

Introduction

Good morning. I'm delighted to be here this morning – to be part of the Michigan team that is looking at global competitiveness and the state's economic future. I truly believe that **only** by working together as a team – research universities, business and industry, labor, and state and local governments – will Michigan be able to support a robust economy that provides a high standard of living for this and future generations.

And it from this perspective of teamwork that I would like to discuss the State of Michigan's strategy to achieve prosperity in the face of intense international competition and rapid technological change.

To discuss this challenge, I am going to toss aside my hat as a university president and instead return to my roots as a scientist and engineer. Throughout my scientific career I have been heavily involved in stimulating technological change. I have worked in areas such as nuclear energy, lasers, thermonuclear fusion, and supercomputers. Indeed, I even worked on the project to develop a nuclear rocket to power a manned mission to Mars in the 1960s. In the 1980s I served as Dean of the College of Engineering at Michigan and led an effort to build and align the programs of the University to better respond to the needs of our state and nation. And for the past several years I have served as chair fo the National Science Board, the key body charged with oversight of federal R&D.

Let me also warn you that, like most engineers, I'm not much good at politics. So forgive my candor. I'm simply going to "tell it like it is" ... and the hell with political correctness...

What Is Going On?

I fear that few of us realize the full implications of the ever-accelerating pace of change in our world, our nation, and perhaps most of all, in our state. Change is transforming our world. Who would have predicted several years ago that:❑ Communism would be rejected around the world, swept away by the winds of freedom?❑ The Berlin wall would crumble, and Germany would be reunited?❑ Eastern Europe would break away from the Soviet block to embrace democracy and unite with Western Europe? The Soviet Union would literally disintegrate from the centrifugal forces of freedom and nationalism? Or that we would experience a Newtonian revolution in Congress!!!

Yet the changes we have seen thus far are just the tip of the iceberg. Indeed, many believe that we are going through a period of change in our civilization just as profound as that which occurred in earlier times, such as the Renaissance and the Industrial Revolution. Except that these earlier transformations took centuries to occur, while the transformations characterizing our times will occur in a decade or less! Today we are evolving rapidly to a new post-industrial, knowledge-based society, just as a century ago our agrarian society evolved through the Industrial Revolution. A key element in the transformation is the emergence of knowledge as the new critical commodity, now as important as mineral ores, timber, and access to low skilled labor were at an earlier time. This new critical commodity knows no boundaries. It is generated and shared wherever educated, dedicated, and creative people come together and, as we have learned, it spreads very quickly--worldwide, in fact.

I used to portray the 1990s as the countdown toward a new millennium, as we found ourselves swept toward a new century by these incredible forces of change. But the events of the past several years suggest that the twenty-first century is already upon us, a decade early.

From this perspective it is clear that Michigan's primary challenge is the *challenge of dramatic economic change* itself. This profound change is being driven in large measure by the growing importance of knowledge, that is, educated people and their ideas, as the key strategic commodity necessary for economic prosperity, national security, and social well-being. In a very real sense, the world is entering a new age, an *age of knowledge*, and Michigan's challenge is to take the necessary actions today--to make the necessary investments--to enable it to compete and prosper in this new age.

The Challenges Before Our State

My wife and I have lived in Michigan for almost thirty years--we have paid taxes here, we have brought up a family, and we have seen our state go through wrenching changes. In the past our industrial base, our economy, has relied on the fortunes of a few large companies--in fact, one large industry. For most people, there was never any reason to be particularly entrepreneurial or to worry about anything more than occasional uptakes and downturns in the economy. Only during the last decade have many of us begun to understand that the old economy will never return, that even if our traditional industries become more successful, the huge economic base upon which all of our policies were formed will never return.

Michigan is midway through a several decade-long transition from a state dominated by a single industry and a few large companies to one dependent upon tens of thousands of small, dynamic companies competing in a broad spectrum of world markets. We are experiencing a transition from low-skill, high-pay jobs to high-skill, high-pay jobs (or, tragically, low-skill, "no" pay jobs); from a transportation industry state to an information industry state; and, as I noted, from the Industrial Age to the Age of Knowledge in which educated people and ideas have become the key strategic commodities determining economic prosperity, national security, and quality of life.

Until recently Michigan was not well-positioned to make this difficult transition since over the years our state tax policy, regulatory policy, social services, public investment strategy, and politics had evolved primarily to serve big business, big labor, big government--and, in reality, a single industry. Yet this old alliance--big business, big labor, and big government--was increasingly irrelevant to our future, although we were still propping it up.

It has been clear for some time that Michigan's future would be determined by our ability--rather our will--to take five critical steps:

1. To restructure our state.
2. To reemphasize the importance of quality education.
3. To generate the new knowledge necessary to stimulate the new industries and new jobs for Michigan's future.

4. To stop cutting and begin to invest once again in our future.
5. To build a new respect for and commitment to the achievement of quality in everything we do.

Let me explain.

Step 1: Restructuring

It was clear that our challenge was to **restructure** our state to create, attract, and support the tens of thousands of new companies on which our future would depend. We had to create an economic environment capable of enabling them to function in a rapidly changing, frighteningly competitive, and knowledge-intensive world marketplace. Michigan's challenge was not dissimilar to that faced by industrial corporations, by government, and by universities themselves. We had to restructure ourselves to serve the future rather than simply perpetuate the past.

Michigan's problems were not partisan. Nor were they political. Our problems could not be laid at foreign doors. Michigan's problems were **structural**. Our political and economic system were no longer capable of producing the revenues needed to meet the demands placed upon it. ■As a result of this fundamental structural inadequacy, we were being forced to meet our urgent current needs, to protect invaluable resources such as our schools, to balance our

current budget, by shifting burdens to future budgets, where they would become even more painful.□

We were held hostage by outdated tax and regulatory policies and a disturbing lack of understanding of what knowledge could do in creating economic growth. In this state, we simply were not increasing our base of knowledge quickly enough nor were we investing adequately in funding knowledge creation.

Like much of American industry, state government has become too large and bureaucratic, no longer responsible to its citizens. In his first term as Governor, John Engler took the very difficult and painful steps to turn that around. Nobody likes to do it, but it had to be done if we were to thrive again as a state.

In this effort, Governor Engler and his colleagues cut away much of the undergrowth that was clogging government and the economy. While it has been painful, over the last four years Michigan has indeed been unique among the states in its capacity to eliminate a massive funding deficit while holding the line on taxes, downsizing unnecessary government, and protecting education as its highest priority.

It should be noted that in this effort Governor Engler was guided by many of the same values and virtues that I have suggested throughout my own remarks. As he noted in his State of the State address two winter, he has embraced the founding principles in the Northwest Ordinance which gave rise to our state in the first place:

- Common values of faith and family
- Common sense to wisely spend no more than one can earn
- Common goals of educating our children and preparing them for the future

And that brings me to the second step:

Step Two: Education

One of the strongest beliefs I hold is that the key to economic growth is education, not economic development programs. Education is the only enterprise that will save us from becoming a backwater economy. It is a point of "lift off," from which we can create new markets, processes, and skills.

In an age of knowledge it has become the skills of the nation's work force and the quality of its infrastructure which give it the capacity to compete in the new world economy. Once again Governor Engler provided exceptionally strong leadership. He restructured and reformed the way we finance our schools, reformed the policies that constrained them, and created remarkable opportunities for innovation and experimentation through the Charter Schools program.

As a result, today we find ourselves closer to designing a system that lets students, teachers, and parents know what is expected of them--one that uses

international benchmarks to compare our schools. But we are still far from getting parents to understand that there indeed IS a problem, and we are still focused on school finance versus a clear vision of what will make better schools. Michigan children may be able to compete with children from Ohio, but they are far behind children in Tokyo and Beijing. K-12 reform is imperative, and that message must be delivered more forcefully not just in Lansing, but around the state.▮

But there is something else. Even if we are successful in our reform of K-12 education, it is clear that we must make additional investments to create the new jobs that can employ these graduates. These jobs presently do not exist in our state. And that leads me to a second critical area for strategic investment: research and development.

Step Three: Knowledge-Driven Economic Development

It is important to realize that increasing the competitiveness of existing industry, while perhaps retaining market share and sustaining profits, will NOT retain jobs (since doing things with less people is a frequently a key to increased productivity). Efforts such as total quality management, shorter cycle times, just-in-time inventory, will not create new jobs but, at best, will only preserve some existing jobs.

Rather, in an Age of Knowledge, new knowledge itself is necessary to create new jobs.

It seems increasingly clear that new jobs in Michigan are not going to be spawned by existing industry but instead will be created by entirely new activities, e.g., genetic medicine, biotechnology, information technology and computer networking, optics, lasers, ultra-high-speed technology, and automated manufacturing.

From this perspective it is clear that the most powerful economic engines in Michigan may well turn out to be our two great research universities: the University of Michigan and Michigan State University.

Why?

The key ingredients in technology-based economic development are: (1) technological innovation, (2) technical manpower, and (3) entrepreneurs. Research universities produce all three. Through their on-campus research, they generate the creativity and ideas necessary for innovation. Through their faculty efforts, they attract the necessary "risk capital" through massive federal R&D support. Through their education programs they produce the scientists, engineers, and entrepreneurs to implement new knowledge. And they are also the key to knowledge transfer, both through traditional mechanisms, such as graduates and publications, as well as through more direct contributions such as faculty/staff entrepreneurs, the formation of start-up companies, strategic partnerships, and so on.

There is ample evidence to support the impact of world-class research universities. We need only look at MIT's impact on the Boston area, Stanford and UC-Berkeley's impact on Northern California, Caltech's impact on Southern

California, and the University of Texas' impact on Austin. But there is an important lesson from these examples. Only world-class research universities are capable of major impact. A university must be able to play in the big leagues, to compete head-to-head with institutions such as MIT, Stanford, and Berkeley if it is to attract the outstanding faculty and students and massive resources necessary for technological leadership.

How many of you remember the colorful centerfold in the June 27, 1994, issue of *Fortune*. The graphic featured a map of the United States and pinpointed what *Fortune* referred to as "those glistening entrepots, all centers of knowledge-driven industry." Ann Arbor was the only city identified between the East Coast and Chicago. Ann Arbor was highlighted because of our leadership in the computer hardware and software industries.

This is really not so surprising because the University of Michigan ranks today as the leading research university in the nation – indeed the world. Through competitive federal grants and contracts, we receive \$450 million of venture capital annually.

We have in Ann Arbor and East Lansing the source of fundamental knowledge necessary to act as powerful job creation machines. A year or so I floated a proposal to take advantage of these extraordinary opportunities. I suggested we needed to develop a **University Enterprise Zone** in Ann Arbor and East Lansing where we would do everything possible to stimulate knowledge transfer and convert it into forms that benefit society--new companies, new jobs, new prosperity. We would form a partnership involving the University; local, state, and federal government; business and industry; organized labor; and our

financial institutions. All would commit themselves to adopting the best practices learned from other successful areas across the nation or around the world, from Portland to Austin to Route 128, from Hong Kong to Cambridge to Stuttgart.

We might think of the University Enterprise Zone as a type of free trade zone, free of excessive regulations, antiquated tax systems, adversarial labor-management relations. In this zone, strategic alliances would be formed through commitments from higher education, state and local government, organized labor, the business community, and the financial community.

For example, UM and MSU would commit themselves to:

- attracting key thought-leaders and entrepreneurs to Michigan
- making strategic investments in key intellectual areas
- building knowledgeable advisory boards of experts from around the world
- expanding its already successful efforts to secure more R&D funding from Washington and industry
- attracting the “venture capital” necessary for knowledge generation
- overhauling its knowledge transfer activities
- forming strategic alliances with other institutions
- creating more of a risk-taking, entrepreneurial culture among its faculty, staff, and students

State government would, in turn:

- make the strategic investments in both the operating budget and capital facilities necessary to sustain a world-class university
- assist with key university-industry partnerships
- protect start-up companies within the enterprise zone from excessive regulation and burdensome taxes

Local governments would:

- take a long-term, strategic view toward planning and economic development
- work on developing more cooperative relationships with the private sector
- make the necessary commitments to build a world-class K-12 school system

Private companies would:

- shift from a short-term, “what’s in it for me” attitude to a long-term strategic growth stance
- agree to participate with the University and government as partners, rather than using the public sector merely as a source of “deep pockets”

Organized labor would:

- agree to back off a bit
- allow small companies to grow, unfettered from suffocating

labor contracts

Financial institutions would:

- adopt a higher-risk, entrepreneurial strategy
- give higher priority to local economic development

In a sense, the concept of a “University Enterprise Zone” is really a challenge to both the public and private sectors, to state and local government to business and labor, and to our research universities themselves. It is a challenge to think and act more strategically. It is a challenge to position Ann Arbor as the economic engine of the midwestern United States.

Step 4: Investing in the Future

We also need to take a harder look at state spending policy generally, to ask the important question: What is the role of state government and how should resources be allocated? For decades Michigan was fabulously wealthy. We developed a culture of expensive practices and expectations: employee benefits, health care, social services, litigation. Yet today, as Michigan's economy attempts to adjust to the brave, new world of a knowledge-driven society, it still attempts to support a Cadillac appetite on a Ford income.

We are not investing our resources strategically. We are tending to deploy them to pay for past sins (corrections, social services, entitlements) or sustain and perpetuate the past (tax abatements) rather than investing in the future by creating new knowledge, new skills, and new jobs.

A case in point: the alarming erosion in public support of higher education in Michigan.

Despite the fact that Governor Engler has recognized the importance of education to Michigan's future and has protected it from the deep budget cuts experienced by other sectors of state government, higher education in Michigan has nevertheless seen hard times for the past two decades. In particular, the state has been systematically disinvesting during this period in its two major research universities, the University of Michigan and Michigan State University.

Our state once ranked among the national leaders in its support of higher education. During the 1970s and 1980s, Michigan fell to the bottom third of the states. In the early 1990s we moved up slightly--rather other states such as California plummeted past us as they struggled economic crisis. But today, they are moving back up, restoring their support of their universities, and Michigan is once again falling.

More specifically, in each of the past five years, our major research universities have experienced either frozen or sub-inflationary state appropriations, losing roughly 15% of its purchasing power (...for Michigan, a loss of \$35 million in annual support...)

Estimates of deferred maintenance on the 15 four-year campuses now exceed half a billion dollars.

Yet there is a certain irony here. During that same period, state support of our prison system has exploded and will pass the total dollars invested in higher

education in the next year or so. David Adamany notes that 10 years ago we had 15 public universities and 8 prisons. Today we still have 15 universities...but 35 prisons.

More to the point, this year the state will spend \$1.3 billion for the education of 250,000 college students, and essentially the same amount (\$1.2 billion) for the incarceration of 40,000 inmates.

Once again the same dilemma is painfully apparent: Michigan as a state has had great difficulty in achieving either an understanding or a willingness to invest in its future! Most states would give anything to build world-class research universities of the quality of MSU and UM. Yet, our state, for almost two decades, has ignored the needs of these marvelous institutions, forcing them to evolve from "state-supported" to "state-assisted" to "state-related" and perhaps eventually just to "state-located" institutions. This is a great tragedy and clearly reveals the bankruptcy of public policy over the past two decades, not to mention the tyranny of pork-barrel politics, which all too frequently turns the higher education appropriations process into something more like a football rivalry, pitting our 15 public universities against one another in a political arena, and doing great disservice to the future of higher education in Michigan.

One final comment: At a recent session of the National Science Board, Nobel Laureate Economist, Bob Solow, led a discussion with Laura Tyson on the economic rate of return on R&D investment. They noted that advances in knowledge, coming from basic science and science-based technology and moving through to product and process applications, are a major determinant of long-run living standards. It was increasingly clear that the fastest growing

companies and the fastest growing economies around the world are those that remain at the forefront of scientific discovery and technological innovation.

The average rate of return on capital investment in the United States today ranges from 10% to 14%.

In contrast, the private rate of return of R&D investments is now estimated to be 25% to 30%, twice as high.

Further, the social rate of return of R&D investments, that is the rate of return that accrues not just to one firm, but to many firms, industries, and consumers in the society is typically 50% to 60%, almost four times the rate for other types of investment.

The bottom line: Not investing in knowledge generation, in research and education is absolute lunacy in a knowledge-intensive society.

Step 5: A Respect For and Recommitment To Quality

You would think that the one lesson we should have learned during the 1980s--in Michigan of all places--is the importance of quality in everything we do, in everything we buy, sell, and produce. It is this culture of competence--a set of attitudes, expectations, and demands--that is often missing in America today. Ultimately, competence requires that people and institutions be held accountable for their performance. Competition helps improve performance. But too often we spend our time trying to protect ourselves from accountability and competition.

Further, we fall victim to those age-old forces of populism--a distrust of expertise and excellence. Dr. William Hubbard, former CEO of Upjohn, used to point to one of the great character flaws of the Midwest as "our extraordinary intolerance of extreme excellence."

We see these character flaws as well when it comes to key investments in our people, such as education and worker training. We seem hell-bent on insisting on bargain-basement prices, even if it means bargain-basement quality in the performance of our institutions or products and services. A couple of years back I actually had a state official (in the previous administration) say to me that quality was a luxury that students had no right to expect from a public university. If they wanted quality, they could pay the extra price to go to a private university. Worth noting is the guy who said this had gone to Harvard. I suppose this was his version of "let them eat cake."

Concluding Remarks

As I noted at the outset it is now painfully apparent that our state is in the midst of a profound transition. We are leaving behind our industrial economy, once prosperous due to an abundance of natural resources, unskilled labor, and--to some degree--constrained, slowly moving domestic markets. Our future will be quite different: Michigan must compete in a knowledge-based economy, characterized by intensely competitive world markets, rapid technological change, and--most important of all--its dependence upon educated people and their ideas. ■ This has not been--and this will not be--an easy transition to make. We face

another five to ten years of low economic growth as we make the transition to a knowledge economy.

The truth is that the outcome is still very much in doubt. Times are going to be much worse before they improve. Will we emerge from this transition, this time of trial, as a world economic leader once again, with a strong, prosperous--albeit new--economy producing jobs and improving our quality of life? Or will we fail to heed the warnings, fail to make the necessary investments and sacrifices today necessary for strength and prosperity tomorrow, and instead become an economic backwater in the century ahead?

Governor Engler has brought us a long ways over the past several years. He has tackled and solved some of our toughest problems. He has cut away the underbrush of outdated policies and bureaucracy. But now that the field has been cleared and the ground has been plowed, it is time to plant a new crop for the future. It is time to renew our investments in Michigan...for our children.

We have to roll up our sleeves and try new things, open our minds to new possibilities, try to understand what businesses need to grow, and take advantage of some of our greatest assets, such as the University of Michigan and Michigan State University. We must work together on a radical plan for our future. We must try to do what hasn't been done before, blaze new trails, encourage new industry to replace the old, and encourage individual initiative in the best American tradition. It is time to become a lean, mean, economic machine. That is what needs to happen. That must happen.

There is an old saying in politics: "Democracies always do the right thing . . . after they have tried everything else."

Well, I think that's where we find ourselves today.

We have tried everything else.

Now the time has come to do the right thing.

It's up to us. ▣