculty to participate in University history activities, since many have very important and unique perspectives through their own experiences. To this end:

- Faculty History and Tradition Committees should be created in each school or college.
- The efforts of senior and emeritus faculty to share their own contributions to the history of the University should be strongly encouraged. In particular, funds should be created at both the University and school or college level to provide subventions for such faculty history projects (books, archives, etc.)
- The University of Michigan Press should consider creating a special series of historical publications by Michigan faculty (similar to those at several leading private universities).

Restoring a Sense of Public Purpose: The University has drifted too far from its early public purpose of providing "an uncommon education for the common man". In fairness, much of this has been a consequence of eroding state support that has forced the University to develop alternative revenue streams, e.g., increasing the enrollments of out-of-state students paying higher tuition, promoting "premium" services for those activities with strong market appeal (e.g., college athletics, student housing, parking). But these decisions have had a significant impact on the University's "public" character, as the fraction of the student body from low-income backgrounds has declined and community participation in activities such as Michigan athletics, cultural productions has become increasingly rarefied with increasing ticket prices.

As it has throughout its history, the Michigan needs to acknowledge its public character and be attentive to the needs of the society it serves. New financial paradigms will be necessary to enable the University to achieve a student socioeconomic balance that better reflects society. It is also clear that the University needs to take a more strategic approach toward public service and engagement. In the years ahead, the institution will be called upon to provide a broad array of public services consistent with our public mission. Developing the capacity to assess such opportunities and responsibilities and then to make rational decisions about which to accept is crucial. We need to develop the capacity to say "no" when a societal request does not align well with our academic mission or could better be performed by other institutions.

Strengthening the University's Commitment to Diversity: The University needs to reaffirm and broaden its commitment to creating a institution characterized by great diversity. As with biological organisms or ecosystems, the diversity of the University may well be the key characteristic that will allow it to flourish in a rapidly changing environment. Diversity goes far beyond racial and ethnic representation to include almost every aspect of the human condition: race, gender, nationality, economic circumstances, and beliefs. The challenge is to build an institution in which people of different backgrounds, ethnicities, cultures, and beliefs come together in a spirit of respect and

Recommitting Michigan to Diversity

Recapturing the Michigan Spirit

tolerance for these differences while working together to learn and to serve society.

During the 1990s the University made great progress in achieving diversity through major strategic efforts such as the Michigan Mandate, the Michigan Agenda for Women, and other initiatives aimed at responding to the increasing diversity of our society. Yet today, much of this progress has been lost. Undergraduate enrollments of underrepresented minorities have dropped to half their previous levels. Several of the University's professional schools (notably Law, Business, and Medicine) have experienced ever more dramatic declines in minority enrollments. While external factors such as Michigan's constitutional referendum opposing affirmative action (Proposition 2), the decline of state support, and the shift of state financial aid programs from need-based to merit-based have played roles, there is a growing concern that the decline of campus diversity has also been the result of an erosion of institutional commitment to diversity. The University should strive to renew its commitment and develop and implement new strategies to restore a sense of progress.

Building a Sense of Pride in, Respect for, Excitement about, and Loyalty to the University: The increasing specialization of the academic and professional disciplines, the University's long tradition of decentralization, and the increasing mobility of faculty, students, and staff can sometimes erode personal commitment to general institutional goals and the

values of a learning community. All too frequently, faculty, students, and staff focus primarily on personal or professional goals rather than on the welfare of the University. It is important to seek opportunities to engage the University community in both discussions of and active participation in determining the future of the institution. Beyond this, we need to develop a sophisticated and strategic internal communications effort to give members of the University a better understanding of the challenges, opportunities, and responsibilities facing the University rather than simply marketing the party line.

Re-igniting the Michigan "broad and liberal" spirit: Every effort should be made to rekindle the activist spirit that has long animated Michigan students, faculty, and staff, leading them to both identify with key issues facing our society and challenging the establishment to address these. While sometimes disruptive for the institution (and the community), this should be regarded as an appropriate and important element of the University's role as both servant and critic of society. Such activism should not only be tolerated but encouraged both as an element of the learning environment and an important responsibility of the University. Today's issues such as global sustainability, social justice, wealth inequity, and generational responsibility provide compelling opportunities for such activist engagement.

Reaffirming the Michigan Saga as a Pathfinder and Trailblazer: As we have stressed, the perception of Michigan as a trailblazer appears again and again

throughout its history, as the university explored possible paths into new territory and blazed a trail for others to follow. At times, it has also been a pioneer, building the roads that others can follow. Whether in academic innovation, social responsiveness, or its willingness to challenge the status quo, Michigan's history reveals this trailblazing character. During an era of profound and rapid change, it is more important than ever that the University recapture this saga as a pathfinder.

This character of pathfinding has always been driven from the grassroots by the energy, creativity, and commitment of our faculty, students, and staff. Hence we must avoid attempting to dictate directions or major initiatives from on high and instead seek to identify and support them at the level of our academic programs where the real excitement occurs.

The *Renaissance* Roadmap

As we have noted throughout this report, the world is changing rapidly, driven by the role played by educated people, new knowledge, innovation, and entrepreneurial zeal. These characteristics are driving profound changes in our world and its social institutions. They also contain the elements of what could be a renaissance in the 21st century. Since universities will play such a critical role as the source of these assets of the age of knowledge, our vision for the early 21st century involves stressing the following characteristics among our people and our programs:

    Creativity
    Innovation
    Ingenuity and Invention
    Entrepreneurial Zeal
    Risk-taking
    Tolerance of Failure as a Learning Experience

    People

The first and most important goal of the roadmap for the Renaissance time frame is to attract and sustain exceptional students, faculty, and staff:

Recruit Outstanding Students: The University should place greater emphasis on identifying and attracting students of truly exceptional ability and creativity. This effort may require special scholarship or fellowship programs (such as the Morehead Scholars at the University of North Carolina) to augment existing need-based programs. It might also involve extending the dual admission practice (which our Medical School used to provide through its Inteflex programs) to other professional and graduate programs to attract outstanding undergraduate students. We need to reduce the disciplinary barriers between various graduate and professional programs to attract the very best graduate students.

Recruit Paradigm-Breaking Faculty: We should allocate more resources toward the recruitment and development of truly exceptional faculty through a University-wide effort. Although endowed chairs are important, this recruiting of paradigm-breaking faculty might be better served through the introduction of institution-wide appointments as University Professorships reporting directly to the Provost similar to those at leading institutions such as the University of California (University Professors) and MIT (Institute Professors) since much of the creative teaching and research will occur across disciplinary lines (convergence).

Strengthen the Emphasis on Human Resource Development: The University should continue efforts to give high priority to human resource development throughout all areas of the institution. It is important that we sustain the University's commitment to education, training, and career planning for both staff and faculty.

    Intellectual

Enabling Intellectual Change: The University needs to take steps to assist its students and faculty in responding to the extraordinary pace of intellectual change in which new missions are added to the traditional university role of *lux et veritas*, e.g., learning and scholarship. As our society increasingly values creativity and innovation, the university will be called

Reflection--> To Know

Renaissance --> To Do, To Create

Enlightenment --> To Become

Learning Objectives of the Vision Themes

upon to augment its traditional emphasis on "learning to know" with "learning to do", "learning to create", and "learning to become". Of course these latter skills have always been valued by studio- or laboratory-based disciplines such as engineering, architecture, and the arts ("doing" and "creating") and the professional disciplines ("becoming"). In fact, much of the campus infrastructure has evolved to support "doing" and "creating" (e.g., the North Campus) and "becoming" (e.g., the Medical Center). 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 to ALL of its students. This would probably imply a shift away from highly specialized disciplines and degree programs to programs placing more emphasis on integrating knowledge.

Lowering Disciplinary Boundaries: Beyond the changing needs of a knowledge-driven society, the activities of the disciplines are rapidly converging as their boundaries become more diffuse. Biomedical advances depend increasingly on the physical sciences (atomic, molecular, and even nuclear physics) and engineering (complex systems analysis). Similarly, professional practice is changing rapidly (e.g., medical practice evolving more toward the team-based system approaches of engineering, engineering requiring the perspective of the social sciences, etc.). Key will be efforts to break down the constraints posed by disciplinary organizations, e.g., academic units such as departments, schools, and colleges, and academic degree programs at the undergraduate, graduate, and professional level. To allow faculty and students to teach, study, and learn where the need and interest are highest, we need greater flexibility. In this regard,

Michigan should encourage more flexibility that spans disciplinary boundaries (e.g., centers and institutes), and university faculty appointments that could span multiple disciplines. More effort also needs to be made to coordinate faculty appointments, academic programs, research activities, and resource allocation among academic units.

"T" Graduates: An increasingly complex and rapidly changing world requires what some call "T" graduates, capable of both depth in a particular discipline as well as intellectual breadth to provide perspective. This counters the current educational philosophies adopted by many academic programs, particularly in more applied areas such as engineering, business administration, and allied health professions, where a growing disciplinary knowledge base has largely pushed aside the "liberal education" component of an undergraduate education that is particularly important for creativity and innovation. These programs must heed the wisdom that "the purpose of an undergraduate education is not to prepare a student for their first job but rather prepare them for the last job" and restore the philosophy of a liberal education to their curriculum to produce "T" graduates.

Restructuring the Ph.D.: While the Ph.D. degree continues to be superb preparation for a research or academic career, it has become clear that most Ph.D. students will continue on to nonacademic careers in the public or private sectors. Recent national reports have challenged the excessive specialization, attrition rate, and time-to-degree characterizing today's Ph.D. programs. (Holliday, 2012) The university should provide leadership in examining and perhaps restructuring its Ph.D. programs to better serve the students enrolling in them and the society they will serve. A similar assessment and restructuring of the postdoctoral experience is also urgently needed, and the University should provide leadership for such an effort.

Transformative Research: The University should give more priority in both student and faculty recruiting and resource allocation to areas with the potential for truly transformative research, i.e., breaking the current

The North Campus contains the University's disciplines based on creativity.

knowledge paradigms. This will require both the development of flexible funding to stimulate high-risk research, as well as organizational structures similar to the "advanced research project agencies" (e.g., DARPA, ARPA-E, ED-ARPA) now appearing in several federal research agencies.

Translational Research: In a similar sense, the University should also build organizations and programs capable of translational research, i.e., linking fundamental scientific discovery with the use-inspired technological innovation to serve society. The recently acquired Pfizer Global Research Center (the North Campus Research Center) provides an ideal site for the translational research sought by federal sponsors through new programs such as regional innovation hubs.

Strategic Alliances: Over a longer time frame, the higher education enterprise in America will clearly undergo significant restructuring. Anticipating this, the University of Michigan should give high priority to forming and sustaining strategic alliances with regional institutions (e.g., the CIC universities), national institutions (e.g., the AAU), and international institutions (e.g., Europe and Asia). We also should establish alliances with other knowledge-based institutions in the public and private sector (e.g., software and entertainment companies or national laboratories and institutes.)

Culture

Stimulate a Sense of Adventure, Excitement, and Risk-taking: During a period of rapid change, the University's capacity to try new things, to be adventurous and experimental, has become increasingly important. The unusual size, comprehensiveness, and quality of the institution provide us with an unusual capacity for such risk-taking. Michigan's culture at times can become quite conservative and adverse to risk, particularly during times of financial stress or pre-occupation with growth. Hence, an early objective should be to create a more fault-tolerant community, in which risk-taking is encouraged, failure is anticipated and tolerated, and creativity and innovation are prized.

Next-Generation Leadership: Throughout the University, the selection and appointment of leaders who have bold visions, energy, and a sense of adventure is key to preparing for the future. Simply selecting leaders to maintain the status quo is dangerous for an institution such as Michigan, particularly during an era of rapid change. The University needs to build a leadership team that is committed to the necessary transformations in the University and that relishes the role of leading during a time of challenge and change.

Possible Pathfinding Initiatives
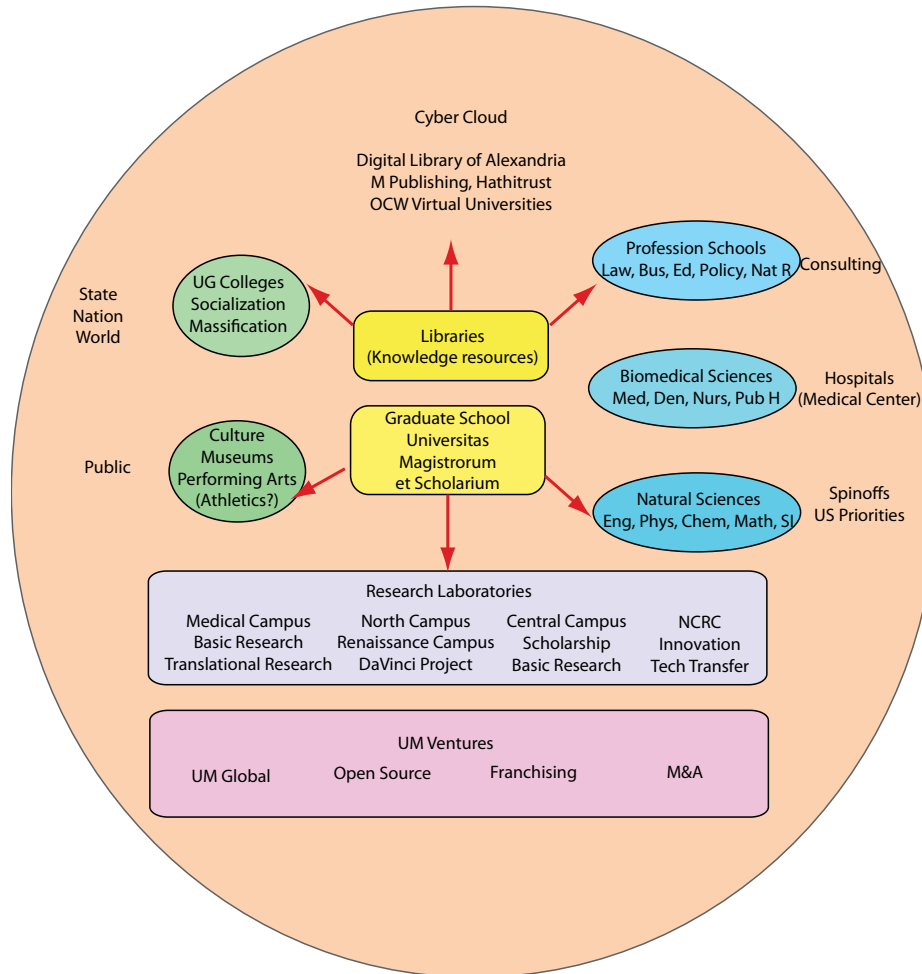
The Renaissance Campus

A University College: The University should consider developing a more coherent academic program for all undergraduates, reducing the amount of specialization offered in degree programs, and striving to provide instead a more general liberal learning experience. It should expand experiments in pedagogical alternatives to classroom learning, including collective learning experiences based on studio or laboratory paradigms, greater use of social networking (e.g., wikis and MOOCs), immersive environments such as those characterizing the gaming world (e.g., World of Warcraft, Minecraft), as well as more advanced learning technologies such as AI-based cognitive tutors and learning analytics.

The presence of an unusually broad array of professional schools is one of the great strengths of the University and clearly one of the major factors in attracting outstanding undergraduates. We need to develop closer linkages between undergraduate education and the faculty of these schools, so that students could have the opportunity to explore and choose among various careers. Indeed, many professional-school faculty members seek more direct interaction with undergraduate students.

Yet here one of the great strengths of the University in pursuing a vision of creativity is its deep commitment to the liberal arts. Ironically, perhaps Steve Jobs of Apple stated this best: "It is in Apple's DNA that technology alone is not enough. It is technology married with the liberal arts, with the humanities, that yields us a result that makes our heart sing in our devices. The reason why Apple is able to create products like the iPad is because we always try to be at the intersection of technology and the liberal arts, to get the best of both!"

The Renaissance Campus: Largely due to historical accident, the University has located on its North Campus an unusual concentration of academic programs characterized by the common intellectual activities of creativity and innovation (e.g., art, architecture, music, theatrical arts, engineering, information technology, and design), along with very unusual commons facilities to bring together students and faculty from these disparate disciplines. This colocation of the University's creative disciplines provides the University with the opportunity to address the rapid convergence of their intellectual activities, e.g. linking the creativity of the arts with the technological innovation of engineering and architecture. It also positions the University to respond to the increasing importance attached to innovation in our society. Indeed, one might even think

The academic "core" in a cyberspace "cloud".

of the North Campus, its academic programs, faculties, and students, as the "Renaissance Campus" of the University (a designation once suggested by the North Campus deans).

Beyond the location of the various schools and colleges of the University most deeply engaged in the intellectual activity of creativity, the North Campus also has unique common spaces such as the Duderstadt Center and Walgreen center, facilities supporting highly interdisciplinary academic programs stressing creative activities such as design and performance.

The "New" University: Experience has revealed the difficulty of approaching university transformation by changing existing programs and activities. While such a direct approach may suffice for incremental changes at the margin, an effort to achieve more dramatic change usually creates so much resistance that little progress is possible. It is sometimes easier to take a "green-field" approach by building separately a model of the new paradigm, developing the necessary experience with it, and, then, propagating successful elements of the model to modify or, perhaps, replace existing programs.

One possible approach to major university transformation taken in earlier and more affluent times was to build a separate campus. The efforts of the University of California in the 1960s to explore academic colleges built around research themes at UC-San Diego and residential learning at UC-Santa Cruz are examples of this approach. However, today's resource-limited environment make it difficult to justify such separate new campuses to explore new educational paradigms–not to mention finding sites comparable to the bluffs overlooking the Pacific. But there is a more important

reason to consider an alternative approach: we believe that it is far more effective to develop and explore such new paradigms of the university directly, within an existing university community, since this more quickly propagates successful efforts to the host institution.

To this end, the University might consider creating a "New University" within its existing organization to provide an environment in which creative students and faculty could join with colleagues from beyond the campus to develop and test new paradigms of the university. In some ways, the New University would be a laboratory where the fundamental missions of the university—teaching, research, service, extension—could be redeveloped and tested. But it would also be aimed at developing a new culture, a new spirit of excitement and adventure that would propagate to the university at large. In such an academic enterprise, the University would hope to build a risk-tolerant culture in which students and faculty were strongly encouraged to "go for it," in which failure is accepted as part of the learning process, and is associated with ambitious goals rather than poor performance.

The New University could have both a physical and a virtual presence. In terms of structure, the New University might be organized with convergent themes among the disciplines. Furthermore, while it could offer academic degrees, such programs would stress stronger linkages among undergraduate, graduate, professional, and lifetime education programs than those offered by the traditional university. The New University could strive to more effectively integrate the various activities of the University by engaging its students in an array of teaching, research, service, and extension activities. The New University would almost certainly involve an array of outreach activities, e.g., linking alumni to the on-campus activities of the University or providing richer and more meaningful international experiences for students.

While the New University would enroll a significant number of students, it would not have a large cohort of permanent faculty or staff. Rather, it would draw faculty members from across the University and around the world who would become associated with the New University for specific programs. This would allow it far greater flexibility, since it could avoid the constraints posed by faculty appointments and tenure.

The success of the New University would depend in large part upon its governance and advisory structure. Although it would report through the normal University channels, it could also have its own steering board comprised of leaders from many sectors of society. It would also make extensive use of external advisory groups for its various activities.
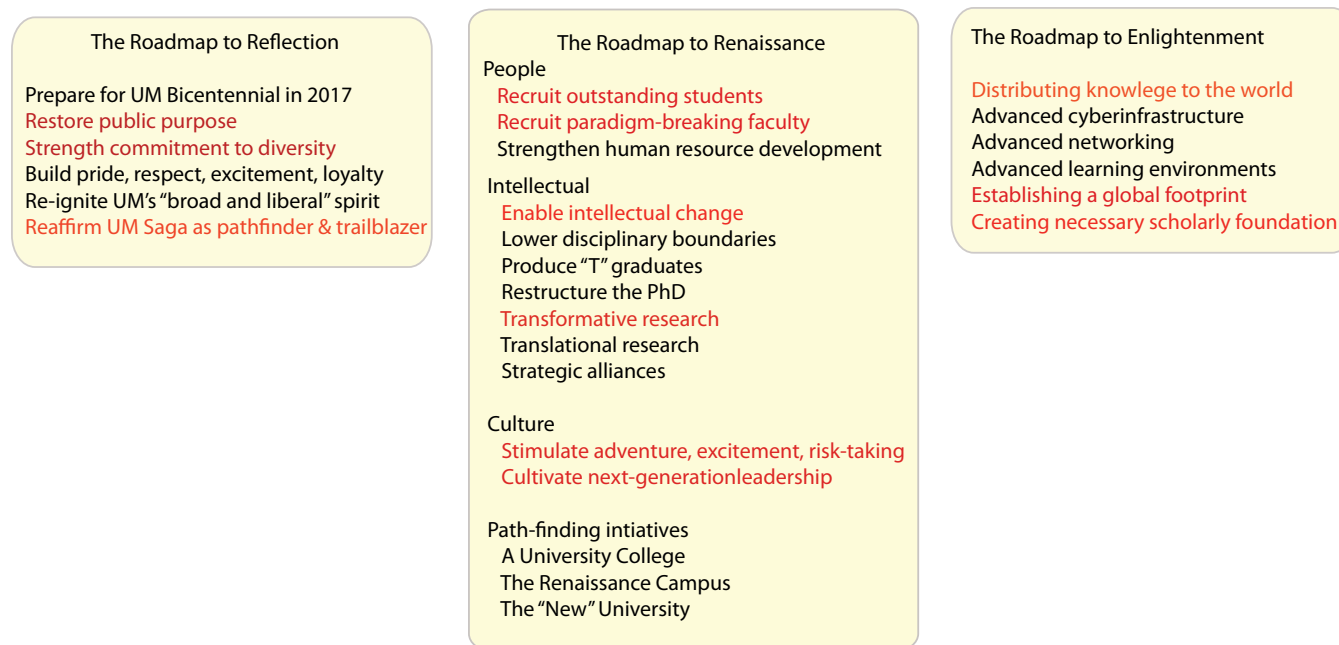
The Roadmap to *Enlightenment*

The final vision proposed for the University is the theme of Enlightenment, spreading the light of learning and knowledge to the world, as its public purpose for its third century. Here we suggest major elements of a possible roadmap to this future based upon several of the paradigms discussed in Chapter 5:

- The emergence of a *universitas magistrorum et scholarium* in cyberspace.
- The power of network architectures in distributing knowledge and learning
- The perspective of learning organizations as ecologies that evolve and mutate into new forms
- The university as the prototype of an emergent global civilization

Of course the themes we have suggested for comprising at least a rough roadmap to the Enlightenment vision of the University of Michigan's third century are highly speculative if not utopian in nature. They need to be better defined, refined, and translated into practical steps that the University can begin to take. But such is the case with any bold vision. And, interestingly enough, the University is already taking important steps down the path sketched out by this roadmap.

Capturing and distributing knowledge to the world: We have noted the leadership role that the University has in the massive digitization of printed materials and the use of these digital repositories (e.g., JSTOR, Google Book, HathiTrust). In fact, since the University's leadership of the HathiTrust has led to it creating the largest digital library in the world, one might suggest that Michigan is already serving as the nucleus of what may become a 21st century analog to the great Library

The Roadmap to Reflection

Prepare for UM Bicentennial in 2017
Restore public purpose
Strength commitment to diversity
Build pride, respect, excitement, loyalty
Re-ignite UM's "broad and liberal" spirit
Reaffirm UM Saga as pathfinder & trailblazer

The Roadmap to Renaissance
People
  Recruit outstanding students
  Recruit paradigm-breaking faculty
  Strengthen human resource development

Intellectual
  Enable intellectual change
  Lower disciplinary boundaries
  Produce "T" graduates
  Restructure the PhD
  Transformative research
  Translational research
  Strategic alliances

Culture
  Stimulate adventure, excitement, risk-taking
  Cultivate next-generationleadership

Path-finding intiatives
  A University College
  The Renaissance Campus
  The "New" University

The Roadmap to Enlightenment

Distributing knowlege to the world
Advanced cyberinfrastructure
Advanced networking
Advanced learning environments
Establishing a global footprint
Creating necessary scholarly foundation

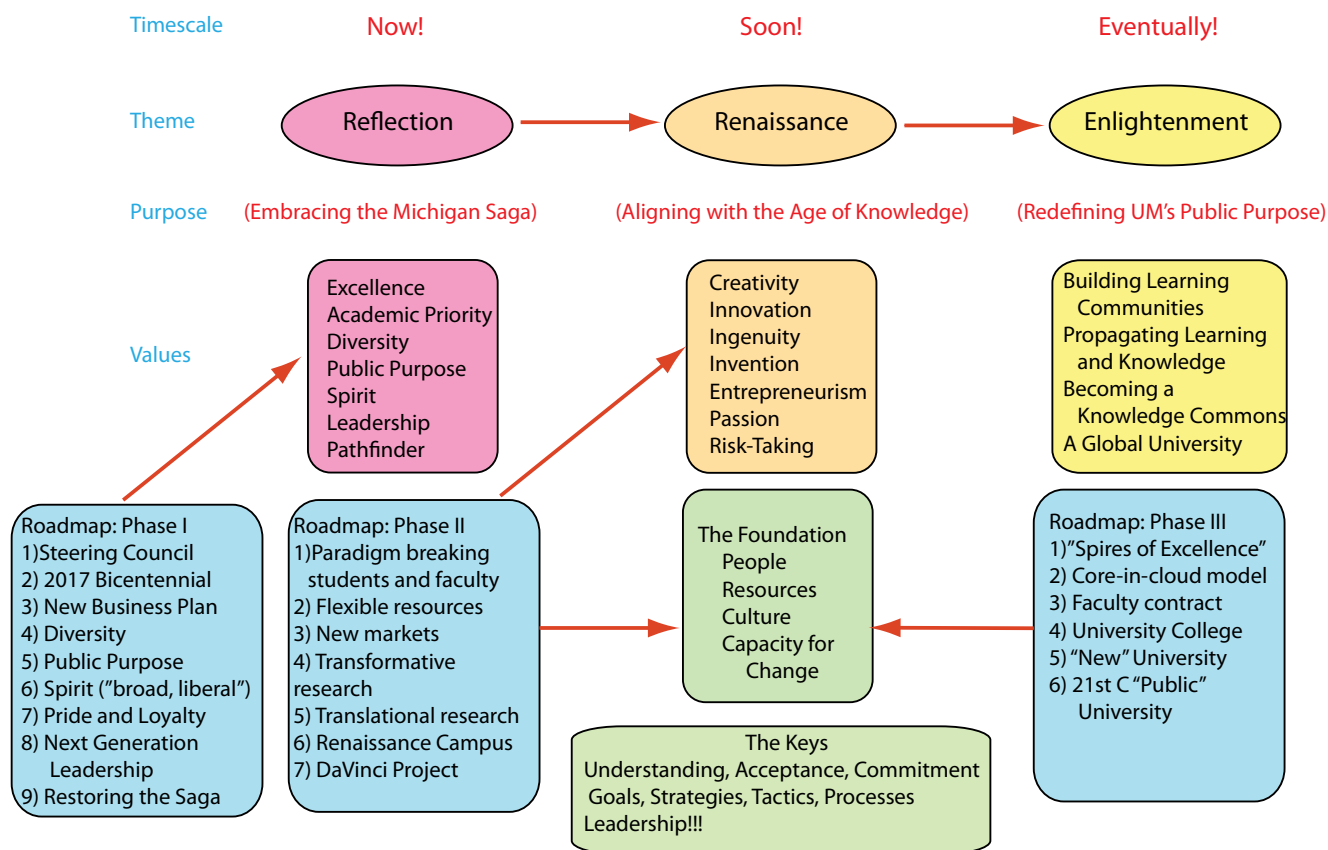The Elements of the Michigan Roadmap (priorities in red)

of Alexandria.

The University is also playing an important leadership role in the open resource movement, using its influence to push for open access to research data and other scholarly materials. Finally, its School of Information, one of the first such academic programs merging traditional library science with informatics and other digital age technologies, provides leadership in both education and research in areas that will be critical to unprecedented access to the world's knowledge. Of particular important is the role of Michigan Publishing with its new ventures in open access publishing for scholars.

Open Education Resources: Although the University has some participation in efforts such as the OpenCourseWare movement and digital course development and distribution through vendors such as iTunes, Amazon, and other mechanisms, its recent involvement is limited to only a few academic units (most notably the School of Medicine). However, the University's involvement in new efforts such as massively open online courses (MOOCs) through organizations such as Unizen and Coursera will hopefully catalyze a greater leadership role in these

important areas.

Cyberinfrastructure: In recent years, the University has once again begun to develop strategies and make investments to restore the position of leadership it once had in developing and deploying advanced cyberinfrastructure in partnerships with leading IT companies. Here the University must embrace a balanced strategy, both utilizing advanced technology in an efficient and cost-effective manner, and partnering with leading companies in both technology development and application for academic environments (much as it has in the past through efforts such as MTS, CAEN, NSFnet, Internet2, and Sakai).

Networking: Clearly advanced network development is key to the Enlightenment vision. The University has long had leadership in the development of national and international networks (e.g., NSFnet, the Internet, Internet2). Yet, simply providing high-speed network links between campuses and other knowledge institutions is only the first step, since such connectivity must be distributed to the desktop, laptop, and laboratory on the campus and to the homes of faculty and students in the surrounding community.

Timescale	Now!	Soon!	Eventually!
Theme	Reflection	Renaissance	Enlightenment
Purpose	(Embracing the Michigan Saga)	(Aligning with the Age of Knowledge)	(Redefining UM's Public Purpose)

Values

Excellence
Academic Priority
Diversity
Public Purpose
Spirit
Leadership
Pathfinder

Creativity
Innovation
Ingenuity
Invention
Entrepreneurism
Passion
Risk-Taking

Building Learning
  Communities
Propagating Learning
  and Knowledge
Becoming a
  Knowledge Commons
A Global University

Roadmap: Phase I
1) Steering Council
2) 2017 Bicentennial
3) New Business Plan
4) Diversity
5) Public Purpose
6) Spirit ("broad, liberal")
7) Pride and Loyalty
8) Next Generation
   Leadership
9) Restoring the Saga

Roadmap: Phase II
1) Paradigm breaking
   students and faculty
2) Flexible resources
3) New markets
4) Transformative
research
5) Translational research
6) Renaissance Campus
7) DaVinci Project

The Foundation
  People
  Resources
  Culture
  Capacity for
  Change

Roadmap: Phase III
1) "Spires of Excellence"
2) Core-in-cloud model
3) Faculty contract
4) University College
5) "New" University
6) 21st C "Public"
   University

The Keys
Understanding, Acceptance, Commitment
Goals, Strategies, Tactics, Processes
Leadership!!!

Strategic roadmaps to a vision for the University of Michigan's Third Century.

Here the University is also participating in the Gig U effort to assemble a coalition of the nation's leading research universities to challenge industry (e.g., carriers such as AT&T, Verizon, and Comcast and technology companies such as Google and IBM) to provide ultra-high bandwidth connectivity through the campuses and surrounding communities (much like the Goggle community fiber program).

Advanced Learning Environments: The University should launch a major effort to develop and deploy advanced learning environments–particularly those enabling social networking and immersive environments (including "sim-stim"–high fidelity simulation of all the senses at a distance). Its past experience with the development of open source curriculum management software such as CTools and Sakai positions it well for this effort.

Establishing a Global Footprint: Clearly the University of Michigan will need to establish a global footprint to achieve this vision. While it certainly has a strong international reputation in higher education, its current strategy of developing selected partnerships at the institution level will need to be expanded considerably. To some degree this is a "branding" exercise, but more significantly, it will require developing strategic relationships with key international higher education and technology organizations such as OECD, the European University Association, and the LERU universities and their counterparts in Asia.

Building the Necessary Scholarly Foundation for the Effort: To enable such a bold effort, the University will have to establish a strong intellectual foundation of faculty scholarship in areas key to a global knowledge and learning enterprise. Here the University's great strength in the social sciences, along with its many research institutions and professional schools, position it well for such an effort.

Taking Advantage of the University's Decentralized Structure: As we have noted, the University of Michigan is characterized by a highly decentralized organizational structure, in effect, as a loosely coupled

adaptive ecosystem. Interestingly enough, this is also similar to the structure of the Internet itself, which has little central control and instead depends upon activity on the edge as it adapts to changes and demands. Hence the unusual structure of the University provides it with an extraordinary capacity to propagate knowledge and learning similar to the Internet itself.

The Public Character of the University of Michigan: The key themes of the 18th Century Enlightenment, the rational distribution of freedom, the universal access to knowledge, and the use of collective experiences stressed that knowledge, learning, and connectivity, were public goods. The public communities of those eras, the salons, seminars, and academies, today have evolved into new forms such as social networks and data clouds. Yet they remain very much public "unions" characterized by "universality", much as the University of Michigan is very much a public institution (although clearly not longer restricted to a state but rather serving the world itself).

Concluding Remarks

The visions we have suggested for the future of the University of Michigan, captured by the terms Reflection, Renaissance, and Enlightenment, become more challenging as we move into the future. Not surprisingly, the roadmaps to these visions for each epoch become less detailed and more uncertain, as does our speculation about the future itself.

This should not be surprising. Such eras of dramatic change have happened many times throughout the history of higher education in America. As Frank Rhodes so eloquently stated it in his closing words of reassurance in the 1999 Glion Declaration:

"For a thousand years, the university has benefited our civilization as a learning community where both the young and the experienced could acquire not only knowledge and skills, but the values and discipline of the educated mind. It has defended and propagated our cultural and intellectual heritage, while challenging our norms and beliefs. It has produced the leaders of our governments, commerce, and professions. It has

both created and applied new knowledge to serve our society. And it has done so while preserving those values and principles so essential to academic learning: the freedom of inquiry, an openness to new ideas, a commitment to rigorous study, and a love of learning.

There seems little doubt that these roles will continue to be needed by our civilization. There is little doubt as well that the university, in some form, will be needed to provide them. The university of the twenty-first century may be as different from today's institutions as the research university is from the colonial college. But its form and its continued evolution will be a consequence of transformations necessary to provide its ancient values and contributions to a changing world. " (Rhodes, 1999)

Chapter 9

Plans, Tactics, and Processes

A roadmap is just that, a set of possible directions to the future. Of course, the destination we have proposed for the University's third century, the vision, has been stated for a series of timeframes in deceptively simple terms:

1. *Reflection*: Reaffirming the Michigan Saga. (Now)

2. *Renaissance*: Stressing creativity and innovation in academic programs. (Soon)

3. *Enlightenment*: Extending the University's public purpose to be that of providing knowledge and learning to the world. (Eventually)

But setting a direction, even with a roadmap, is far from arriving at one's destination. Furthermore, recommendations that require major institutional change are not spontaneously or miraculously implemented. The acceptance of and action upon the recommendations in this proposed roadmap to the University of Michigan's third century require active involvement and commitment from a variety of stakeholders and patrons. Without commitment at all levels–faculty, administration, Regents, stakeholders, and patrons–long-term or sustained innovation and change on the scale recommended in this report cannot be achieved–unless, of course, revolution becomes an option (remember earlier experiences during the Age of Enlightenment, e.g., the French and American Revolution).

Institutions and their stakeholders require a more definitive operational plan that addresses key questions such as: What are the first steps to be taken? What policy actions are necessary? Are there follow-on studies that need to be commissioned? What about an ongoing process or framework to assess and sustain progress?

Furthermore, we should acknowledge that this roadmapping study has been stated in straightforward–sometimes even blunt–terms. To survive in the political environment of campus, state, national, and international policy, it must be reclothed in more Machiavellian garb.

Finally we must also acknowledge that both the proposed vision and roadmap for the University of Michigan's third century is, in reality, a call for institutional transformation. It is clear that we are entering an era of great challenge and opportunity for higher education, characterized by a rapid and profound transformation into a global knowledge society in which creativity and innovation are prized. The task of transforming the University of Michigan to better serve such a society and to move toward a new vision for its third century would be challenging under any circumstances. But perhaps the greatest challenge of all will be the university's very success. It will be difficult to convince those who have worked so hard and successfully to build one of the world's great universities for the twentieth century, that they cannot rest on their laurels when the old paradigms will no longer work. The challenge of the University's third century will be to reinvent the university once again to serve a new generations in a new world.

Strategic Planning

As many leaders in higher education have come to realize, our changing environment requires a far more strategic approach to the evolution of our institutions at all levels. Simply encouraging and supporting planning at the unit level, perhaps augmented by occasional presidential initiatives, for an institution of Michigan's scale, complexity, and impact is both inadequate and dangerous indeed, both for the institution and those
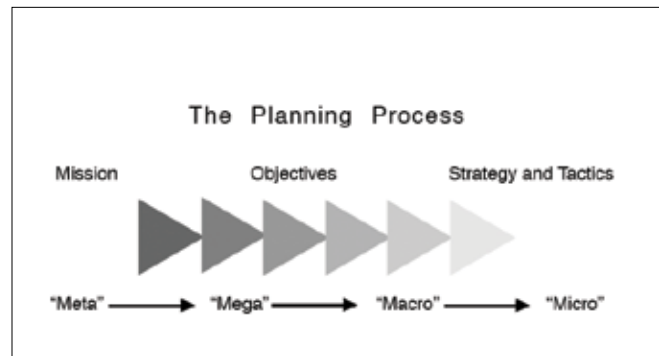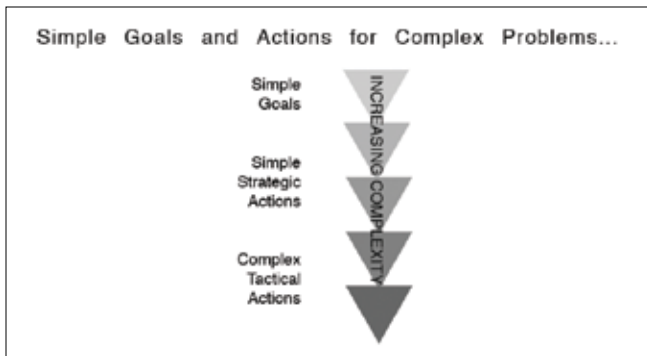
dependent upon it. It is critical for higher education to give thoughtful attention to the design of institutional processes for planning, management, and governance. The ability of universities to adapt successfully to the profound changes occurring in our society will depend a great deal on the institution's collective ability to develop and execute appropriate strategies. Key is the recognition that in a rapidly changing environment, it is important to develop a planning process that is not only capable of adapting to changing conditions, but to some degree capable of modifying the environment in which the university will find itself in the decades ahead. We must seek a progressive, flexible, and adaptive process, capable of responding to a dynamic environment and an uncertain—indeed, unknowable—future.

Here, there is an important distinction to make. Strategic planning is deciding what should be done, that is, choosing objectives ("What do we want to do"); tactics are operational procedures for accomplishing objectives ("How do we go about doing it?"). Note, as well, that long-range planning is not the same thing as strategic planning. Long-range planning establishes quantitative goals, a specific plan. Strategic planning establishes qualitative goals and a philosophy. Because strategic planning should always be linked to operational decisions, some prefer to use the phrase strategic management, rather than strategic planning, to denote it.

Key to any planning effort is an assessment of the planning environment. In large universities it is particularly important to tap the wisdom of a variety of groups to help evaluate both the current and past state of the university, as well as the internal and external environment issues that should be considered in planning activities. All of these factors are time-dependent, of course. Hence, it is important to consider not only the current environments for planning, but also the historical context that led to these environments and the possible futures that might evolve. Furthermore, it is essential to recognize that the internal and external environments are tightly connected. Hence, external conditions that might first appear to be constraints can be altered through appropriate modifications of the internal environment and related activities. Rather than view environmental factors as absolute constraints, they can be recast as challenges or opportunities subject to modification. That is, one can adopt the mindset that the university can influence its planning environment. The key is to begin with the challenging question of asking what can be done to modify the planning environment.

There are always opportunities to control constraints—and the future—if one takes a proactive approach. Universities are rarely playing in a zero-sum game. Instead, they may have the opportunity to increase (or decrease) resources with appropriate (or inappropriate) strategies. The university is never a closed system. Put in more engineering terms, any complex system can be designed in such a way as to be less sensitive to initial and/or boundary conditions. (In the language of systems engineering, a system can be designed with sufficiently short time constants or decay lengths so that it evolves rapidly into an asymptotic state where the constraints imposed by initial and boundary conditions are no longer controlling.)

A successful strategic planning process is highly iterative in nature. While the vision remains fixed, the goals, objectives, actions, and tactics evolve with progress and experience. During a period of rapid, unpredictable change, the specific plan chosen at a given instant is of far less importance than the planning process itself. Put another way, one seeks an "adaptive"
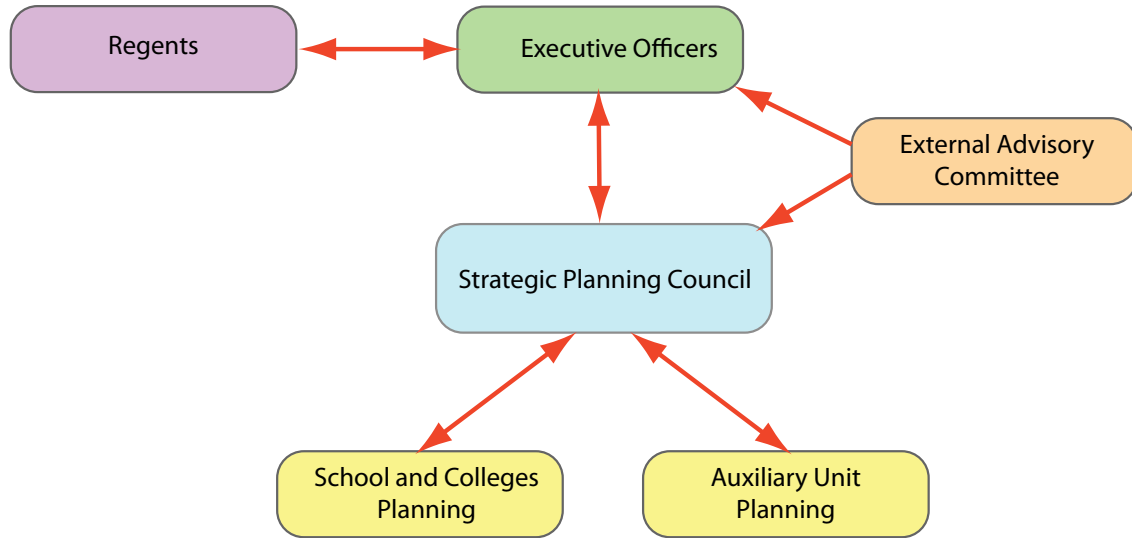
A posslble organizational structure for University strategic planning

planning process appropriate for a rapidly changing environment and a loosely coupled adaptive system such as a university.

In an institution characterized by the size and complexity of the contemporary research university, it is usually not appropriate (or possible) to manage centrally many processes or activities. One can, however, establish institutional priorities and goals and institute a process that encourages local management toward these objectives. To achieve institutional goals, processes can be launched throughout the institution aimed at strategic planning consistent with institutional goals, but with management authority residing at the local level. One seeks an approach with accurate central information support and strong strategic direction.

To this end, it is important to create a high-level steering group with strong representation from the leadership of both the administration and the academic units. Furthermore, each of the major academic and administration units of the university should be encouraged to utilize similar strategic planning organizations, either adding these missions to existing bodies such as school, college, and department executive committees or new organizations created for this role. The various levels of the planning process should be coupled and highly interactive. The planning processes should be highly iterative in nature. Each step would be viewed as a learning process with the power to influence not just subsequent stages of the process, but to feed back information to revise and sharpen the results of earlier stages.

Tactics at the University Level

As apparent from the brief discussion of the Michigan Mandate, even a compelling strategic plan must be accompanied by a series of tactical initiatives and processes to achieve the goals of the effort. To illustrate the approach, we will consider several such tactical efforts that address key challenges today that must be surmounted to enable the University to make progress toward the vision we propose for its third century. In particular, we have selected three of the most important areas that must be addressed by the University: financial stability, organizational structure, and public purpose.

Possible Financial Tactics

The University has taken important steps to address the staggering loss of state support, now exceeding 50% over the past decade. It has achieved cost reductions, in areas such as business operations and energy utilization. However much of the actual savings has come from limiting faculty and staff salary programs and increasing co-pays on staff benefits, actions that could weaken the competitiveness of the University for talent. It is also the case that during the past decade, the University has added hundreds of new employees in areas such as fund-raising, marketing,

and communications at both the level of the central administration and within various academic units that has hindered much of the cost savings efforts. So too, the rapid increase in compensation for central administration staff and leadership also has added significant additional costs.

On the revenue side of the ledger, while major enrollment increases (10,000 students) with a strong bias toward non-state-resident students paying private tuition levels has greatly increased tuition revenue, it has also overloaded both tenure-track faculty and facilities, resulting in a major shift in undergraduate instruction to the use of non-tenure track and parttime instructions.

Actually, the most important action taken to mitigate the loss in state support was the effort of the 1990s to manage University reserves as part of the endowment, increasing it by and order of magnitude during that decade and resulting today in an endowment in excess of \$10 B, yielding \$450 million per year in University support (compared to the roughly \$300 M/y lost in state support).

It is important that the University continue its efforts to explore bolder business plans capable of sustaining the quality of the University in a future with little state support. Among the issues and questions that must be considered are:

1. What levels of resources (per student and per faculty member) are needed to sustain the University's quality at world-class levels? State support per student has already declined to a level more characteristic of community colleges than a world-class research university. Private giving and endowment earnings, while growing rapidly, are still an order of magnitude less on a per student basis than the levels characterizing elite private universities. And other revenue streams such as student fees may be approaching ceilings.

2. In the current business model, the "profit making" activities of the University are undergraduate education for non-state-resident students, some programs of professional education (law, business), clinical care, philanthropy, and investments. Auxiliary activities such as hospitals, housing, and athletics are currently operated as revenue-neutral. Essentially all other activities currently require subsidies including undergraduate education for Michigan students (since the state appropriation is no longer sufficient to cover the discount provided to instate students), graduate education, most professional education, sponsored research (where costs are 30% above external support), arts and culture, and probably intercollegiate athletics (particularly in terms of indirect costs and impact on gift revenues available to academic units).

3. Furthermore, several of the key revenue streams are under serious threat, e.g., state support, while already seriously inadequate, is likely to decline still further; the availability of clinical revenues to subsidize academic activities could also decline with the Affordable Care Act; federal research support continues to fall roughly 30% short of covering full costs and may decline still further with federal budget cuts; and private support tends to be highly targeted to donor interests rather than university priorities. Hence one must seriously question the current growth trajectory of the University (e.g., enrollments, research, facilities, and auxiliary activities).

Below we suggest several tactical initiatives as examples of this approach.

Streamlining, Cost-Containment, Productivity Enhancement: Clearly, in the face of the impact of aging populations and the global financial crisis on state and federal budgets and hence on support for higher education, the nation's public research universities must intensify their efforts to increase efficiency and productivity in all of their activities. In particular, they should set bold goals for reducing the costs of their ongoing activities. Many companies have found that cost reductions and productivity enhancement of 25% or greater are possible with modern business practices such as lean production and total quality management. While universities have many differences from business corporations–for example, cost reductions do not drop to the bottom line of profits–there is likely a very considerable opportunity for process restructuring in both administrative and academic activities. (Augustine, 2020)

Of course, in the face of deep cuts in state

appropriations, most public research universities have already been engaged in intense cost-cutting efforts, particularly in non-academic areas such as financial management, procurement, energy conservation, competitive bidding of services, and eliminating unnecessary regulation and duplication. They have also reduced benefits costs and held the increase in faculty and staff salaries at the inflation rate (or less), albeit while allowing administrative salaries to soar. In the process institutions have cut hundreds of millions of dollars of recurring costs from their budgets. But it is now time to consider bolder actions that require restructuring of academic activities as well. Some obvious examples include:

Exploring new business model paradigms: For most flagship public universities, and particularly for the University of Michigan at this point in its history, developing a sustainable resource base, that is, a business plan, capable of accommodating the likely disappearance of state support has become critical. Clearly the University will require a radically new business paradigm to maintain quality with declining state support. While tuition adjustment and internal cost reductions may suffice in the near term, the UM needs to focus on either increasing the top line (revenue) or "right-sizing" the institution to better align it with available resources.

However, in addition to reacting to current challenges and opportunities, it is important to adopt a more strategic perspective by considering new paradigms for financing higher education, e.g., first determining the appropriate mix of public support (i.e., higher education as a "public good") and private support (higher education as a personal benefit). This should include a full accounting of both direct public support (e.g., appropriations, research grants, and student financial aid) and indirect public subsidy (e.g., "tax expenditures" currently represented by favorable tax treatment of charitable gifts and endowment earnings and distributions). Furthermore, one should consider key policy issues such as: i) the appropriate burdens borne by each generation in the support of higher education as determined, for example, by the mix of grants versus loans in federal financial aid programs (the classic questions of "Who benefits?" and

"Who should pay?"), ii) the degree to which public investment should be used to help shape powerful emerging market forces to protect the public purpose of higher education, and iii) new methods for internal resource allocation and management that enhance productivity.

Year-Round Operation: Today, the vision of moving the University to year-round operation, first explored with the trimester term system of the 1960s, should be reconsidered, since the majority of University instructional activity is now supported by student fees rather than state appropriations. The recent massive investments to renovate both academic and student resident facilities with modern HVAC systems not only enable year-round operation, but essentially demand it for efficient use of the University's capital facilities. By focusing spring-summer enrollments on non-state-resident (and perhaps international) students, and achieving cost-effective instructional staffing through the use of those tenure-track faculty desiring year-long appointments, part-time faculty, and emeritus faculty, a spring-summer term could yield a very strong revenue stream adequate to support a year-round calendar. It could also provide additional capacity to both diversify our student base while also facilitating experimentation in innovative approaches to learning and discovery.

But there is one more compelling reason to consider this major step: the affordability of higher education. It is likely that efforts would be made to preserve student choice in moving to year-round operation. Some students would likely prefer to pursue their studies within the current four-year curriculum we offer today. But others, recognizing the savings from room and board expenses, might choose to accelerate their students through year-round enrollment, completing their degrees in two-and-one-half years–of even two-years flat with sufficient advanced credits from secondary school. In fact when one realizes that these accelerated programs provide students with up to two additional years in the workplace at baccalaureate degree levels of compensation, the financial benefits of year-round operations to students become a powerful way to address the affordability of a college education.
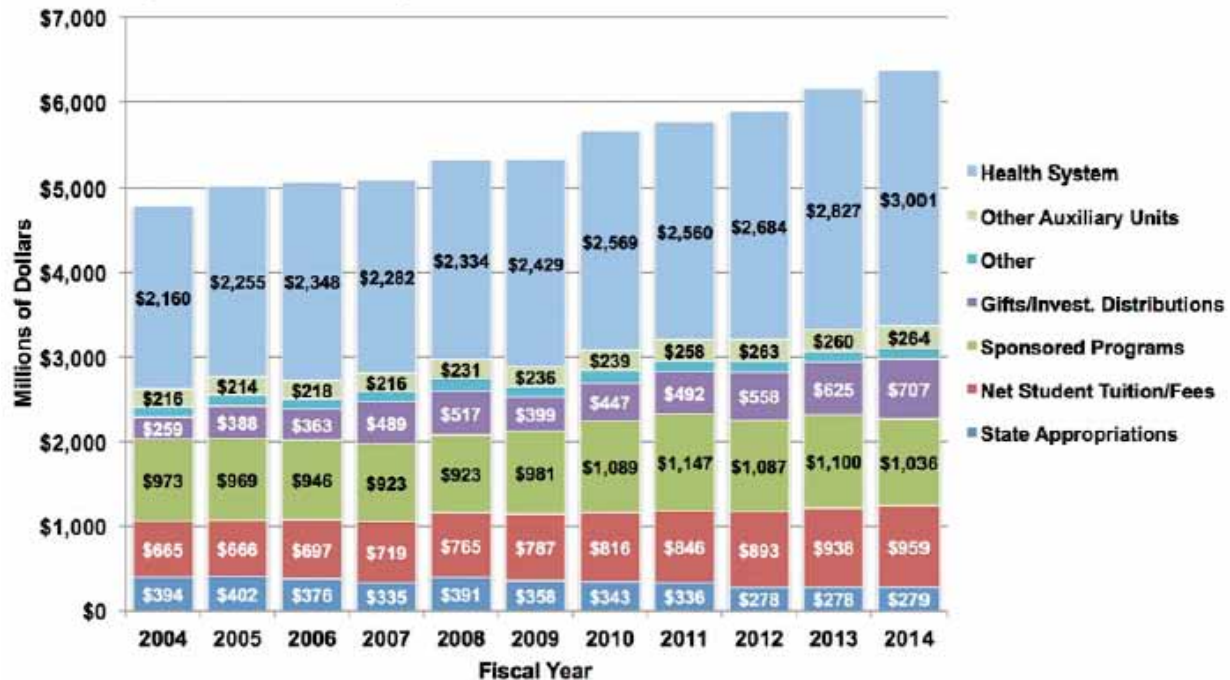
In contrast to the modest increase in the academic budget over the past decade because of the erosion of state support, the budgets of the auxiliaries (hospitals, housing, and athletics) have increased rapidly.

Develop Flexible Resources ("Venture Capital"): Moving the University forward requires more flexibility to support new initiatives and change. While the responsibility center management system provides some of this capacity, it would also be important to attract or reallocate sufficient "venture capital" to support the array of initiatives associated with University transformation over the next several years. Establishing endowments to support such innovative initiatives might be very attractive to donors in the high-tech fields that have come to depend on such funds.

Break down the Financial Firewalls between Academic and Auxiliary Units: As state support has declined while instate tuition has been constrained by political considerations, the academic core of the University has been faced with serious financial pressures for the past decade. Yet during this same period the relative inelastic markets characterizing auxiliary activities such as the University hospitals, residence halls, and the Athletics Department have allowed them to increase prices and hence revenues very substantially. This, together with low interest rates, has ignited a massive capital expansion program. The University should seriously

reconsider the constraints imposed by its current fund accounting model to explore ways to redeploy some fraction of the revenue growth of auxiliary units to the support of academic units, at least until a more long-term solution can be found for disappearing state support. Since the success of these auxiliary activities depends heavily on the academic reputation of the University, one could make a strong case for a tax on auxiliary expenditures to benefit its academic core (similar to the reallocation of assets to highest priorities practiced by most other ventures in the private and public sector, including state and federal government.)

A caution about methods used in business enterprises: Such efforts in cost containment should not only consider best practices from peer institutions but also those aspects of corporate management that might be appropriate for the University. However here there is a strong caution to make certain that such initiatives are compatible and support the ongoing culture and processes that characterize both the academic enterprise and key Michigan characteristics.

A good example here is the implementation of intrusive processes such as "shared services" and "rationalization", aimed at identifying common

activities at the unit level that might be centralized into shared services. While this approach may be logical enough for business enterprises, the great diversity and loosely coupled nature of the university makes this an awkward approach that can quickly stifle innovation and creativity at the unit level, causing great damage to academic quality. Wise university leaders quickly learn to tolerate some level of inefficiency and redundancy at the unit level as necessary for the academic enterprise to function appropriately

Furthermore it is important to avoid any sense of uncertainty among units that might paralyze ongoing activities, while taking advantage of the aggressive "strategic" processes already underway in many of our units.

Possible Organizational Tactics

Spires of Excellence: While the breadth and capacity of the University's programs are important, the institution's primary emphasis in the decades ahead should be on program quality. Resource constraints will require us to build "spires" of excellence in key fields, rather than try to achieve a uniform level of quality across all of our activities. Here we do not propose to focus the resources of the University in order to build only a few isolated areas of excellence, in the manner of a small liberal arts college, for example. Nor should we accept models that distribute resources to achieve a uniform level of necessarily lower quality across all programs. Rather, within each of our academic units— our schools, departments, centers, and institutes—the University should seek to build a number of spires of focused excellence. Constrained resources require us to accept that some areas will be very good as opposed to excellent. In our effort to focus resources and to prune or even discontinue programs, we will have to revise and streamline many current policies and procedures.

Better Align Faculty/Staff Incentives with Institutional Values and Priorities: While the highly decentralized, entrepreneurial culture of this modern university is remarkably adaptive to change, faculty members generally move toward individual or local unit goals rather than embracing institutional goals. The challenge is to tap the extraordinary energy of this entrepreneurial

spirit and align it with institutional goals. This effort should focus on establishing strong incentives, such as incentive compensation and promotion criteria, to reflect the broader goals of the University.

Renegotiate the Faculty Contract: One of the most difficult challenges to institutional change results from the nature of faculty appointments. While tenure and the disappearance of mandatory retirement policies are frequently noted as barriers to flexibility, perhaps even more challenging is the extraordinary degree of disciplinary specialization and the narrowness of faculty roles resulting from our current hiring and promotion policies.

The changing nature of the university and the society it serves compels us to think carefully and creatively about the nature of the faculty of the University in the years ahead. For example, we need to discuss the definition and role of the faculty, particularly in the face of the growing diversity in missions and activities of our various academic units (e.g., the contrast between clinical departments in medicine and performance departments in music). As the character of the faculty and its activities evolves, we must rethink the privileges and responsibilities of faculty members, including the nature of appointments, tenure, rewards, and retirement. These will be difficult but important discussions that should occur both within and among major research universities. In fact, it might even be time to take on third rail issues such as faculty tenure by reconsidering the appropriate balance between the role of tenure in protecting academic freedom and providing the security of career-long employment, particularly in professional schools such as medicine and engineering where professional practice is comparable to faculty scholarship in determining both faculty contributions and compensation.

Clearly this is also the time to consider more carefully the role of those in non-tenure track roles such as lecturers, instructors, and adjunct faculty members who are carrying an increasing share of the instructional load in most universities. Their valuable contributions need to be recognized with appropriate policies and support.

Redefining the State Contract: Over the past three decades, state appropriations have eroded to the point that today the state is only a relatively minor shareholder in the support of the University. It is time to renegotiate the University's "contract" with the people of Michigan, redefining just what services the state should expect and what kind of control it could exert for the ever-diminishing support it provides. For example, one possibility would be moving to a hybrid model, similar to that suggested in Chapter 5, where the "state" component primarily consists of providing high quality education to state residents at the undergraduate level characterized by tuition levels subsidized by the state. Graduate, professional, and research programs would primarily be supported by federal and private patrons, although, of course, the impact of these programs would have strong impact on the State of Michigan (e.g., witness the impact of Cornell, another hybrid public-private university on New York or MIT, a private university, on Massachusetts). Furthermore, the University's world-class excellence would allow it to access global talent and economic markets, thereby attracting both highly skilled talent and economic resources to the state.

Secure and Protect the Autonomy of the University: One of the most important characteristics of the University is its constitutional autonomy, as vested in the Board of Regents, which allows the University to control its own destiny and adapt to change. Unfortunately, in recent years this autonomy has come under attack from a number of quarters. Both the Governor and the Legislature have attempted to dictate key policies of the institution, including tuition, nonresident enrollments, academic focus, and research agendas. At times the media has made a concerted effort to push the University toward the mediocrity of a broader populist, anti-intellectual strain already in evidence in parts of our society. The University needs to vigorously resist these threats to its autonomy, but also actively seek ways to re-establish its capacity to control its own destiny.

Restructure Organization and Governance: As a third class of initiatives, we should continue to explore alternative corporate structures for the diverse range of University activities. The current organization of the University into departments, schools and colleges, and various administrative units is largely historical rather than strategic in nature. To some degree it is more a byproduct of our incremental style of resource allocation, with its presumption that units and activities continue unless a very good case can be made for doing something else, rather than a conscious strategy of intellectual objective. We have to assess whether existing organizational structures would be capable of the transformations we are suggesting. Most evidence suggests that while these units are capable of modest internal change, they generally feel threatened by broader institutional change and will strongly resist it. For example, it is clear that the present organization of our schools and colleges is increasingly incompatible with intellectual, human, and financial resource-management goals.

Our administrative organizations also need to be restructured to better support the multiple missions of the University. Simply imposing a corporate organization from the business world on top of a loosely-coupled academic organization clearly threatens our academic mission. With the appearance of more University-owned subsidiaries to provide services, we need to experiment with alternative corporate structures such as holding-company models.

Finally, and particularly in the case of public universities, the composition, authority, and responsibility of governing boards needs to be better aligned with those served by and supporting their institutions (and who, in today's limited state support, are no longer only the citizens and taxpayers of the state).

Selecting Leadership for the Times: Leadership has always been an important characteristic of the University of Michigan's role, both for higher education and more broadly, for changing the world through the contributions of its faculty, students, and alumni. While such institutional leadership flows upward from the quality, creativity, and importance of academic efforts at the grass-roots level, to flourish they require capable, energetic, and enlightened academic and institutional leadership appropriate for the times.

Because of the University's unique history and

academic culture, it has long chosen to focus on and develop leadership from within, particularly at the level of department chairs and deans. As the University prepares to enter its third century, it is important to continue to develop and appoint those with a clear understanding and acceptance of the Michigan Saga, which seems uniquely positioned to address the challenges facing our world and responsive to the new generations joining the institution as students, faculty, and staff.

Public Purpose

The frustrating history of Michigan's efforts to achieve adequate racial diversity was described earlier in Chapter 7, first as it languished following the protest efforts of the 1960s and 1970s, then as a bold strategic plan, the Michigan Mandate, achieved striking progress that elevated Michigan to national leadership in this objective, and most recently as both the impact of constraining state policies and the lack of both priority and planning led to a precipitous decline back to the inadequate enrollment levels of the 1960s.

To be sure, there is ample evidence today from states such as California and Texas that a restriction to race-neutral policies will drastically limit the ability of elite programs and institutions to reflect diversity in any meaningful way. As former UC President Richard Atkinson noted in a recent address in Ann Arbor, "Proposition 209 asked the University of California to attract a student body that reflects the state's diversity while ignoring two of the major constituents of this diversity–race and ethnicity. A decade later, the legacy of this contradictory mandate is clear. Despite enormous efforts, we have failed badly to achieve the goal of a student body that encompasses California's diverse population. The evidence suggests that without attention to race and ethnicity this goal will ultimately recede into impossibility."

In fact, many of the approaches used by the University in the wake of Proposition 209 have also been considered by Michigan. The University of California reached out to low-performing high schools, making it possible for students achieving at top levels in these schools would not be penalized in admission decisions for the weaknesses of their schools. They changed

their standardized test requirements to put primary emphasis on achievements tests rather than aptitude tests. They sought to look more carefully at applicants to identify those who had overcome serious obstacles in preparing themselves for higher education. They worked with K-12 schools and community colleges to strengthen the preparation for under represented minority students. They launched a major effort to let students, parents, and counselors know about the opportunities UC provided in financial aid, broadened applications, and preparation for attendance.

Yet, as Atkinson and his colleagues concluded, "Today if we look at enrollment overall, racial and ethnic diversity at the University of California is in great trouble. A decade later the legacy of Proposition 209 is clear. Despite enormous efforts, we have failed badly to achieve the goal of a student body that encompasses California's diverse population. The evidence suggests that–without attention to race and ethnicity–this goal will ultimately recede into impossibility." The University of Michigan provides further evidence from the collapse of its minority enrollments of the difficulty of achieving a diverse campus in the wake of Proposal 2.

Of course racial diversity is only one component of a far broader agenda to honor, achieve, and sustain Michigan's public purpose, e.g., "to provide an uncommon education for the common man". Throughout the last decade, there has been an increasing concern that many public universities, particularly flagship research universities such as Michigan, are also losing the economic diversity that characterized their public purpose. Earlier in Chapter 7 we noted recent studies by Kati Haycock of the Education trust suggested that "Founded to provide "an uncommon education for the common man", many flagship universities have drifted away from their historic mission. Their students not only don't look much like the young people in the states they service, but they also don't look much different from those who attend elite private research universities." (Haycock, 2010)

Even more pointedly, the studies demonstrated that when rated on the basis of success and access of low-income and underrepresented minority students over the past decade, the University of Michigan received the lowest marks for performance and progress. More
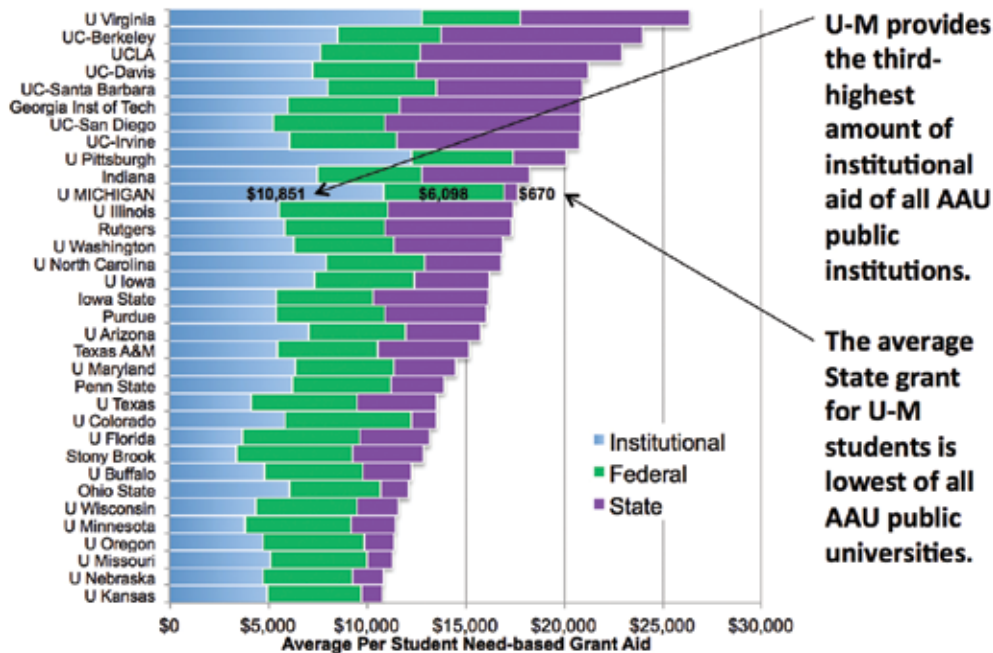
Although Michigan makes a substantial commitment to need-based financial aid, it is unable to compensate for the absence of a meaningful State of Michigan need-based financial aid program.

specifically, that the percentage of Pell Grant students enrolled at UMAA (the standard measure used by higher education of measuring enrollment by low income students) has dropped to 11% (compared to an average among flagship public universities of 24%), while its fraction of underrepresented minorities is now down to 10% (low again compared to an average of 14%). It is also disturbing that its percentage of first generation college students has now dropped to less than 6% compared to 16% of its public university peers and 14% of the enrollment of highly selective private universities.

What is happening? To be sure, the State of Michigan ranks at the bottom of the states in the amount of need-based financial aid it provides to college students, requiring the University to make these commitments from its own internal funds. But it is also due to the decision made in the late 1990s to compensate for the loss of state support by dramatically increasing enrollments with a bias toward out-of-state students who generate new revenues with high tuition. Clearly students who can pay annual tuition, room & board at the private rates of $60,000 come from highly affluent families. Indeed, the average family income of Michigan undergraduates is now approaching $150,000 per year,

more characteristic of the "1%" than the "common man".

But when one turns to economic diversity, the University of California provides a sharp contrast to the University of Michigan. Today 42% of all UC undergraduates receive Pell Grants, compared to 15% at UM. 46% of UC's entering California residents come from families where neither parent graduated from college, compared to 16% for UM. Approximately 25% of undergraduates come from underrepresented minority populations (African American, Chicano/Latino, and Native American) compared to 10% at UM (although this later comparison is due in part to the very large growth in the Latino population of California).

So where is the difference? To be sure, since the University of Michigan has managed to contain the actual cost of its educational programs at inflationary levels, the real blame for the increasing costs seen by parents must fall on the State of Michigan, which has dramatically cut its support of higher education. In fact, the chart in Chapter 7 comparing state appropriations with University tuition and fees demonstrates that almost all of the increase in the costs faced by students and parents have been driven by the erosion of the state subsidy through appropriations. This failure

in state support of public higher education has been compounded by the elimination of the state's support of need-based financial aid, now among the lowest levels in the nation. Part of the reason could be do to the more highly integrated higher education system of California, using both the community college system and the California State University as feeder institutions to the University of California

Hence restoring the University's diversity will require not only a serious restructuring of Michigan's financial strategies, but even more important, a renewed commitment to the fundamental public purpose that has guided the University for almost two centuries. While the University's concerted effort to generate support from other patrons, particularly through private giving and sponsored research, it simply must realize that these will never be sufficient to support a world-class university of this size, breadth, or impact. Without substantial public support, it is unrealistic to expect that public universities can fulfill their public purpose.

Hence the highest priority should be to re-engage with the people of Michigan to convince them of the importance of investing in public higher education and unleashing the constraints that prevent higher education from serving all of the people of this state. This must become a primary responsibility of not only the leadership of the University, but its Regents, faculty, students, staff, alumni, and those Michigan citizens who depend so heavily on the services provided by one of the great universities of the world.

Returning again to President Atkinson's analysis, he suggests that "We need a strategy that recognizes the continuing corrosive force of racial inequality but does not stop there. We need a strategy grounded in the broad American tradition of opportunity because opportunity is a value that Americans understand and support. We need a strategy that makes it clear that our society has a stake in ensuring that every American has an opportunity to succeed—and every American, in turn, has a stake in our society. Race still matters. Yet we need to move toward another kind of affirmative action, one in which the emphasis is on opportunity and the goal is educational equity in the broadest possible sense. The ultimate test of a democracy is its willingness to do whatever it takes to create the aristocracy of talent that Thomas Jefferson saw as indispensable to a free society. It is a test we cannot afford to fail."

Concluding Remarks

Perhaps the best indication of the gap that exists between the University today and the vision for its third century was conveyed in the University's 2010 Accreditation Report concerning "preparing for the future", where the University states its current planning philosophy and approach as follows:

In contrast to many other institutions of higher education, the University of Michigan does not have a campus-wide long-range planning process for its academic mission. The highly decentralized structure of the University asks units to develop such plans at the school/college level, and for large units, at the departmental level. Central administration supports these plans through budget allocations and strategic funding, creating a flexible planning environment.

Clearly, without a strategic process or a plan, the path to any vision of the University of Michigan's future would look distant indeed. Without planning the University will be flying blind into the storms of change in our world.

Institutions all too frequently chose a timid course of incremental, reactive change because they view a more strategically-driven transformation process as too risky. They are worried about making a mistake, about heading in the wrong direction or failing. While they are aware that this incremental approach can occasionally miss an opportunity, many mature organizations such as universities would prefer the risk of missed opportunity to the danger of heading into the unknown.

But, today, incremental change based on traditional, well-understood paradigms may be the most dangerous course of all, because those paradigms may simply not be adequate to adapt to a future of change. If the status quo is no longer an option, if the existing paradigms are no longer viable, then transformation becomes the wisest course.

While universities have always successfully managed the balance between preserving and propagating the fundamental knowledge sustaining

our cultures and civilizations and not only adapting to but actually creating the paradigm shifts that drive change, the time scales characterizing these roles are becoming ever shorter. The centuries characterizing social transitions such as scholasticism to humanism and enlightenment contracted to decades for the industrial revolution and globalization and now have collapsed even further to within a generation or less for the age of knowledge as the technologies of our times now evolve exponentially. Put another way, during the transition from Generation X to the Millennials, info-, bio-, and nano-technology have increased in power a millionfold and will do so yet again with Generation Z.

The capacity for intellectual change and renewal has become increasingly important to us as individuals and to our institutions. Our challenge, as an institution, and as a faculty, is to work together to provide an environment in which such change is regarded, not as threatening but rather as an exhilarating opportunity to conduct teaching and scholarship of even higher quality and impact on our society.

To succeed, we strive for a more flexible culture, one more accepting of occasional failure as the unavoidable corollary to any ambitious effort. We must learn to adapt quickly while retaining the values and goals that give us a sense of mission and community. Many view the current rigid and hierarchical structure of the university as obsolete. To advance, we must discover ways to draw upon the unique and vibrant creativity of every member of our community.

As financial resources become increasingly constrained, and as competition for students globally increases, especially with the advent of "virtual" technology, we cannot afford to hide our heads in the sand. Increasingly, many fear an age of attrition in higher education similar to that of the post-Civil War period, where those institutions that cannot re-establish their sense of purpose for a new society will begin to disappear. As we ask our students to critique the received authority of their society, to examine and decide rather than accept the status quo, so must we also re-open debates about the structure and goals of our common institution.

It is often scary and difficult to let go of old and comfortable roles, to open ourselves to new possibilities and ways of being. Yet change brings with it the possibility of deeper connections to our students and the potential for serving a much broader range of our society. Growth, both for an institution and for the individuals that comprise it, can come only with a step into the unknown.

Our challenge is to tap the great source of creativity and energy of outstanding faculty, students, and staff, working at the grassroots level of the academic enterprise of the University in a way that preserves our fundamental mission and values. We need to continue to encourage our tradition of natural evolution, which has been so successful in responding to a changing world, but do so with greater strategic intent. We must also develop a greater capacity to redirect our resources toward our highest priorities. Rather than allowing the university to continue to evolve as an unconstrained, transactional, entrepreneurial culture, we need to guide this process in such a way as to preserve our core missions, characteristics, and values.

The Roadmap to Reflection

Prepare for UM Bicentennial in 2017
Restore public purpose
Strength commitment to diversity
Build pride, respect, excitement, loyalty
Re-ignite UM's "broad and liberal" spirit
Reaffirm UM Saga as pathfinder & trailblazer

The Roadmap to Renaissance

People
 Recruit outstanding students
 Recruit paradigm-breaking faculty
 Strengthen human resource development

Intellectual
 Enable intellectual change
 Lower disciplinary boundaries
 Produce "T" graduates
 Restructure the PhD
 Transformative research
 Translational research
 Strategic alliances

Culture
 Stimulate adventure, excitement, risk-taking
 Cultivate next-generation leadership

Path-finding intiatives
 A University College
 The Renaissance Campus
 The "New" University

The Roadmap to Enlightenment

Distributing knowlege to the world
Advanced cyberinfrastructure
Advanced networking
Advanced learning environments
Establishing a global footprint
Creating necessary scholarly foundation

Tactics

Financial stability
Streamlining, costs, productivity
Breaking down firewalls
New business model paradigms
Moving to year-round operations
A caution about "privatizing" UM

Strategies

Spires of excellence
Aligning incentives with values & priorities
Renegotiating the faculty contract
Renegotiating the state contract
Restructuring organization & governance
Selecting leadership for the times

The tactics and strategies necessary to implement the Michigan Roadmap.

Chapter 10

The Challenge of Leadership

The triad mission of the university as we know it today—teaching, research, and service—was shaped by the needs of an America of the past. Since our nation today is changing at an ever-accelerating pace, is it not appropriate to question whether our present concept of the research university, developed largely to serve a homogeneous, domestic, industrial society, must not also evolve rapidly if we are to serve the highly pluralistic, knowledge-intensive world-nation that will be the America of the 21st Century?

Of course, there have been many in recent years who have suggested that the traditional paradigm of the public university must evolve to respond to the challenges that will confront our society in the years ahead. But will a gradual evolution of our traditional paradigm be sufficient? Or, will the changes ahead force a more dramatic, indeed revolutionary, shift in the paradigm of the contemporary research university?

Just as with other institutions in our society, those universities that will thrive will be those that are capable not only of responding to this future of change, but that have the capacity to relish, stimulate, and manage change. In this perspective it may well be that the continual renewal of the role, mission, values, and goals of our institutions will become the greatest challenge of all!

> James J. Duderstadt
> "The Challenge of Change"
> Presidential Inauguration Address
> The University of Michigan
> October 6, 1988

The Challenge to America

During the years following the Great Depression and World War II, our nation launched a massive effort to provide educational opportunities to all Americans.

Returning veterans funded through the GI bill 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. The Truman Commission proposed that all Americans should have the opportunity of a college education, 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, today the leading research university system in the world.

Our nation–and, indeed, the world–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 has benefited greatly from the extraordinary commitments of the "Greatest Generation" to educational opportunity and the support of university research.

Yet, today, much of this earlier commitment to educational opportunity seems to have waned. The quality of our primary and secondary schools lags many other nations as K-12 teaching has been transformed into a blue-collar profession, dominated by political demands and administrative bureaucracy. Over the past decade, state support of our public universities has dropped by roughly 35%, putting even the great University of California at risk (which has lost almost two-thirds of its state support per student). 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 have become extraordinary. The unfortunate reality facing students today can be summarized by observing that "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, 2010)

Something has gone terribly wrong! Today our nation seems to no longer understand that the support of educational opportunity and campus-based research represent investments in the future, not burdensome expenditures. Today most of those responsible for public policy at both the federal level and among the states have ignored the public good character of higher education. Instead, and in sharp contrast to most of the rest of the world. Today most Americans view a college education primarily as a private benefit for individuals aimed at providing them with good jobs that should be paid for through student fees, increasingly funded through personal debt, rather than through public investment.

Both the tragedy and irony 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, develop innovative applications of these discoveries, and transfer them into the marketplace through entrepreneurial activities.

Despite the myopia characterizing today's public policies, more than ever, people see education as their hope for leading meaningful and fulfilling lives. Just as a high school diploma became the passport to participation in the industrial age, today, a century later, a college education has become the requirement for economic security in the age of knowledge. Furthermore, with the ever-expanding knowledge base of many fields, along with the longer life span and working careers of our aging population, the need for intellectual retooling will become even more significant. Even those with advanced degrees will soon find that their continued employability requires lifelong learning.

Ironically, 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. America's challenge today is to understand that once again it is time for new commitments to education to enable our nation to achieve prosperity, health, and security.

So what should our nation do to address these challenges, much as our parents and our ancestors did for us a half-century ago? Perhaps it is time to step forward to accept a greater degree of generational responsibility for the educational opportunities that we provide our descendants. Perhaps it is time that we use our influence, our wisdom, and for many, our considerable wealth, to make our own bold commitments for the educational resources that will be needed by future generations. One can always hope that an aging population will eventually seek more positive future visions to give meaning to their lives. To be sure, younger generations are already exploring more positive approaches to their futures. But more is required.

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 our nation's history when its 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 American citizens with universal access to lifelong learning opportunities, thereby enabling participation in the world's most advanced knowledge and learning society.

The challenge facing America today is to recognize and accept its responsibility as a democratic society to provide all of its citizens with the educational, learning, and training opportunities they need and deserve, throughout their lives, thereby enabling both individuals and the nation itself 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 the nation is to achieve prosperity, security, and social well being in the global, knowledge- and value-based economy of the 21st century.

It is very difficult to peer over the horizon, but there are already trends suggesting that we are facing yet another era of profound transformation. Increasingly robust communications technologies (always on, always in contact, high-fidelity interaction at a distance) are stimulating the evolution of new types of communities (e.g., self-organization, spontaneous emergence, collective intelligence, "hives"). Info-bio-nano technologies continue to evolve at the current rate of 1,000 fold per decade. During the 20th century, the life expectancy in developed nations essentially doubled (from 40 to 80 years). Suppose it doubles again in the 21st century?

More generally, it is clear that as the pace of change continues to accelerate, our schools, colleges, and universities will need to become highly adaptive if they are to survive. Here, we might best think of future learning and innovation environments as ecologies that not only adapt but also mutate and evolve to serve an ever-changing world. Such future challenges call for bold initiatives. 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.

The Challenge to Higher Education

The American university has changed quite considerably over the past two centuries, and it continues to evolve today. Colonial colleges have become private research universities; religious colleges formed during the early 19th century gradually became independent colleges; junior colleges have evolved into community colleges and then into regional universities. Today public research universities also continue to evolve to adapt to changes in students (from state to national to global), support (from state to national, public to private), missions (from regional to national to global), and perception (education from a public good to a private benefit). Public universities are already rapidly expanding their public purpose far beyond the borders of their states, since the more mobile the society, the more global the economy, the broader the "publics" served by the university must become.

Of course, this ever changing nature of the university itself is part of the challenge, since it not only gives rise to an extraordinary diversity of institutions, but also a great diversity in perspectives. What is a university? Is it a "college", in the sense of the heritage of the colonial colleges (and, before that, the English boarding schools)? Is it the 20th century image of university life– football, fraternities, Joe-college, campus protests? Is it Clark Kerr's multiversity, accumulating ever more missions in response to expanding social needs–health care, economic development, technology transfer? Or is the true university something more intellectual: a community of masters and scholars (*universitas magistrorum et scholarium*), a school of universal learning (Newman) embracing every branch of knowledge and all possible means for making new investigations and thus advancing knowledge (Tappan)?

What is the core of its university activities? Student development (or, in the words of Lord Rugby, "transforming savages into gentlemen"). Or creating, curating, archiving, transmitting, and applying knowledge? Or serving society, responding to its contemporary needs–health care, economic development, national defense, homeland security, entertainment (e.g., athletics).

What are its core values? Critical, rigorous thinking (e.g., "the life of the mind")? Academic freedom?

Students...

Faculty...

Individual achievement (noting that the contemporary organization of the university is really designed to enable individuals to strive to achieve their full potential (as students, faculty, athletes).

With much the character of the proverbial elephant being felt by the blind men, it is not surprising that discussions involving the future of the university can be difficult. It is particularly difficult to ignite such discussions among university leaders, who generally fall back upon the famous Clark Kerr quote: "About 85 institutions in the Western World established by 1520 still exist in recognizable forms, with similar functions and with unbroken histories, including the Catholic Church, the Parliaments of the Isle of Man, of Iceland, and of Great Britain, several Swiss cantons, and…70 universities."…*Hakuna Matata*

It is true that the university today looks very much like it has for decades–indeed, centuries in the case of many ancient European universities. They are still organized into academic and professional disciplines; they still base their educational programs on the traditional undergraduate, graduate, and professional discipline curricula; our universities are still governed, managed, and led as they have been for ages.

But if one looks more closely at the core activities of students and faculty, the changes over the past decade have been profound indeed. The scholarly activities of the faculty have become heavily dependent upon digital technology–rather cyberinfrastructure–whether in the sciences, humanities, arts, or professions. Although faculties still seek face-to-face discussions

with colleagues, these have become the booster shot for far more frequent interactions over the Internet. Most faculty members rarely visit the library anymore, preferring to access digital resources through powerful and efficient search engines. Some have even ceased publishing in favor of the increasingly ubiquitous digital preprint or blog route. Student life and learning are also changing rapidly, as students bring onto campus with them the skills of the net generation for applying this rapidly evolving technology to their own interests, forming social groups through social networking technology (Facebook, Twitter), role playing (Minecraft, World of Warcraft), accessing web-based services (Google, Wikipedia), and inquiry-based learning, despite the insistence of their professors that they jump through the hoops of the traditional classroom paradigm.

In one sense, it is amazing that the university has been able to adapt to these extraordinary transformations of its most fundamental activities, learning and scholarship, with its organization and structure largely intact. Here, one might be inclined to observe that technological change tends to evolve much more rapidly than social change, suggesting that a social institution such as the university, which has lasted a millennium, is unlikely to change on the timescales of tech turns, although social institutions such as corporations have learned the hard way that failure to keep pace can lead to extinction (Remember Borders?). Yet, while social institutions may respond more slowly to technological change, when they do

And graduates!

so, it is frequently with quite abrupt and unpredictable consequences, e.g., "punctuated evolution".

It could also be that the revolution in higher education is well underway, at least with the early adopters, and simply not sensed or recognized yet by the body of the institutions within which the changes are occurring. Universities are extraordinarily adaptable organizations, tolerating enormous redundancy and diversity. It could be that the information technology revolution is more of a tsunami that universities can float through rather than a rogue wave that will swamp them.

An alternative viewpoint of the transformation of the university might be as an evolutionary, rather than a revolutionary process. Evolutionary change usually occurs first at the edge of an organization (an ecology) rather than in the center where it is likely to be extinguished. In this sense, the forces that are now transforming scholarship and enabling new forms of learning communities have not yet propagated into the core of the university. Of course, from this perspective, recent efforts such as the HathiTrust project take on far more significance, since the morphing of the university library from stacks to Starbucks strikes at the intellectual soul of the university.

Admittedly, it is also the case that futurists have a habit of overestimating the impact of new technologies in the near term and underestimating them over the longer term. There is a natural tendency to implicitly assume that the present will continue, just at an accelerated pace, and fail to anticipate the disruptive

technologies and killer apps that turn predictions topsy-turvy. Yet, we also know that far enough into the future, the exponential character of the evolution of Moore's Law technologies such as info-, bio-, and nano-technology makes almost any scenario possible.

Clearly, 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. This time of great change, of shifting paradigms, provides the context in which we must consider the changing nature of the university.

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. Those of us in higher education must always keep before us two questions: "Whom do we serve?" and "How can we serve better?" And society must work 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 we 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.

Certainly, the need for higher education will be of increasing importance in our knowledge-driven future. Certainly, too, it has become increasingly clear that our current paradigms for the university, its teaching and research, its service to society, its financing, all must change rapidly and perhaps radically. Hence, the real question is not whether higher education will be transformed, but rather how . . . and by whom. If the university is capable of transforming itself to respond to the needs of a culture of learning, then what is currently perceived as the challenge of change may, in fact, become the opportunity for a renaissance, an age of enlightenment, in higher education in the years ahead.

The remarkable resilience of the university, its capacity to adapt and change in the past, has occurred in part because it embraces and encourages an intensely

entrepreneurial culture. We have provided our faculty the freedom, the encouragement, and the incentives to move toward their personal goals in highly flexible ways, and they have done so through good times and bad. Our challenge is to tap this grassroots energy and creativity in the effort to transform our institutions to better serve a changing world.

Yet, we must do so within the context of an exciting and compelling vision for the future of our institutions. Rather than allowing the university to continue to evolve as an unconstrained, transactional, entrepreneurial culture, we need to guide this process in such a way as to preserve our core missions, characteristics, and values. We must work hard to develop university communities where uncertainty is an exhilarating opportunity for learning.

While many academics are reluctant to accept the necessity or the validity of formal planning activities, woe be it to the institutions that turn aside from strategic efforts to determine their futures. The successful adaptation of universities to the revolutionary challenges they face will depend a great deal on an institution's collective ability to learn and to continuously improve its core activities. It is critical that higher education give thoughtful attention to the design of institutional processes for planning, management, and governance. 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.
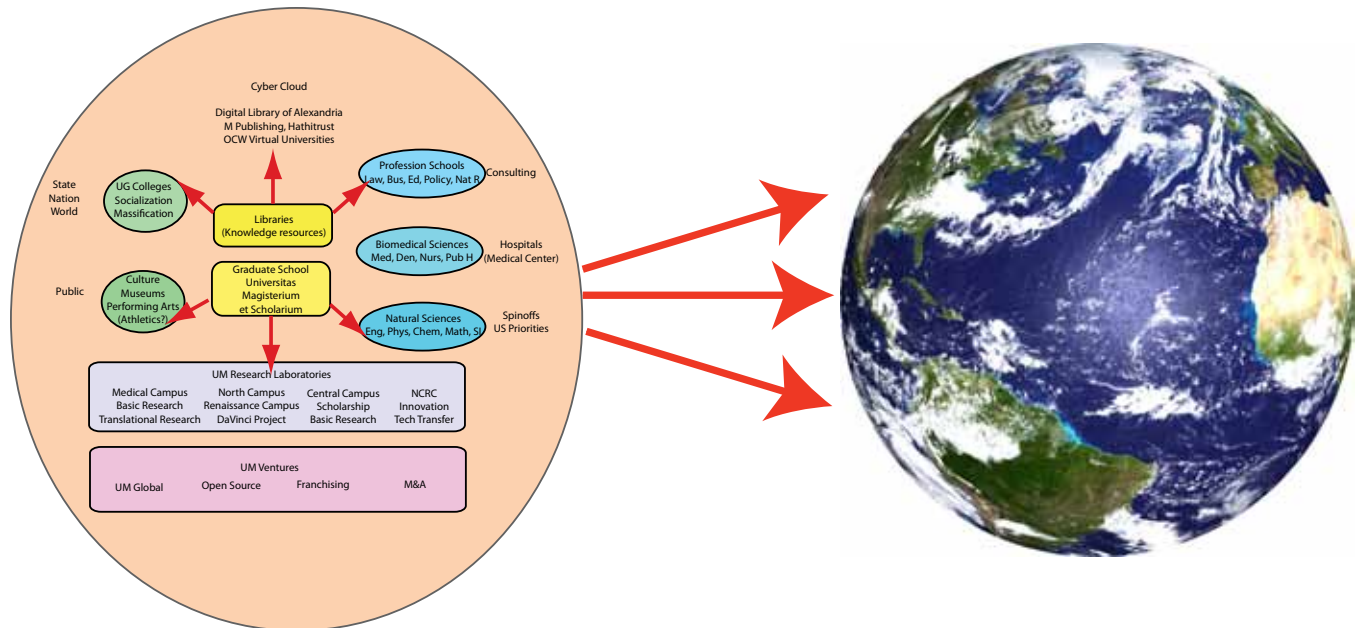
The Challenge and Opportunity

The University of Michigan is an institution that should not only respond to this challenge but provide leadership for higher education in this endeavor, just as it has during earlier eras of change in America. Michigan possesses a unique combination of characteristics, particularly well suited to exploring and charting the course for higher education as it evolves to serve a changing world. Former Michigan Professor David Hollinger captured this character of the university well in an address celebrating the 75th anniversary of the founding of its graduate school: (Hollinger, 1988)

"Michigan is a more impressive university as a whole than in those of its parts that are measured by conventional indices of excellence. The principled constraint has been the University's effort to govern itself by the standard academic values of free and open inquiry, veracity, objectivity, reasoned argument, and reliance on evidence…Multitudinous, sprawling, decentralized, contingent, imperfect, Michigan retains its capacity to inspire. That capacity derives not from any claims to uniqueness but from its strivings toward cosmopolitanism, from the enormous range of learned pursuits and doctrines available here. If there is a Michigan mystique, it is more democratic than exclusive, more egalitarian that hierarchical; it is a mystique more of pluralism than of uniqueness of any sort. Michigan's tradition is pre-eminently national rather than local. The chiefly historical significance of the University of Michigan is an embodiment of the national academic culture, as an institution successfully devoted to both excellence and comprehensiveness."

It is this unique character that should shape the University's mission, vision, and goals as the University of Michigan enters its third century.

We have suggested three elements of a possible vision for future for the University of Michigan as it prepares to enter its third century:

1. A vision for today of *Reflection* upon the past accomplishments, values, and key characteristics of the University's institutional saga;

2. A near-term vision of a *Renaissance* as the University aligns itself to better engage with a world dependent upon learning, knowledge, creativity, and innovation by spanning the broad range of learning from simply "to know", "to do", "to create" and "to become"; and

3. A longer term vision of *Enlightenment* as the University commits itself to expand its public purpose to provide "the light of learning and knowledge" to the world in the new forms enabled by rapidly evolving information and communications technologies.

A public purpose for the Third Century: providing the light of knowledge and learning to the world!

Although bold, we believe these visions to be consistent both with the University's heritage and the challenges and opportunities it will face as it begins its third century.

We contend that as the University approaches its third century, it should embrace once again its heritage as a pathfinder for higher education, a saga established two centuries ago in the 19th century when the University of Michigan became a primary source for much of the innovation and leadership for higher education. Once again, Michigan has the opportunity to influence the emergence of a new paradigm of what the university must become in our 21st Century world to respond to the changing needs of our society.

This, then, is the particular challenge and opportunity for the University of Michigan. As it has so many times in its past, the University of Michigan must embrace yet again its historic role of leadership for a future characterized by great challenges, immense responsibilities, and exciting opportunities.

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