UMF Science Building Dedication

Introduction

The dedication of this facility is a very important event... not just for the UM-F campus...but for our state. Let me explain...

The view from Michigan..."the Rust Belt"...

While people generally look at the midwest as a relic of America's industrial past, let me suggest that in many ways, it can also be viewed as America's future.

For it is in the industrial midwest...in Michigan...

...a brave, new world of intense economic competition...

Familiar ills which dominate the headlines

- The budget deficit
- The trade deficit
- Displaced workers
- Original Industries

The bad news for Michigan is obvious...

Industries of great economic importance such as steel and automobiles have fallen victim to intense competition from abroad...

Plants have closed...our cities are filled with chronically unemployed...

In Michigan we no longer worry about nuclear war and the bomb because we believe that "The odds are greater that America will be bought up by the Japanese than blown up by the Russians."

What is happening?

The world economy is now in control

However, it is misleading to blame all our ills on international competitiveness alone!

Something else is happening...

The Challenge of Change

Traditional industry economy is shifting to a new knowledge-based economy, just as our industrial economy evolved from an agrarian society at the turn of the century.

A transition is occurring in which...

- Intellectual capital has replaced financial and physical capital as key to economic development
- In all developed countries, "knowledge" workers have already become the center of gravity of the labor force.
- As Erich Bloch, Director of the National Science Foundation puts it, we have entered a new age, an "Age of Knowledge in a Global Economy"
- And in this age, the major force behind economic change is technology, itself.

Clouds on the Horizon

Maintaining America's competitive edge requires attention to our traditional strength -- people and research -- and a strong offensive strategy based on these resources.

Taxes, trade, policies, influence economic competitiveness. But in the long run, a strong base of science
d engineering research and education is more important.

WARNING SIGN 1: We are seriously underinvesting in R&D and Education

For over two decades, US investment in civilian R&D has dropped while that of our competitor nations has risen rapidly. US investment in civilian R&D as a percent of GNP is now less than that of any other developed nation (and only 60% that of Japan and West Germany... )
Note: While midwestern states such as Michigan and Ohio have undertaken many important new initiatives, we still lag considerably behind areas such as California and New England in our investment in knowledge-based resources such as education. We've come a long way in the past few years, but we still have one hell of a long ways to go.

**WARNING SIGN 2: The S&E Pipeline Problem**

Today, an unprecedented explosion of knowledge marks the onset of a new era. Since people are the source of new knowledge, we will rely increasingly on a well-educated and trained workforce to maintain our competitive position in the world and our standard of living at home.

Previous economic transformations were closely associated with major public investment in infrastructure such as railroads, canals, electric networks, and highways.

In the coming economic transition, an equivalent infrastructure will be an educated population.

But things are going to get MUCH rougher: NSF Study

1. Demand for S&E likely to go up
   - Population is growing
   - S&E share of workforce is growing
   - Industry is becoming more scientific
   - Most experts predict growth in S&E!

2. Supply will probably fall off dramatically simply due to demographics...
   - Traditional source of S&E college students is declining
     - 25%-30% fall off in HS graduates by 1992
     - Assuming that same fraction (4.8%) choose to enter S&E, and assuming constant demand (very conservative), drop will be from 197,000 (83) to 152,000 in 1996; there will be a cumulative shortfall of 930,000 by 2010!

   To put it another way, fraction of students choosing S&E majors will have to increase by 40% to maintain even present level of graduates.

3. Trends in Intended Majors:
   - But this situation may become even worse:
     - Over period from 1966 to 1987, proportion of students who intended to major in physical sciences was dropped from 3% to 1.3%; in mathematics, the decline was from 4% to less than 1%.
     - Recent trends in engineering also show softening.
       - Applications to most engineering schools are down by 10-20% this year. (USC <0%)

4. Composition of college age population is also changing...
   - In 1966 44% of college freshmen were women; today 52%.
   - By 2020 30% will be composed of Blacks and hispanics...
   - Indeed, by the turn of the century, over 50% of K-12 students

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will be Black or Hispanic.
Less than 15% of new people entering the
labor force of the 1990s will be white males.
The fastest growing pool of youths has the lowest
participation rate in college and the highest dropout
rate in high schools -- not the mention the least
likelihood to study science and math.
NOTE: We must make special efforts to expand
participation by these groups...not just because that is
good social policy, but because we cannot afford to waste
their talents!

Conclusions:
i) If we couple demographics with student preferences, we have
got a timebomb on our hands...
ii) We must act rapidly...
First to plug up the leaks in the pipeline...
Then, over the longer term, to adapt the education system
in American to a changing population

WARNING SIGN 3: Technological Illiteracy
+ **We really haven't appreciated impact of technology.**

Today we are witnessing an unprecedented explosion of
knowledge.
Technology doubles every 5 years in some fields!
Graduates are obsolete by the time they graduate!
Technology change is a permanent feature of our environment
Examples of just the past few months:
i) hole in the ozone layer over Antarctica
ii) new supernovae in the heavens
iii) new high temperature superconductor
iv) a new theory suggesting that all matter is composed
   of infinitesimal "superstrings" rather than point particles

Yet, at the same time "ignorance is extraordinary!"
A recent NSF survey indicated that only 18% of those
asked said they knew how a telephone works -- and

'head 5 - only half of these gave the right answer.'head 4 + Yet
more than half of those surveyed indicated they 'head 5 - believe we
were being visited by aliens from outer space!
'head 3 + And yet, our education system has not responded..

Note: it is bad enough that...
10% of Americans are illiterate
25% now fail to complete high school
Scientific Literacy of J-12 Teaching Force
Only 30% have passed college chemistry
Only 20% have had college physics
Less than 50% have had calculus or computers

'head 4 + International Association for Evaluation of
Educational Achievement (IEA)
Grades 4, 8, and 12
US was 8th of 17 for 4th graders
US was 14th of 17 for 8th graders
US was 11-13 of 17 for 12th graders
Bottom 25% of US students were scoring at
chance level, indicating that they were
scientifically illiterate
'Top scores were Japan, Korea, Hungary
"For a technologically advanced country, it would
appear that a reexamination of how science is
presented and studied is required...in the
United States."
More than half of all our high school graduates have not had even one year of science.

Face it, gang:

The tragedy is not simply our poor showing relative to other nations. Science, mathematics, and computer literacy will increasingly become a requirement for almost all employment.

We are condemning an entire generation to a lifelong estrangement from the very technology that will inevitably govern their lives.

**WARNING SIGN 4: America's Work Force is Becoming Obsolete**

The education of the Michigan workforce is inadequate to the demands of the next century.

Michigan is undergoing dramatic change in industry...

Away from low-skill, blue-collar workers

Unskilled labor will lose relevance in a world dominated by microelectronics, computers, and automation.

The factory of the future will have NO low skill workers.

Statistical quality control and just-in-time inventory systems require production workers with mathematical abilities that are far beyond the present level.

An example: Expert systems

The "expert system" craftsman...

**Serious concern:**

Key input, however, is quality of the workforce.

Our principal competitors are simply producing workers better capable of absorbing modern production skills. The lack of these skills is preventing us from achieving the productivity gains that we should be getting.

It is bad enough to face the prospect of a significant fraction of our labor force becoming permanently unemployable because of an inadequate education. Do we want to condemn their children...OUR children...to a similar fate? Can we afford it?

**The State of Michigan Response**

What has been the response of Michigan to the challenge of change -- to the Age of Knowledge in a Global Economy...

The Michigan Strategy

Blessed with public leaders that recognized the challenge...

had the vision to develop a forward-looking strategy to respond...

and the courage and skills to implement this strategy...

Economic prosperity lies not in tearing down our old industrial base for a different kind of economy, but in helping that base make the changes necessary to compete in a new economic environment.

The goal: Michigan must become America's factory of the future...its source of emerging industrial technology...

Our ability to innovate will become our principal economic advantage...

innov...on will be the energy that drives change

**Development of Unique State-University Partnership**

Universities committed themselves to:

Strategically realigning activities into key thrust areas...had 5 - of major impor...nce to State...

Attracting leading scientists, engineers, and professionals to...taff these programs...

Developing new mechanisms for technology transfer...

State government committed itself to:

Establishing higher education in general and the state's research universities as a high priority

Providing seed...ources to sustain key thrust areas

Developing novel institutions to act as catalysts in these activities
State Actions:
Vision and courage of leaders in public and private sector
Recognized the importance of technology to Michigan's future...
Also, were willing to make the investments today necessary for Michigan's prosperity tomorrow...

Michigan is on the move!
State has taken strong first steps to rebuild capacity of its research universities to provide the knowledge-based resources so necessary to our long term well-being and prosperity.
Indeed, Michigan is rapidly becoming a model for the nation of the advent of an exciting new competitive age.
The state has assembled its tremendous assets and its people into a winning team involving state government, Michigan's colleges and universities, business, labor, and industry.

BUT, Michigan's efforts have just begun...
We still have far to go to counteract the crippling deterioration of public support experienced in the 1970s and 1980s.
1. While Michigan ranks 5th in tax revenue, we rank only 32nd in appropriations per student and only 37th in percentage of total appropriations allocated to higher education.
   Indeed, we have dropped to 32nd in tax revenue for higher ed--7.8%
   compared to 11.4% for California!
2. SRI Study suggests that we presently are underinvesting by as much as 30% in the knowledge infrastructure necessary to secure our state's future leadership and prosperity.
   We are being outspent by 30 - 40% in state support per student...
   Not simply by prosperous states like California...but by neighbors such as Indiana and Ohio!
3. In fact, the only area where we now lead the nation is in our prison system...
   We are now investing more in prisons than in higher ed...that is, we spend more money putting people into jail than we do in keeping them out of jail!

Intense international competition, turbulent markets, rapid technological change present new challenges to our future.
To stand still...to fail to make the investments in our research universities so necessary for tomorrow...is to lose the race for future prosperity and well-being of our citizens.
We really have no choice but to forge ahead, to pick up the pace, and to increase these investments in order to secure once again the position of leadership to which our state has long been accustomed.

Courage...
The renewed investment in higher education of recent years has taken extraordinary vision, courage, and determination on the part of state government, particularly during a period with many other competing demands and pressures.
However, it also seems clear that in the knowledge-intensive future that our state faces, we really have no choice but to sustain and increase these investments.
In the long run it will be our investments in the most important resources of all, in people and ideas, that will determine our future prosperity and well-being of our state.
As we enter the Age of Knowledge, our ability to sustain the strength of our nation...to achieve the quality of life for our citizens...will be determined by, more than any other educate that most
precious of resources, our people. We simply must provide them with the most outstanding education possible to prepare them for the age in which knowledge will hold the key to prosperity and quality of life...