

Executive Summary

Michigan's old manufacturing economy is dying, slowly but surely, putting at risk the welfare of millions of citizens in our state in the face of withering competition from an emerging global knowledge economy. For many years now we have seen our low-skill, high-pay factory jobs increasingly downsized, outsourced, and offshored, only to be replaced by low-skill, low-pay service jobs—or in too many cases, no jobs at all and instead the unemployment lines. Preoccupied with obsolete political battles, addicted to entitlements, and assuming what worked before will work again, Michigan today is sailing blindly into a profoundly different future.

Thus far our state has been in denial, assuming our low-skill workforce would remain competitive and our factory-based manufacturing economy would be prosperous indefinitely. Yet that 20th-century economy will not return. Our state is at great risk, since by the time we come to realize the permanence of this economic transformation, the out-sourcing/off-shoring train may have left town, taking with it both our low-skill manufacturing jobs and many of our higher-paying service jobs.

Michigan is certainly not alone in facing this new economic reality. Yet as we look about, we see other states, not to mention other nations, 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 profes-

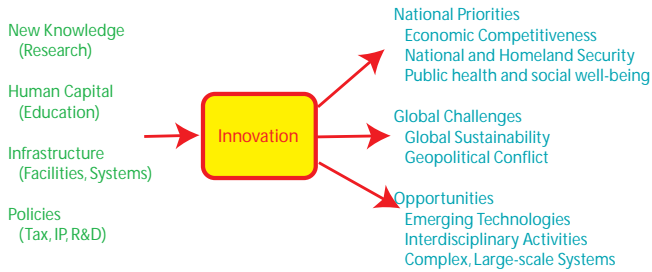
sional and technical services. From California to North Carolina, Bangalore to Shanghai, there is a growing recognition throughout the world that economic prosperity and social well-being in a global knowledge-driven economy require public investment in knowledge resources. That is, regions must create and sustain a highly educated and innovative workforce, supported through policies and investments in cutting-edge technology, a knowledge infrastructure, and human capital development.

Ironically, a century ago Michigan led the nation in building just such knowledge resources. It created a great education system aimed at serving all of its citizens, demonstrating a remarkable capacity to look to the future and a willingness to take the actions and make the investments that would yield prosperity and well-being for future generations. Yet today this spirit of public investment for the future appears missing. Decades of failed public policies and inadequate investment now threaten the extraordinary educational and knowledge resources built through the vision and sacrifices of past generations. Ironically, at a time when the rest of the world has recognized that investing in education and knowledge creation is the key to not only prosperity but, indeed, survival, too many of Michigan's citizens and leaders, in both the public and private sector, have come to view such investments as a low priority, expendable during hard times. The aging baby boomer population that now dominates public policy in our state demands instead expensive health care, ever more prisons, homeland security, and reduced tax burdens, rather than investing in education, innovation, and the future.

Beyond a commitment to educational opportunity, there is another key to economic prosperity: technological innovation. As the source of new products and services, innovation is directly responsible for the most dynamic sectors of the U.S. economy. Here our nation has a great competitive advantage, since our society is based on a highly diverse population, democratic values, and free-market practices. These factors provide an



Investing in human capital...and the future!



The Keys to Innovation

unusually fertile environment for technological innovation. Once again Michigan provided leadership in the 20th century, first putting the world on wheels and then becoming the arsenal of democracy.

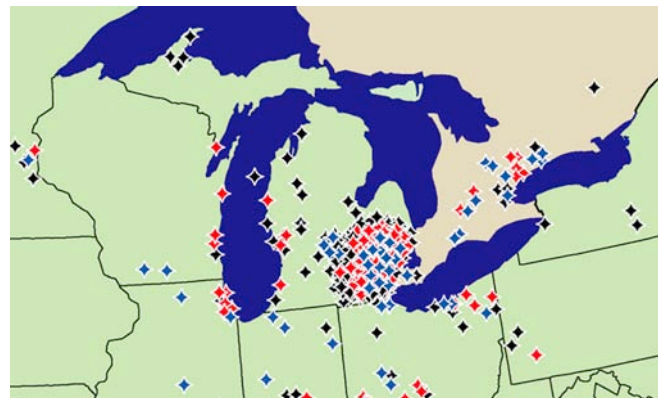
However, history has also shown that significant public investment is necessary to produce the essential ingredients for innovation to flourish: new knowledge (research), human capital (education), infrastructure (facilities, laboratories, communications networks), and policies (tax, intellectual property). Other nations are beginning to reap 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., Toyota) and through new paradigms such as the off-shoring of knowledge-intensive services (e.g., Bangalore, Shanghai). Yet again, at a time when our competitors are investing heavily in stimulating the technological innovation to secure future economic prosperity, Michigan is missing in action, significantly under-investing its economic and political resources in planting and nurturing the seeds of innovation.

Adequately supporting education and technological innovation is not just something we would like to do; it is something we have to do. What is really at stake here is building Michigan's regional advantage, allowing it to compete for prosperity, for quality of life, in an increasingly competitive world. In a knowledge-intensive society, regional advantage is not achieved through gimmicks such as lotteries and casinos. It is achieved through creating a highly educated and skilled workforce. It requires an environment that stimulates creativity, innovation, and entrepreneurial behavior. Specifically, it requires public investment in the ingredients of innovation—educated people and new knowledge. Put another way, it requires public purpose, policy, and

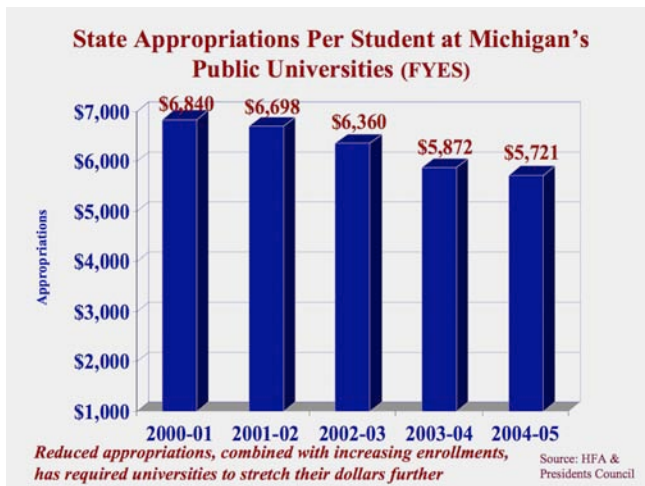
investment to create a knowledge society competitive in a global economy.

This study has applied the planning technique of *strategic roadmapping* to provide a framework for the issues that Michigan must face and the commitments that we must make, both as individuals and as a state, to achieve prosperity and social well-being in a global knowledge economy. The roadmapping process was originally developed in the electronics industry and is applied frequently to major federal agencies such as the Department of Defense and NASA. Although sometimes cloaked in 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, sometimes divided into those that can be accomplished in the near term and those that will require longer-term and sustained effort.

By any measure, the assessment of *Michigan today* is very disturbing. Our state is having great difficulty in making the transition from a manufacturing to a knowledge economy. In recent years we have led the nation in unemployment, and our leading city, Detroit, now ranks as the nation's poorest. Furthermore, the out-migration of young people in search of better jobs is the fourth most severe among the states; our educational system is underachieving with one-quarter of Michigan adults without a high school diploma and only one-third of



Michigan today: Still dependent on a factory economy as illustrated by automotive plant locations. (MDLEG)



Drastic cuts in state appropriations over the past five years are crippling the state's public universities.

high school graduates college-ready. Fewer than one-quarter of Michigan citizens have college degrees. Although Michigan's system of higher education is generally regarded as one of the nation's finest, the erosion of state support over the past two decades and most seriously over the past five years—with appropriation cuts to public universities ranging from 20% to 40%—has not only driven up tuition but put the quality and capacity of our public universities at great risk.

More generally, for many years Michigan has been shifting public funds and private capital away from investing in the future through education, research, and innovation to fund instead short term priorities such as prisons while inacting tax cuts that have crippled state revenues. And all the while, as the state budget began to sag and eventually collapsed in the face of a weak economy, public leaders were instead preoccupied with fighting the old and increasingly irrelevant cultural and political wars (cities vs. suburbs vs. exurbs, labor vs. management, religious right vs. labor left). In recent years the state's motto has become "Eat dessert first; life is uncertain!" Yet what Michigan has really been consuming is the seed corn for its future.

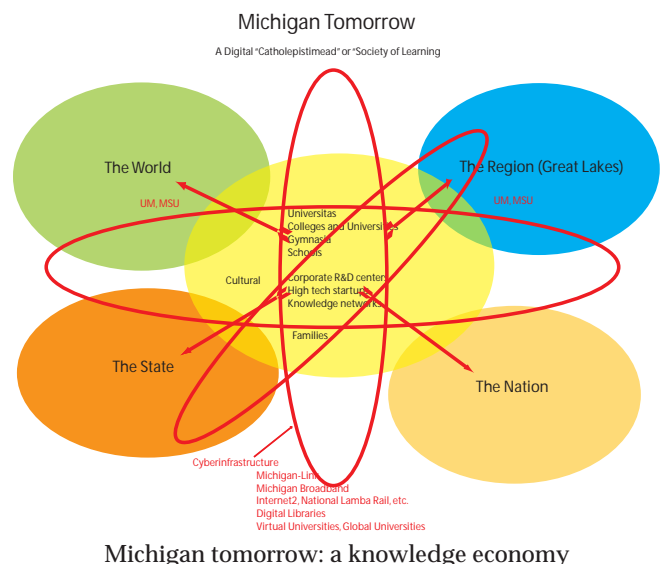
A vision for *Michigan tomorrow* can best be addressed by asking and answering three key questions:

1. *What skills and knowledge are necessary for individuals to thrive in a 21st-century, global, knowledge-intensive society?* Clearly a college education has become mandatory, probably at the bachelor's level, and for many,

at the graduate level. Beyond this goal, the state should commit itself to providing high-quality, cost-effective, and diverse educational opportunities to all of its citizens throughout their lives, since during an era of rapid economic change and market restructuring, the key to employment security has become continual, lifelong education.

2. *What skills and knowledge are necessary for a population (workforce) to provide regional advantage in such a competitive knowledge economy?* Here it is important to stress that we no longer are competing only with Ohio, Ontario, and California. More serious is the competition from the massive and increasingly well-educated workforces in emerging economies such as India, China, and the Eastern Bloc. For such knowledge workers, there is little distinction between work and education, since rapid technological change in a global economy requires the continuous improvement of workforce skills.

3. *What level of new knowledge generation (e.g., R&D, innovation, entrepreneurial zeal) is necessary to sustain a 21st-century knowledge economy, and how is this achieved?* Here it is increasingly clear that the key to global competitiveness in regions aspiring to a high standard of living is innovation. And the keys to innovation are new knowledge, human capital, infrastructure, and forward-looking public policies. Not only must a region match investments made by other states and nations in education, R&D, and infrastructure, but it must



recognize the inevitability of new innovative, technology-driven industries replacing old obsolete and dying industries as a natural process of “creative destruction” (*a la* Schumpeter) that characterizes a hypercompetitive global economy.

So *how far does Michigan have to travel* to achieve a knowledge economy competitive at the global level? What is the gap between Michigan today and Michigan tomorrow? This part of the roadmapping process does not require a rocket scientist. One need only acknowledge the hopelessness in the faces of the unemployed, or the backward glances of young people as they leave our state for better jobs, or the angst of students and parents facing yet another increase in college costs as state government once again cuts appropriations for higher education. To paraphrase Thomas Friedman, “The world is flat! Globalization has collapsed time and distance and raised the notion that someone anywhere on earth can do your job, more cheaply. Can Michigan rise to the challenge on this leveled playing field?”

So, what do we need to do? What is the *roadmap to Michigan’s future*? In a knowledge-intensive economy, regional advantage in a highly competitive global marketplace is achieved through creating a highly educated and skilled workforce. It requires an environment that stimulates creativity, innovation, and entrepreneurial behavior. Experience elsewhere has shown that visionary public policies and significant public investments in high-skilled human capital, research and innovation, and infrastructure are necessary to sustain a knowledge economy.

The Roadmap: The Near Term (...now!...)

For the near term our principal recommendations focus on changing policies for investing in higher education, research, and innovation, while providing our institutions with the capacity to become more agile and market-smart.

Human Capital

1. *Michigan simply must increase the participation of its citizens in higher education at all levels—community college, baccalaureate, and graduate and professional degrees. This will require a substantial increase in the funding of higher*

education from both public and private sources as well as significant tax revenues to achieve and secure the necessary levels of investment during a period of gridlock in state government, perhaps through a citizen-initiated referendum. This, in turn, will require a major effort to build adequate public awareness of the importance of higher education to the future of the state and its citizens.

2. *To achieve and sustain the quality of and access to educational opportunities, Michigan needs to move into the top quartile of states in its higher education appropriations (on a per student basis) to its public universities. To achieve this objective, state government should set a target of increasing state appropriations for higher education by 10% over the next five years.*

3. *The increasing dependence of the knowledge economy on science and technology, coupled with Michigan’s relatively low ranking in percentage of graduates with science and engineering degrees, motivates a strong recommendation to state government to place a much higher priority on providing targeted funding for program and facilities support in these areas in state universities, similar to that provided in other leading states. A major effort should be directed toward K-12 to encourage and adequately prepare students for science and engineering studies, including incentives such as forgivable college loan programs in these areas (with forgiveness contingent upon completion of a science or engineering degree).*



New engineering students

state government should strongly encourage public universities to recruit science and engineering students from other states and nations, particularly at the graduate level, perhaps even providing incentives if they accept employment following graduation with Michigan companies.

4. Colleges and universities should place far greater emphasis on building alliances that will allow them to focus on unique core competencies while joining with other institutions in both the public and private sector to address the broad and diverse needs of society in the face of today's social, economic, and technological challenges while addressing the broad and diverse needs of society. For example, research universities should work closely with regional universities and independent colleges to provide access to cutting-edge knowledge resources and programs.

New Knowledge (R&D, innovation)

5. The quality and capacity of Michigan's learning and knowledge infrastructure will be determined by the leadership of its public research universities in discovering new knowledge, developing innovative applications of those discoveries that can be transferred to society, and educating those capable of working at the frontiers of knowledge and the professions. State government should strongly support the role of these institutions as sources of advanced studies and research by dramatically increasing public support of research infrastructure, analogous to the highly successful Research Excellence

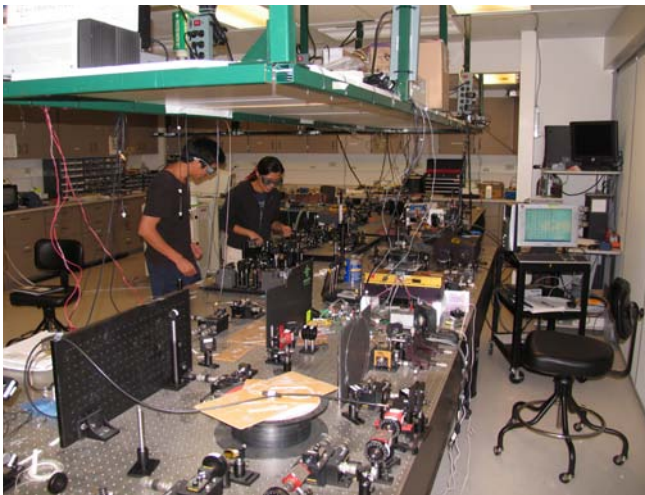
Fund of the 1980s. Also key will be enhanced support of the efforts of regional colleges and universities to integrate this new knowledge into academic programs capable of providing lifelong learning opportunities of world-class quality while supporting their surrounding communities in the transition to knowledge economies.

6. In order to maximize the productivity of Michigan's universities, they, in turn, must become more strategically engaged in both regional and statewide efforts to attract and support high-tech start-ups. Universities should be encouraged to participate in the startup and spinoff of high-tech companies, and to leverage their own assets (e.g., endowment funds) in state- and region-based venture capital activities. Furthermore, universities and state government should work more closely together to go after major high tech opportunities in both the private sector (attracting new knowledge-based companies) and federal initiatives).

7. Michigan must also invest additional public and private resources in private-sector initiatives designed to stimulate R&D, innovation, and entrepreneurial activities. Key elements would include reforming state tax policy to encourage venture capital, state participation in cost-sharing for federal research projects, and a far more aggressive and effective effort by the Michigan Congressional delegation to attract major federal research funding to the state.

Education and Research Infrastructure

8. Providing the educational opportunities and new knowledge necessary to compete in a global, knowledge-driven economy requires an advanced infrastructure: educational and research institutions, physical infrastructure such as laboratories and cyberinfrastructure such as broadband networks, and supportive policies in areas such as tax and intellectual property. Michigan must invest heavily to transform the infrastructure for a 20th-century manufacturing economy into that required for a 21st-century knowledge economy. Of particular importance is a commitment by state government to provide adequate annual appropriations for university capital and research infrastructure.



Ultra-high power laser laboratory

also important for both state and local government to play a more active role in stimulating the development of pervasive high speed broadband networks, since experience suggests that reliance upon private sector telcom and cable monopolies could well trap Michigan in a cyberinfrastructure backwater relative to other regions (and nations).

Policies

9. As powerful market forces increasingly dominate public policy, Michigan's higher-education strategy should become market-smart, investing more public resources directly in the marketplace through programs such as vouchers, need-based scholarships, and other programs that enable public colleges and universities to compete in this market-driven environment. This includes innovation in pricing, programs, and quality aspirations.

10. Michigan should target its tax dollars more strategically to leverage both federal and private-sector investment in education and R&D. For example, a shift toward higher income tax rates on high-income students avoids unnecessary subsidy of high-income students. Furthermore greater state investment in university research capacity would leverage greater federal and industrial support of campus-based R&D.

11. Key to achieving the agility necessary to respond to market forces will be a new social contract negotiated between the state government and Michigan's public colleges and universities, which provides enhanced market agility in return for greater (and more visible) public accountability. This includes greater transparency in rates, student socioeconomic backgrounds, and intellectual property generated through research and transferred into the marketplace.

The Roadmap (longer term...but within a decade...)

For the longer term, our vision for the future of higher education is shaped very much by the recognition that we have entered an age of knowledge in a global economy, in which educated people, the knowledge they produce, and the innovation and entrepreneurial skills they possess have become the keys to

economic prosperity, social well-being, and national security. Moreover, education, knowledge, innovation, and entrepreneurial skills have also become the primary determinants of one's personal standard of living and quality of life. We believe that democratic societies—including state and federal governments—must accept the responsibility to provide all of their citizens with the educational and training opportunities they need, throughout their lives, whenever, wherever, and however they need it, at high quality and at affordable prices.

To this end, the long-term roadmap proposes a vision of the future in which Michigan strives to build a knowledge infrastructure capable of adapting and evolving to meet the imperatives of a global, knowledge-driven world. Such a vision is essential to create the new knowledge (research and innovation), a skilled workforce, and the infrastructure necessary for Michigan to compete in the global economy while providing citizens with the lifelong learning opportunities and skills they need to live prosperous and secure lives in our state. As steps toward this vision, we recommend the following actions:

- 1. Michigan needs to develop a more systemic and strategic perspective of its educational, research, and cultural institutions—both public and private, formal and informal—that views these knowledge resources as comprising a knowledge ecology that must be allowed and encouraged to adapt and evolve rapidly to serve the needs of the state in a change driven world, free from micromanagement by state government or intrusion by partisan politics.



Diverse institutions for diverse needs.

2. Michigan should strive to encourage and sustain a more diverse system of higher education, since institutions with diverse missions, core competencies, and funding mechanisms are necessary to serve the diverse needs of its citizens, while creating a knowledge infrastructure more resilient to the challenges presented by unpredictable futures. Using a combination of technology and funding policies, efforts should be made to link elements of Michigan's learning, research, and knowledge resources into a market-responsive seamless web, centered on the needs and welfare of its citizens and the prosperity and quality of life in the state rather than the ambitions of institutions and political leaders.

" "Gf]ci g' Wbg]XfU]cb g'ci `XVY[]j Yb`lc`fYwbU]i f-ing Michigan's educational enterprise by exploring new paradigms based on the best practices of other regions and nations. For example, the current segmentation of learning (e.g., primary, secondary, collegiate, graduate-professional, workplace) is increasingly irrelevant in a competitive world that requires lifelong learning to keep pace with the exponential growth in new knowledge. More experimentation both in terms of academic programs and institutional types should be encouraged.

4. The quality and capacity of Michigan's learning and knowledge infrastructure will be determined by the leadership of its two AAU-class research universities, UMAA and MSU, in discovering new knowledge, developing innovative applications of these discoveries that can be transferred to society, and educating those capable of working at the frontiers cZ_bck` YX`YUbXh`YdfcZgg]cbg"-b`h`lgg`bgYI A 55`UbX MSU should be encouraged to evolve more toward a "universitas" character, stressing their roles as sources of advanced knowledge and learning rather than focusing on providing general education (or socialization) at the undergraduate level.

) " K` \]Y`]h`]g`bUi`fU`lc` WbU`bY`g`U`Y`dc`]W`h`c`g`U`Y` boundaries, in reality such geopolitical boundaries are of no more relevance to public policy than they are to corporate strategies in an ever more integrated and interdependent global society. Hence Michigan's strategies must broaden to include regional, national, and global elements, including the dgg]V`]lmcZ`bW`fU`]b[`h`Y`g`U`M`g`h`k`c`U`j`g`d`f`y`g`U`W` universities, the University of Michigan and Michigan State University, to join together to form a true world university,

capable of assisting the state to access global economic and human capital markets.

6. Michigan's research universities should explore new models for the transfer of knowledge from the campus into the marketplace, including the utilization of endowment capital (perhaps with state match) to stimulate spinoff and startup activities and exploring entirely new approaches such as "open source - open content paradigms" in which the intellectual property created through research and instruction is placed in the public domain as a "knowledge commons," available without restriction to all, in return for strong public support.

7. Michigan should explore bold models aimed at producing the human capital necessary to compete economically with other regions (states, nations) and provide its citizens with prosperity and security. Lifelong learning will not only become a compelling need of citizens (who are only one paycheck away from the unemployment line in a knowledge-driven economy), but also a major responsibility of the state and its educational resources. One such model might Ylc`Xy`Ycd`U&g`H`W`b`h`f`m`L`b`U`c`]`lc`h`Y;`"="6]`c`Z`h`Y`d`c`g`i` K`K`="f`U`h`U`h`k`ci`X`d`f`c`j`]X`i`]b`X`Y`X`Z`[`i`L`F`U`b`h`Y`i`U`A`]W`]-gan citizens with access to abundant, high-quality, diverse learning opportunities throughout their lives, and adapts to their ever-changing needs

8. Michigan should develop a leadership coalition-involving leaders from state government, industry, labor, education, UbX`W`b`W`f`b`Y`X`W`h`n`b`g`k`]h`j`]g`cb`UbX`W`i`f`U`Y`g`Z`U`M`b`h`lc` challenge and break the stranglehold of the past on Michigan's future!

Although this roadmapping exercise was for a specific state, we believe it offers a possible model of how regions can utilize the roadmapping process to develop their own unique paths to future prosperity, security, and social well-being for their citizens. We are currently engaged in further studies about how such regional technology roadmapping efforts can be applied to multiple-state regions or even nation-states. In an Epilogue section, we have suggested broadening this roadmapping activity to include the entire Great Lakes region, encompassing those states that once comprised the manufacturing center of the world. We suggest that



Roadmapping for the Great Lakes states
(Scott Swanm, CSCAR, 2003)

these states could build on the unique capacity of the region's flagship research universities to build strong regional advantage in a global, knowledge-driven economy. While such a regional plan would require considerable leadership at the level of both the state (governors) and higher education (university leaders), it could be the key to the economic future of the Great Lakes states.

Finally, a word about the target audience for this study. The Michigan Roadmap is intended in part for leaders in the public sector (the Governor, Legislature, and other public officials), the business community (CEOs, labor leaders), higher education leaders, and the nonprofit foundation sector. However, this report is also written for those interested, concerned citizens who have become frustrated with the deafening silence about Michigan's future that characterizes our public, private, and education sectors. The state's leaders, its government, industry, labor, and universities, have simply not been willing to acknowledge that the rest of the world is changing. They have held fast to an economic model that is not much different from the one that grew up around the heyday of the automobile era—an era that passed long ago.

Michigan is far more at risk than many other states because its manufacturing-dominated culture is addicted to an entitlement mentality that has long since disappeared in other regions and industrial sectors.

Moreover, politicians and the media are both irresponsible and myopic as they continue to fan the flames of the voter hostility to an adequate tax base capable of meeting both today's urgent social needs and longer-term investment imperatives such as education and innovation. As Bill Gates warned, cutting-edge companies no longer make decisions to locate and expand based on tax policies and incentives. Instead they base these decisions on a state's talent pool and culture for innovation—priorities apparently no longer valued by many of Michigan's leaders, at least when it comes to tax policy.

To be sure, it is difficult to address issues such as developing a tax system for a 21st-century economy, building world-class schools and colleges, or making the necessary investments for future generations in the face of the determination of the body politic still clinging tenaciously to past beliefs and practices. Yet the realities of a flat world will no longer tolerate procrastination or benign neglect. In Chapter 7 we have broadened the discussion to suggest several ideas for breaking this public policy logjam to facilitate the implementation of the recommendations of the Michigan Roadmap.

Finally, it should be acknowledged that much of the rhetoric used in this report is intentionally provocative—if not occasionally incendiary. But recall here that old saying that sometimes the only way to get a mule to move is to whack it over the head with a 2x4 first to get its attention. The Michigan Roadmap is intended as just such a 2x4 wake-up call to our state. For this effort to have value, we believe it essential to explore openly and honestly where our state is today, where it must head for tomorrow, and what actions will be necessary to get there. Michigan simply must stop backing into the future and, instead, turn its attention to making the commitments and investments today necessary to allow it to compete for prosperity and social well-being tomorrow in a global, knowledge-driven economy.

Recommendations

The Near Term

Today's Challenge: Enabling Michigan's transition to a knowledge-driven economy capable of providing prosperity, security, and social well-being in a hypercompetitive global economy.

Key Vision:
To invest more adequately, strategically, and intelligently.

Investment Goals:
 ... human capital (lifelong learning)
 ... new knowledge (research, innovation, entrepreneurship)
 ... infrastructure (institutions, labs, cyber)
 ... policy (tax, investment, intellectual property)

The Elements:

1. Increase participation of all citizens in higher education.
2. Move Michigan into top quartile in higher ed investments.
3. Targeted state investment in science and engineering.
4. Stress alliances among Michigan's colleges and universities.
5. Michigan should increase investments in university research infrastructure (similar to Research Excellence Fund).
6. Michigan universities should become more engaged in tech transfer and economic development.
7. Michigan should develop incentives (including tax policy) to stimulate private sector R&D and innovation.
8. Public investment in infrastructure such as broadband is critical.
9. Michigan should invest more in higher education marketplace (particularly need-based financial aid).
10. State funds should be used to leverage private and federal funds.
11. State universities should be provided with agility to adapt to market, subject to accountability measures.

The Longer Term

Tomorrow's Challenge: To provide all of Michigan's citizens with the education and training they need, throughout their lives, whenever, wherever, and however they desire it, at high quality, and affordable cost.

Key Vision: To develop a knowledge society capable of responding to the imperatives of a 21st century, global, knowledge-driven society.

Goal: A society of learning, capable of adapting and evolving rapidly to provide learning opportunities, knowledge, and innovation during a period of extraordinary change.

The Elements:

1. Michigan must develop a more systemic and strategic approach to its knowledge resources.
2. The state should encourage more diversity in institutions.
3. New paradigms for K-16 education should be explored.
4. UM and MSU should be encouraged to stress advanced education and research.
5. UM and MSU should be encouraged to develop capacity to access global markets.
6. Michigan's universities should explore bolder models of tech transfer, spinoffs, and startup activities.
7. Michigan should consider bolder models for producing human capital such as a 21st century version of the G.I. Bill that guarantees lifelong educational opportunities for all citizens.