RECOMMENDATIONS FOR A

Minnesota Science & Technology Initiative

Submitted to the Minnesota Legislature January 15, 2010

By the Minnesota Science and Technology Economic Development Project Committee

Pursuant to Minnesota Statutes 116J.658

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Commissioner, Department of Employment and Economic Development

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Managing Partner, Magnet 360

Executive Summary

Minnesota faces a crisis of competitiveness. Once a state that led the nation in science and technology (S&T) innovation, Minnesota now ranks 14th-17th and is accelerating downward in key measures of S&T leadership. (See appendices) Global competition has increased as well, making it difficult for the United States as a whole to maintain its leadership.

Science and technology directly impact the quality of life of every individual in our state and our nation. Planning and investment in S&T impact every industry from manufacturing to agriculture to support services. More importantly, S&T leadership is a prime engine, arguably the prime engine, for robust, self-sustaining economic development and growth. High paying technology jobs and productivity through innovation become the fuel for the economy by putting significantly more dollars into all hands in a local region.

From struggling former Rust Belt states such as Ohio to established high-tech leaders like Massachusetts, states are investing as much as $1 billion or more in science and technology initiatives in aggressive efforts to create jobs and drive long-term, sustainable economic growth. Evidence of the economic benefits of coordinated S&T planning and investments is readily available from a review of the experiences of many states that have already implemented state-supported initiatives. Examples of Return on Investment (ROI) results include:

- Ohio has estimated that the state's expenditures of $681 million under the auspices of the Ohio Third Frontier project have generated $6.6 billion of economic activity, 41,300 jobs and $2.4 billion in employee wages.
- For every dollar invested by the Oklahoma legislature in OCAST (Oklahoma Center for the Advancement of Science & Technology) Oklahoma has realized an average of $18 in return.
- North Carolina has invested more than $1 billion in its expanding biotechnology enterprise during the past 10 years, and the annual economic impact exceeds $45 billion.
- Texas brought more than 51,000 jobs and more than $13.6 billion in capital investment as a direct result of its Texas Enterprise Fund, only one of several S&T-based economic development strategies enacted by the state legislature.

It is our consensus that Minnesota's competitiveness, economic well-being and future are imperiled by the lack of a Science & Technology economic development plan. **It is imperative that the Minnesota Legislature establish and fund a Science and Technology economic development initiative.** We recommend an initial appropriation of $500,000, with subsequent recommended funding levels to be determined. This major, multi-year

initiative would guide investments, incentives and programs that would enhance Minnesota's competitive position relative to other states that have already embraced the need to support their future economic positions through comprehensive S&T strategic plans. The initiative would be governed by a public/private authority charged with the design, implementation and governance of a comprehensive science and technology strategic initiative to ensure national and global competitiveness and robust job creation, as described in greater detail in our full report. This initiative should transcend the biennial budget process.

The Minnesota Science and Technology Initiative proposed in this report reflects our review and analysis of best practices implemented in other states that we believe have formalized the right kind of governance, funding strategies, private-public collaborations and long-term outcome measures to optimize economic benefit in the type of science and technology rich economic environment typical of the state of Minnesota. Ultimately, implementation of the Initiative should contribute to:

- Making Minnesota a recognized leader in science and technology-based economic development,
- Creating a culture of innovation, an entrepreneurial ecosystem, which fosters commercial success, and
- Positioning Minnesota to be competitive for a National Lab, or Centers of Technological Excellence.

As detailed in the report, governance of the Minnesota Science and Technology Initiative would consist of two legislatively-created bodies:

- A permanent private-sector based Commission charged with fiduciary responsibility for legislatively appropriated funds and with defining strategies and policies for disbursement of funds consistent with the Initiative's economic development objectives; and
- A science and technology Advisory Board – in composition very similar to the committee which has prepared these legislative recommendations – charged with the operational management of the initiative's programs and development of recommendations for new programs to support the plan through its multi-year mission.

To capitalize on the groundwork already laid by the Science and Technology Economic Development Project, we further recommend that the project's committee members be appointed as members of the initial Minnesota Science and Technology Advisory Board and be charged with submission of a comprehensive plan for legislative consideration and possible implementation by July 2011. Integral to the completion of the full plan by the Advisory Board would be legislative funding in this session to support staffing of this effort.

To be successful, Minnesota's Science and Technology Initiative must be comprehensive, containing a full spectrum of carefully-designed programmatic elements and corresponding performance metrics, consistent with the best practices in other states. A detailed design of elements and metrics will require additional time for the Advisory Board. However, there are tangible programmatic elements vital to the overall effort that can and should be considered for enactment and implementation in the current legislative session.

Below are key recommendations for specific legislative priorities in keeping with the S&T initiative that we believe should be aggressively pursued in this session:

- Implementation and augmentation of tax credits to induce new investment and job growth
    a. Establishment of an "angel" investment tax credit for investors in early-stage companies.
    b. Expansion of the research and development tax credit.
    c. Establishment of a Small Business Investment Program (CAPCO) to induce insurance companies to invest in early-stage companies.

- Fund mechanisms that attract and retain science and technology companies and individuals to Minnesota such as funding for incentives to capture new business growth.

Conclusion

It is important that Minnesotans, legislators paramount among them, recognize the crisis confronting Minnesota's economic future and commit to implementation of a systematic, coordinated science and technology strategy of investment, supportive public policy and effective public-private partnerships in order to avoid losing further ground in key measures of economic success. Ensuring future success calls for vision, investment and structure – and the patience to stay the course for the long-term. As demonstrated in many other states that have launched major science and technology initiatives, the benefits of such plans require years to materialize, but the measurable impacts have been sizable. The purpose of this report is to strongly encourage passage of legislation, identify other public and private actions, and support investment incentives as parts of an ambitious and energetic plan to bring Minnesota back to the top, nationally and globally, in science and technology. Minnesota needs to seize the opportunity to act now. These recommendations – if implemented – represent the potential for Science and Technology innovation, leadership, action, investment, and job creation.

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Regaining Economic Leadership
Minnesota's Science & Technology Future

Minnesota faces a crisis of competitiveness. Once a state that led the nation in science and technology (S&T) innovation, Minnesota now lags far behind other states and regions in key measures of S&T leadership.

Why is a science and technology plan important?

Science and technology directly impact the quality of life of every individual in our state and our nation. It impacts every industry, from manufacturing to agriculture to support services. More importantly, S&T leadership is a prime engine, arguably the prime engine, for robust, self-sustaining economic development and growth. High paying technology jobs and productivity through innovation become the fuel for the economy by putting significantly more dollars into all hands in a local region.

Twenty years ago, Minnesota held a premier technology rank in the United States as the center of the computer industry that was largely founded in the state. As this industry evolved, the technology base shifted to other regions of the country along with a significant portion of the associated high-caliber talent. Partially as a consequence, less than 6 percent of the Minnesota workforce is employed in high-technology positions today. Largely as a result of a failure to plan for the long-term, our economy has paralleled the high-technology migration out of the state. In sharp contrast to Minnesota, other states have executed clear robust strategies to induce high technology saturation in their region thereby solidifying their position in the high-technology economy and producing significant growth of their state's economy. For example:

- Ohio has estimated that the state's expenditures of $681 million under the auspices of the Ohio Third Frontier project have generated $6.6 billion of economic activity, 41,300 jobs and $2.4 billion in employee wages.
- For every dollar invested by the Oklahoma legislature in OCAST (Oklahoma Center for the Advancement of Science & Technology) Oklahoma has realized an average of $18 in return.
- North Carolina has invested more than $1 billion in its expanding biotechnology enterprise during the past 10 years, and the annual economic impact exceeds $45 billion.
- Texas brought more than 51,000 jobs and more than $13.6 billion in capital investment as a direct result of its Texas Enterprise Fund, only one of several S&T-based economic development strategies enacted by the state legislature.

What are the key components and capabilities needed to build a strong science and technology plan?

Economic growth and development is increasingly associated with S&T leadership in the progressively hyper-competitive regional, national and global economies. Failure to aggressively compete and lead with respect to S&T strategies means that the state will, by default, cede potential economic growth opportunities to other states and regions. Like other states in the Midwest, Minnesota must overcome other regional, endemic and relational circumstances in order to compete with active S&T economies on the coasts. The impact of such challenges as: the debilitating distance from the existing recognized technology corridors on the East and West Coasts, the absence of federal research labs, and a dearth of federal tax dollars in comparison to other states, just to name a few, will only be compounded by the lack of effective statewide planning and strategy development. These recognized structural limitations that inhibit Minnesota's S&T competitiveness – when combined with the stiff competition from over two-thirds of the states in the union – only serve to underscore the urgency for Minnesota to aggressively secure a prosperous position in the present and future high-tech economy. While to its credit Minnesota has invested public and private capital in a variety of worthy areas other than S&T directly, other states and regions that have embarked on ambitious economic development plans principally focused on science and technology recognize the centrality of such efforts to their economic future. Minnesota must also heed the call while there is still time to reverse current declining economic trends in the state.

This committee, as detailed by legislation from Minnesota's 2009 State Legislature, has been empanelled to "advise state agency collaboration to design, coordinate, and administer a strategic science and technology program for the state" focusing on five key components of the State's science and technology economy:

- High Technology Research and Development Capabilities
- Product and Process Innovation and Commercialization
- High Technology Manufacturing Capabilities
- Science and Technology Business Environment
- Science and Technology Workforce Preparation

How is Minnesota performing with regard to these factors?

Minnesota has historically ranked high in areas pertaining to "Quality of Life." The state performs well in surveys around life satisfaction, work quality, healthy behavior, physical health, emotional health and basic access to food and shelter:

- Forbes – 2008 Best US Cities to Earn a Living – 2nd: Minneapolis/St. Paul
- Sperling's Best Places – 2009 Happiest City for Families – 1st: Minneapolis/St. Paul
- 2009 Hotspots for Young, Talented Workers – 2nd & 5th: Minneapolis/St. Paul

However, financial security and the ability to earn a livable wage certainly impact long-term quality of life. Minnesota has dropped in ranking in the factors contributing to recruitment and retention of successful companies and jobs. The state has also dropped in prognosticators of future success in the "New Economy" – an economy that is knowledge-dependent, global, technology-based, entrepreneurially rooted in information technologies and driven by innovation:

- Drop in Forbes' rankings for "Best Places for Business and Careers" from 20th in 2003, to 71st in 2008.
- Minnesota ranked 14th overall in the State New Economy index which is down 3 positions from 2002.

High Technology Research and Development Capabilities

Having a strong, adaptable R&D ecosystem is a key part of building and executing a state's overall science and technology plan. The system must include both corporate and academic components with active collaborations between the two, as well as systematic involvement with and support from state government entities and elected officials. The state can and should provide public investment to energize these collaborations through funding for R&D matching grants and infrastructure, and through fiscal policies that promote R&D business creation, incentivize R&D programs within existing businesses and facilitate technology transfer as R&D matures. The state's elected leadership (of both state and national legislatures) should also be assertive champions for stronger federal funding to the state for R&D capabilities and research grants across a variety of markets.

Currently in Minnesota, none of these elements are taking place in a coordinated fashion that can be relied upon to foster measurable economic growth, nor are there any significant plans to do so. This is particularly troubling at a time when many other states and regions have embarked, or are embarking, on dynamic and well-funded R&D initiatives. While Minnesota has a legacy of R&D innovation and still excels in some areas (the medical device industry

remains relatively vibrant but vulnerable), the state is losing ground to other states and regions because of the lack of a coordinated vision and executable plan to ensure a world-class environment for innovative and commercializable R&D.

Current statistics include:

- Minnesota ranks 6th in the area of "Industry Investment in R&D," but 43rd in the area of "Non-industry Investment in Research."
- Minnesota has no federal research labs in the state, and very few relationships with federal labs in other states.
- Minnesota has no significant research parks or R&D centers of excellence, nor are there any organized plans to create them.
- The medical technology industry is growing at a rate of 15 percent per year nationally, but Minnesota is barely participating in that growth.
- Biologic and biopharmaceutical products are converging with medical devices. Minnesota is not a leader in the convergence of these industries and is at risk of losing its dominant role in the device industry.
- Minnesota ranks 25th for federal R&D expenditures at universities.

Product and Process Innovation and Commercialization

Research alone is insufficient to ensure success – tools, systems and public policies need to be developed to establish an entrepreneurial ecosystem in the state of Minnesota that will enhance innovation and facilitate commercialization of new technologies relevant to the state's core economic strengths. According to state economist Tom Stinson, the three most important factors for future economic success are productivity, productivity, and productivity. Particularly with the aging population and potential decline in workforce, advancements in S&T, workforce development and, ultimately, the introduction of new products and processes will be required to increase productivity and to improve upon our current standard of living.

Minnesota has been a strong leader in innovation as evidenced by the relatively high number of patents issued per capita but has ranked poorly at building companies around those innovations. The overall business culture of Minnesota is risk and investment averse and does not embrace entrepreneurs. Tax policies encourage successful CEOs and executives to exit the state resulting in significant loss of talent, experience, and potential investment capital. The state needs to develop the infrastructure – incubators, mentoring, and funding sources – to help entrepreneurs develop and commercialize the wealth of their ideas. Capital for new business formation is almost impossible to obtain. Unlike many states, Minnesota has no incentives for angel investors and no state funds for seed, early stage, or gap funding.

Current statistics include:

- Minnesota ranked 6th in patents per capita in 2008
- Minnesota ranked 48th in new company formation in 2007
- Minnesota ranked 43rd in the 2009 Small Business Survival Index
- Minnesota ranked 23rd in the businesses created from university R&D
- Minnesota ranks 28th in federal Small Business Innovation Research (SBIR) grants
- Minnesota ranks 15th in venture capital (VC) investments
- Venture-backed firms have created more than 302,000 jobs in Minnesota
- Small businesses created 44 percent of new jobs in Minnesota from 1996 to 2005

High Technology Manufacturing Capabilities

For decades Minnesota was a leader in the high-tech industry. UNIVAC employed 13,000 people and Control Data once had 15,000 employees here. As the computer industry matured and competition in the market expanded during the 1980s, the cost of manufacturing became a driving business imperative. The industry largely transitioned its manufacturing operations to lower-cost business locations out of state. Some of this was to take advantage of lower-cost labor. However, a significant factor was to take advantage of a more business-friendly environment. That shift in high-technology manufacturing base has largely remained unchanged in the two decades since. The few high-technology manufacturers that are located in the state are largely here due to the relative small size of their workforce and the critical dependency on close proximity of engineering talent to manufacturing operations for leading-edge technology products.

Today, Minnesota is a leader in the medical device industry. But recent trends in this area suggest that it is at risk as well for reasons essentially the same as those that contributed to the exodus of the computer industry to Silicon Valley. In May 2009, Medtronic announced it would be opening a major office in San Antonio, Texas resulting in the creation of 1,300 jobs there. While initially Medtronic plans on moving sales and support jobs to this office, the state is hopeful of possible future research and manufacturing opportunities. Judging by the programs and incentives available through Texas' state's S&T initiatives, identification of such opportunities seems very likely.

As of November 2009, it was projected that the manufacturing sector in Minnesota had lost nearly 43,000 jobs since the start of the recession. Without a clear strategy for rebuilding our high-technology manufacturing capabilities, it will be very difficult to compete both nationally and globally to regain those jobs.

Science and Technology Business Environment

Historically, Minnesota has attracted a diverse base of businesses and the headquarters of a number of Fortune 500 companies. The state is known for the strength of its medical device industry. While certain industry clusters are strong, the business climate and state public policies do not encourage innovation, expansion, and growth across all science and technology sectors. Minnesota has one of the highest corporate tax rates in the world. While Minnesota was the first to implement a state R&D tax credit, it has lagged behind other states in expanding this credit to encourage growth in science and technology companies. Unlike other states, Minnesota does not have the business support groups or significant state incentive programs to attract and recruit new business relocation into the state. As a result, job growth has not been strong and in 2007, for the first time in decades, Minnesota's unemployment rate exceeded the U.S. average.

Minnesota has been a science and technology leader in the past, but its stature among the S&T elite has suffered considerably over the past 10 to 20 years. The state has the basic resources needed to regain its leadership position but lacks the public/private commitment to build a strong S&T economy required to reach or exceed its former heights. A number of the state's businesses, trade associations, and academic leaders have recognized the need for a state-wide S&T strategy. Public policy is needed to establish the structure and funding for this long-term initiative which is critical to the economic growth of the state.

Current statistics include:

- 19 Fortune 500 companies were headquartered in Minnesota in 2009.
- Minnesota's combined state and federal corporate tax rate of 41.1 percent is the 3rd highest tax rate in the world.
- Minnesota ranked 30th in job growth from 2000 to 2007.
- There has been little to no growth in technology jobs in Minnesota from 2007 to 2008, and an 11 percent decline (16,000 jobs) since 2001.

Science and Technology Workforce Preparation

Minnesota has a long history of strong public investment in education, including in S&T areas, particularly in the K-12 system. That investment has been fairly generalized, however, and primarily directed at building awareness (through STEM education programs, for instance). What has been lacking is an overall plan that ties future S&T market projections to the workforce required and then targets specific investment and collaboration at all levels of education – K-12, college and advanced degrees, and trade skills. Few if any existing programs have established return-on-investment (ROI) measurements to gauge their efficacy

over the long-term. Similarly, there is no systematic way in the state for public and private institutions to be able to adapt to the demographic and S&T trends that influence requirements for the workforce, including education programs, or recruiting and retention of talent at all levels of education, position and experience.

Current statistics include:

- Minnesota ranks fairly high in "Managerial, Professional, Technical Jobs" (7th) and "Workforce Education" (8th) but low in the "Immigration of Knowledge Workers" (31st).
- Minnesota ranks 18th in science and engineering doctorates awarded.
- Minnesota ranks 13th in science, engineering and health graduate students.
- Between 2002 and 2008, Minnesota slipped in ranking for teaching technology in schools, from 7th to 28th.

Conclusion

Minnesota faces a crisis of economic competitiveness, vis-à-vis other states and regions, and in the increasingly important *global* marketplace. The state was once recognized as a leader in innovation, particularly with regard to science and technology. The positive conditions that once existed for S&T leadership – an unfettered business environment, strong venture capital funding sources, coordinated public and private support for technology industries among them – are fading against a backdrop of their own legacy, unmodified for current conditions and unsupported by a future vision and plan.

In this environment, more importantly, there are three key elements missing, each of which is required to begin to put Minnesota back at the top:

- **First**, there is no consensus that a crisis of economic competitiveness actually exists, and as a result, no worthy plan to correct the crisis can be mounted;
- **Second**, Minnesota has no overall, coordinated S&T strategy or capital investment plans for the three key pillars of industry, academia and government to embark upon together, to regain its leadership; and
- **Third**, there is no permanent, overarching and accountable structure to create, fund and monitor that strategy and bring these pillars together and ensure a deliberative and measurable path to success.

In short, without an ambitious agenda that first recognizes the crisis for Minnesota's economic future, and then embarks on a systematic path to correct it, the state will continue to lose ground in key measures of economic success. Ensuring future success calls for vision,

investment and structure – and the patience to stay the course for the long term. Even with ambitious and immediate funding, it would take years to see measurable results, but the results would indeed be measurable and sizable, as evidenced by other states that have done so during the past decade. The purpose of this report is to suggest legislation and other public and private actions and investment for an ambitious and energetic plan to bring Minnesota back to the top, nationally and globally, in science and technology leadership.

RECOMMENDATIONS

Key Legislative Priorities for the 2010 Legislative Session

#1 Priority: Create and fund a permanent structure for science and technology strategy and oversight, collaboration and planning

The permanent structure should be a major, multi-year science and technology initiative to support education, research, and business development essential to keeping Minnesota competitive in the new knowledge economy and creating jobs. It will be a private-public partnership designed to leverage state investments in science and technology, based on best practices from programs started in dozens of states and countries. Our recommendation is that this structure be enduring over the years, spanning biennial budget processes and partisan political changes.

As outlined in this report, the governance structure for the overall initiative would include a commission of nine members with corporate representation, having fiduciary and strategic responsibility for the initiative. The Commission would be supported by an Advisory Board, very similar in composition to the science and technology economic development committee which has prepared this report and these recommendations, but perhaps with broader private-sector representation. Currently, the makeup of the committee calls for six CEOs and four trade organization representatives; all sizes of businesses should be represented with heavy focus on serial entrepreneurs with multiple business startup experience. Furthermore, the four representatives from trade organizations should be represented on the Advisory Board – by senior representatives of their organizations, preferably C-level executives. Institutional participation mandated by the current legislation should be continued under the new structure, with provisions that guarantee access, where legally and practically possible, to the key science and technology players within these institutions when deemed appropriate by the Advisory Board. The Committee also asks that the Legislature formalize union representation on the Advisory Board, and stipulate that the BioBusiness Alliance of Minnesota have a seat on the advisory committee, due to the close relationships among the technologies and the necessary supporting disciplines.

In this legislative session we recommend that the Legislature formalize appointment of the Advisory Board and assign it the responsibility of developing a comprehensive S&T economic development plan for consideration by the Legislature in time to permit implementation of the plan with an effective date of July 1, 2011. We believe that appointment of the Commission can await completion of a formal, detailed programmatic description and appropriation of funds to support implementation of the Minnesota Science and Technology Initiative. In the meantime, the Advisory Board, co-Chaired by the Commissioner of DEED and one non-governmental member of the committee to be elected

by the membership, would function as the governing body for the initiative. The Committee recommends that $500,000 be appropriated to enable staff support in the form of paid, non-partisan professionals who are charged with supporting the Advisory Board in the creating and maintaining a plan that will lead to Minnesota's science and technology leadership.

#2 Priority: Provide tax incentives to encourage research and development and investment in innovation

Innovation will be a key factor in leading Minnesota out of the current economic crisis and will be increasingly critical to developing a strong economy going forward. Start-up companies provide job growth and develop products/systems which improve productivity and broaden the economic base.

- One of the most difficult aspects of starting a business is the lack of available capital. Unlike many states, Minnesota does not have an angel tax credit to encourage investment in start-up companies. In addition, the high capital gains tax rate encourages business people and entrepreneurs to leave the state once they have been successful. As a result, the state loses both the financial resources and intellectual know-how that these people could use to help other start-up companies succeed. The Committee urges legislative implementation of the angel investment tax credit proposals that are surfacing this session.
- The Committee also recommends expansion of the research and development tax credit. This should expand the eligibility for companies to receive these breaks; and provide truly bold, meaningful investments that energize companies, not provide meager credits at the margins. A refundable R&D tax credit would provide these small, start-up companies with additional capital during their early formation when capital is most important, given that most companies experience net losses in their early years and cannot benefit from the current R&D tax credit.

#3 Priority: Fund mechanisms that attract - and retain - technology companies, and technology-oriented individuals, to Minnesota

Minnesota should encourage the potential for "bold" actions that include targeting key companies and technologies that fit the state's S&T profile, and empower it to offer sizable incentives that have real impact. A number of states have programs/funding to attract or retain businesses in their states. With the high corporate tax rate in Minnesota, it is difficult to get companies to expand or move into the state. While a relatively large number of Fortune 500 companies currently headquarter in the state, many have chosen to build manufacturing, customer service, or expansion facilities in other locations. Companies often turn to "site selection" professionals to help with this process. Such consultants routinely submit

information to states regarding their clients' plans and seek an "offer letter" from the state that stipulates what might be provided as incentives to relocate. Minnesota does not have significant programs or tax credits to attract companies or to market the state as a desirable location for new or expanded businesses. As a result we often cannot be responsive or effective in creating competitive re-location packages. Lacking these incentives, Minnesota is not perceived as a state that is particularly easy to work with regarding the site selection process. Minnesota also requires funding to aggressively market Minnesota for new business investment.

#4 Priority: Create a small business investment program which uses insurance money for early-stage investment, known generically across the country as CAPCO

A number of states have implemented programs which provide tax credits to insurance companies if they invest money in managed investment funds (venture funds) for the purpose of investing in start-up companies. In exchange for the investment, the insurance company receives a tax credit against their insurance premium tax. Originally called CAPCO (Certified Capital Companies) programs, most states have modified the program such that the funds are still managed by professional venture capital firms but additional restrictions are placed on the fund managers with regard to the type of companies they can make investments in, the type of investments made, how quickly they must invest the funds, and the payment structure to the fund managers (management fees and returns/carried interest). Most states apply the tax credit to insurance premium tax in the future (eg. starting 4 years out with 20% credit for the next 4 years). Minnesota must develop, market, and implement a CAPCO-type investment incentive program that will help level the playing field when it comes to support for new start-up companies.

The Minnesota Science and Technology Initiative

Governance Structure

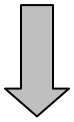
Proposed Long-term Structure

The Minnesota Science and Technology Initiative will be governed by a nine-member Commission legislatively comprised of three state officials and six regional representatives appointed by the Governor (2), the House (2) and the Senate (2). The Commission will be responsible for the allocation of funds appropriated by the Legislature to support programs and activities associated with the Initiative and for evaluation of the effectiveness of individual S&T strategies included in the Initiative.

Minnesota Science and Technology Initiative

Minnesota Science and Technology Commission

(9 members, fiduciary)



Minnesota Science and Technology Advisory Board

(16 members, Advisory)

In addition to the Commission, there will be appointed a 16-member Advisory Board to provide guidance to the Commission. The members of the Advisory Board will represent leaders from industry, academia, and government. The Advisory Board will advise on strategic planning and general management and coordination of programs associated with the Initiative. In addition to providing general advice to the Commission related to Initiative programs and objectives, the Advisory Board's responsibilities would include recommendations of strategic areas for S&T investments, recommendation of additional programs to support the Initiative's overall economic development objectives, selection of specific programs and grantees for support from program funds authorized by the Advisory Board and on-going assessment of the effectiveness of programmatic elements according to metrics identified by the Commission.

Proposed Initial Governance Structure

To prepare the Minnesota Science and Technology Initiative's strategic plan, to include initial recommendations for specific programs, funding levels and operating principles, we recommend that the Legislature formally authorize appointment of the Advisory Board, delaying appointment of the Commission until plan implementation. The Legislature should charge the Advisory Board with responsibility for fully developing the programmatic elements of the Initiative, in consultation with appropriate stakeholders throughout the State, with the expectation that a comprehensive plan will be presented for legislative consideration in time for full funding consideration and implementation of the Initiative by July 2011. To expedite plan development and take advantage of the extensive groundwork already completed in preparation of this report to the Legislature, we recommend the current committee be re-appointed as members of the Advisory Board. Board composition may be augmented to ensure appropriate expertise, but continued involvement of those existing committee members would prove beneficial to the development of a plan in the time suggested in this report. As indicated in Priority Item #1 in the previous section, we recommend that the Legislature formalize union representation on the Advisory Board, and stipulate that the BioBusiness Alliance of Minnesota have a seat on the Board, due to the close relationships among the technologies and the necessary supporting disciplines.

It is essential that the work of the Advisory Board be supported by dedicated staff assigned to the Board and supervised through the Office of Science and Technology in the Department of Employment and Economic Development. Providing staff to these volunteer committees will be critical to ensure that adequate research and analytical support is available to inform program design. For the initial Advisory Board work, we recommend a legislative appropriation of $500,000 to support the necessary staff work, research, consultation with national or international experts, limited travel and materials required for development of the formal program description.

a) Staff

Two staff – New staff dedicated to and reporting to Advisory Board; advisory board evaluates, assigns and directs staff activities.

b) Co-Chairs

The Advisory Board would be co-chaired by the DEED Commissioner and one non-governmental member of the Advisory Board.

c) Advisory Board Composition

We recommend that the Legislature authorize the continuation of the current committee, as described in M.S. 116J.658, with the addition of representation from organized labor and the BioBusiness Alliance, as noted above. During

the developmental phase of the Initiative consideration should be given to possible additions or changes in membership in order to ensure that the Advisory Board composition is best suited to assess statewide S&T needs and opportunities for consideration in planning the Minnesota Science and Technology Initiative.

Program Elements

Although the ultimate Minnesota Science and Technology Initiative must include specific programmatic elements of critical strategic relevance to S&T economic development opportunities for Minnesota, in developing formal elements for inclusion in a comprehensive plan the Advisory Board should thoroughly consider the elements or programs listed below, all of which are integral elements in S&T initiatives launched by over 25 states reviewed as part of this report.

This is not an exhaustive list, and any number of other opportunities or ideas should be considered by the Advisory Board. We cannot over-emphasize the importance of the need for a comprehensive, coordinated portfolio of programs to support S&T economic development including: early-stage research and discovery, R&D, investment strategies, commercialization, workforce development, company formation and job creation. Based on our efforts to date, we believe that the programmatic elements listed below (including a brief description of what these elements typically represent) are an important starting point in the identification of a full-spectrum program.

Research and Innovation

- **Research Innovation Grants**
  Grants to advance major research initiatives that will positively impact Minnesota's economic development and provide long-term improvements in the State's technology base. Projects are to be collaborations among Minnesota higher education institutions, non-profit research organizations, and Minnesota companies in the areas of relevance to Minnesota's economic base. Focus on projects primed for commercialization.

World-class Infrastructure

- **New Centers of Excellence Programs**
  Support large-scale world-class research and technology development platforms designed to accelerate the pace of Minnesota commercialization; collaborations among Minnesota higher education institutions, non-profit research organizations, and Minnesota companies.

- **Centers of Innovation in Science and Technology**
  Grants to assist Minnesota organizations win competitions for large R&D Centers funded by the federal government, industry, foundations, and other sponsoring organizations.
- **Commercialization Platforms**
  Grants to support specifically-defined, near-term commercialization projects requiring major capital acquisitions and improvements at Minnesota higher education institutions and non-profit research organizations. Projects must involve one or more Minnesota companies.

World-class Talent and Workforce

- **Research Scholars Program**
  Public/private partnership to provide aggressive investment in the recruitment of senior research talent from outside Minnesota and related facilities and equipment, in one or more of the state's targeted technology/research focus areas.
- **Workforce Development**
  Funding to support specific programs designed to build, train, re-train and otherwise strengthen the capabilities and capacities of Minnesota workforce to insure availability of a world-class talent pool to support sectors of the economy aligned with the needs of Minnesota companies.
- **K-12 and Post-Secondary STEM Education & Experiences**
  Provide support for STEM (science, technology, engineering, and math) education programs, advanced scientific and technical equipment, and internship opportunities to ensure a strong talent pipeline to fuel innovation and company growth.

Investment Incentives

- **Angel/Venture Investor Tax Credits**
  Tax credits to encourage investments made in the establishment, growth or development of small high-tech companies with strong growth potential.
- **R&D Tax Credits**
  Allow companies to take a credit against their state tax liability for qualified R&D expenditures in excess of some pre-determined base amount – encouraging increased investments in innovation.

Business Recruitment and Support Networks

- **Small Business Innovation Research (SBIR/STTR) Matching Grants and Proposal Assistance**
  Improve the commercial viability of technologies developed through federal Small Business Innovation Research (SBIR), Small Business Technology Transfer (STTR) and Technology Innovation Program (TIP).
- **Bridge ("The Gap") to Success Program**
  Provide funding for promising technologies early in the commercialization pipeline to support continued R&D to enhance the ability to attract investor support; "bridge the gap or valley of death" support.
- **Business Recruitment & Support Networks**
  Provide funding for a vital network of business support groups that would function to recruit new business relocation into the state, provide analysis of opportunities and gaps for relevant sectors of importance to the state's economy. Example: BioBusiness Alliance of Minnesota's Business Resource Network (BRN).

Outcome Measures

Results of the Minnesota Science and Technology Initiative need to be measured. A full set of metrics will be developed by the Commission. The following are examples of potential measurements that could be employed.

- State funds expended
- State funds leveraged
- Venture capital funds invested
- National research dollars awarded
- Jobs created and retained
- Companies started
- Return on investment

APPENDICES

Organization of the
Minnesota Science and Technology Economic Development Project

The authorizing legislation stipulated the selection of a high-caliber, public-private committee to implement the project, with specific mention of several important institutions. A list of the members and the organizations that they represent is on the following page. The membership was designed to represent private firms, investment professionals, higher education, and trade organizations.

The enabling legislation designated the Commissioner of Employment and Economic Development to lead the project. Commissioner Dan McElroy worked with appropriate institutions and DEED staff to develop candidates for the membership. Dan Mallin, managing partner for Magnet 360, has served as co-chair.

In four meetings from the fall of 2009 through early January 2010, there have been slight modifications in membership. By acclamation, the committee added a union member, Jim Nimlos, representing the AFL-CIO, because union representation was critical to fulfilling the science and technology workforce expectations for the committee. Also, after the committee began to meet, Robert Thurston, President of Thurston Genetics in Olivia, withdrew due to work and travel obligations.

All meetings have been in St. Paul, but the committee has made available call-in capabilities for all but one meeting for those members unable to travel to St. Paul. All the meetings of the committee have been open to the public and each has drawn some attendance by interested parties; time permitting, guests at the meetings have been encouraged to engage with the committee.

The committee has met four times since last fall. Its early discussions focused on identifying the state's strengths and weaknesses in Minnesota's science and technology policy and programs, developing a vision and goals for Minnesota, reviewing models for governance that would ensure Minnesota achieves or maintains leadership in science and technology, and determining if there are immediate science and technology actions the Minnesota Legislature should take that would advance the committee's goals. Subcommittees formed around these topics which allowed the committee to work efficiently and quickly to come to where we are today.

Minnesota Science and Technology Economic Development Project Committee

State of Minnesota	Dan McElroy Commissioner MN Dept of Employment and Economic Development 332 Minnesota Street, Suite E200 St. Paul, MN 55101 Telephone: 651-259-7119 Dan.mcelroy@state.mn.us	Commissioner	MN Dept of Employment and Economic Development
University of Minnesota	Dr. Tim Mulcahy Vice President for Research University of Minnesota 419 Johnston Hall 101 Pleasant Streets S.E. Minneapolis, MN 55455 Telephone: 612- 624-5054 Mulcahy@umn.edu	Vice President for Research	University of Minnesota
MnSCU	Dr. Gail O'Kane MN State Colleges and Universities Wells Fargo Place 30 7th Street E; Suite 350 St. Paul, MN 55101-7804 Telephone: 651-282-5514 Gail.okane@so.mnscu.edu	System Director for Education-Industry Partnership	Minnesota State Colleges and Universities (MnSCU)
Mayo Clinic	Dr. Eric Wieben Mayo Clinic Dept of Advance Genomics 200 First Street SW Rochester, MN 55905 Telephone: 507-284-8417 Wieben.eric@mayo.edu	Director, Mayo Clinic Genomics Research Center	Mayo Clinic
MN High Tech Assoc	Todd Hauschildt Telephone: 612-803-3697 toddhauschildt@me.com		

MN Venture Capital Assoc.	Joy Lindsay President and Co-Founder StarTec Investments, LLC 7900 International Drive, Suite 825 Bloomington, MN 55425 Telephone: 952-883-3222 Joylindsay@comcast.net	President and Co-Founder	StarTec Investments, LLC
MN Defense Alliance	Chip Laingen, USN (Ret.) Director Defense Alliance of Minnesota 1835 Energy Park Drive St. Paul, MN 55108 Telephone: 651-659-6767 claingen@mnwire.com	Director	Minnesota Wire
Life Science Alley	Mike McBride Sr. Director of Industry Relations Upsher-Smith Laboratories, Inc 6701 Evenstad Drive Maple Grove, MN 55369 mike.mcbride@upsher-smith.com	Sr. Director of Industry Relations	Upsher-Smith Laboratories, Inc
Industry CEO or designee	Dan Mallin Managing Partner Magnet 360 10000 Hwy. 55 Minneapolis, MN 55441 Telephone: 612-230-2500 Dan.mallin@magnet360.com	Managing Partner	Magnet 360
Industry CEO or designee	Dr. Bonnie Holub CEO Adventium Labs 111 Third Avenue South Suite 100, Mill Place Minneapolis, MN 55401 Telephone: 612-720-4960 Bonnie.holub@adventiumlabs.org	CEO	Adventium Labs

Industry CEO or designee	Pat Ryan VP Research and Development Seagate 7801 Computer Avenue South Bloomington, MN 55435 Telephone: 612-336-1225 Pat.J.Ryan@seagate.com	VP Research and Development Board Chair of MN Nano	Seagate
Industry CEO or designee	Bonnie Baskin 6104 Fox Meadow Lane Minneapolis, MN 55436 Bonnie.baskin@yahoo.com	Ex CEO and founder, AppTec; Ex-CEO and founder, ViroMed	AppTec ViroMed
Industry CEO or designee	Mark Swymeler Vice President & Chief Engineer, Lockheed Martin Tactical Systems 3333 Pilot Knob Road Eagan, MN 55121 Telephone: 651-456-2926 Mark.k.swymeler@lmco.com	Vice President & Chief Engineer, Lockheed Martin Tactical Systems	Lockheed Martin
Industry CEO or designee	Mark Willers CEO Minwind Energy LLC 800 S. Kniss Avenue, #2 Luverne, MN 56156-2258 Telephone: 507-962-3360 mkwill@minwind.com	CEO	Minwind Energy
Industry CEO or designee	Susan Paquette President SZP Consulting, LLC 5865 Neal Avenue North, Suite 115 Stillwater, MN 55082 Telephone: 651-261-1920 spaquette@szpconsulting.com	President	LifeScience Alley Board
Labor Representation	Jim Nimlos Minneapolis Electrical JATC 13100 Frankfort Parkway St. Michael, MN 55376 Telephone: 763-497-0072 x 108 jnimlos@mplsjatc.org	IBEW Apprentice Training Center Training Director	International Brotherhood of Electrical Workers (IBEW)

Legislation Authorizing Creation of the Minnesota Science and Technology Economic Development Project

(a) The commissioner of employment and economic development shall lead a public-private project with science and technology experts from public, academic, and private sectors to advise state agency collaboration to design, coordinate, and administer a strategic science and technology program for the state designed to promote the welfare of the people of the state, maximize the economic growth of the state, and create and retain jobs in the state's industrial base through enhancement of Minnesota's:

(1) high technology research and development capabilities;
(2) product and process innovation and commercialization;
(3) high technology manufacturing capabilities;
(4) science and technology business environment; and
(5) science and technology workforce preparation.

(b) Project membership shall consist of science and technology experts from public, academic, and private sectors. A member must have a background in science or technology in order to serve on the project. The project members shall consist of at least 13 members as follows:

(1) a representative of the University of Minnesota;
(2) a representative of Minnesota State Colleges and Universities;
(3) the chief executive officer of Mayo Clinic or a designee; and
(4) six chief executive officers or designees from science- or technology-oriented companies and four representatives from science- and technology-oriented trade organizations.

(c) The commissioner of employment and economic development must report by January 15, 2010, to the legislative committees having jurisdiction over science and technology and economic development policy and finance on the activities of the project and must recommend changes or additions to its organization, including specific recommendations for necessary legislation.

Laws of Minnesota 2009, Chapter 78, Article 2, Section 16
Codified as Minnesota Statutes 116J.658

Comparison of Rankings for Minnesota and Leading Technology States

General Demographic & Economic Indicators	**MN**	CA	CT	IL	MA	NJ	NC	NY	PA	VA
Population	**21**	1	29	5	15	11	10	3	6	12
Civilian Labor Force	**21**	1	28	5	14	10	11	3	6	12
Personal Income per Capita	**11**	7	1	16	3	2	33	4	19	9
High Tech Employment	**17**	1	24	8	6	9	16	3	7	5
High Tech Wages	**22**	1	13	14	2	3	20	10	21	6
High Tech Establishments	**17**	1	21	5	11	7	15	4	8	6
Gross State Product	**17**	1	23	5	14	8	9	3	6	11
R&D per Capita	**14**	8	2	17	4	10	23	26	18	15
High Tech Jobs Gained in State 2001-06	**40**	51	38	46	49	46	41	50	44	6
Unemployment Rate (1=lowest unemployment rate)	**31**	5	28	44	24	20	4	24	27	35
Academic Indicators & Degree Production	**MN**	CA	CT	IL	MA	NJ	NC	NY	PA	VA
S&E Doctorates Awarded	**18**	1	22	6	4	15	10	2	5	13
S&E and Health Graduate Students	**13**	1	25	6	2	14	11	2	7	10
Federal R&D Expenditures at Universities	**25**	1	19	7	6	20	9	2	5	17
State and Local Govt. R&D Expenditures at Universities	**18**	2	41	12	19	16	6	3	7	9
Industry R&D Expenditures at Universities	**23**	1	25	10	7	16	2	5	4	17
Institutional R&D Expenditures at Universities	**27**	1	29	4	22	14	13	2	9	20
Expenditures per Pupil for Elementary and Secondary Public Schools	**24**	30	4	21	7	1	44	2	11	22
Workforce Indicators	**MN**	CA	CT	IL	MA	NJ	NC	NY	PA	VA
Industrial Diversity	**17**	12	30	6	16	28	8	43	4	36
High Tech Workers per 1,000 Private Sector Workers	**15**	7	22	29	2	11	25	26	27	1
High Tech Employment Change	**44**	16	48	45	19	11	38	39	34	29
High Tech Payroll	**17**	1	21	8	5	6	15	3	9	4
R&D Indicators	**MN**	CA	CT	IL	MA	NJ	NC	NY	PA	VA
Private R&D Per Worker	**10**	6	2	14	1	7	21	25	16	18
SBIR Grants Awarded, 2000-2005	**20**	1	16	18	2	10	19	7	9	3
Gross License Income per Worker	**4**	6	38	27	1	34	12	2	17	24
Industry R&D	**11**	1	10	7	3	4	13	8	9	15
Academic R&D	**25**	1	22	7	6	17	8	2	5	14
Broadband Access	**19**	7	1	17	2	4	18	8	30	14
Patents per Million Workers	**8**	1	17	16	5	7	15	16	10	23
Businesses Created from University R&D	**23**	18	41	26	11	17	7	31	25	6

Venture Capital and Entrepreneurial Indicators	**MN**	CA	CT	IL	MA	NJ	NC	NY	PA	VA
Number of Venture Deals	**15**	1	17	12	2	9	14	3	4	10
Value of Venture Capital Investments	**9**	1	23	13	2	8	11	3	7	10
Venture Capital Dollar Value Change	**9**	1	22	10	2	52	14	51	42	15
Economic Dynamism from 2008 State New Economy Index	**13**	7	24	28	2	8	23	5	30	15
Overall 2008 State New Economy Index	**14**	6	6	16	1	5	24	9	22	7

Source: State "R&D 2009" Factsheets. Alliance for Science and Technology Research in America. Available online at: **www.aboutastra.org/toolkit/state.asp**.

NOTE: Comparison states were among "leading technology states" in the "2008 Index of the Massachusetts Innovation Economy" by the John Adams Innovation Institute.

Comparison of Rankings for Minnesota and Its Border States

General Demographic & Economic Indicators	**MN**	IA	ND	SD	WI
Population	**21**	30	48	46	20
Civilian Labor Force	**21**	30	47	46	16
Personal Income per Capita	**11**	27	29	34	25
High Tech Employment	**17**	32	49	51	21
High Tech Wages	**22**	40	45	51	34
High Tech Establishments	**17**	33	51	48	22
Gross State Product	**17**	30	50	48	21
R&D per Capita	**14**	32	20	49	28
High Tech Jobs Gained in State 2001-06	**40**	24	11	20	25
Unemployment Rate (1=lowest unemployment rate)	**31**	5	3	4	26
Academic Indicators & Degree Production	**MN**	IA	ND	SD	WI
S&E Doctorates Awarded	**18**	24	46	48	16
S&E and Health Graduate Students	**13**	28	45	48	20
Federal R&D Expenditures at Universities	**25**	26	46	50	15
State and Local Govt. R&D Expenditures at Universities	**18**	21	30	37	26
Industry R&D Expenditures at Universities	**23**	20	41	51	15
Institutional R&D Expenditures at Universities	**27**	19	45	51	10
Expenditures per Pupil for Elementary and Secondary Public Schools	**24**	28	33	39	15
Workforce Indicators	**MN**	IA	ND	SD	WI
Industrial Diversity	**17**	35	27	40	14
High Tech Workers per 1,000 Private Sector Workers	**15**	37	34	46	35
High Tech Employment Change	**44**	47	4	43	37
High Tech Payroll	**17**	35	49	51	22
R&D Indicators	**MN**	IA	ND	SD	WI
Private R&D Per Worker	**10**	32	29	46	26
SBIR Grants Awarded, 2000-2005	**20**	44	49	50	24
Gross License Income per Worker	**4**	10	22	47	5
Industry R&D	**11**	32	47	49	21
Academic R&D	**25**	26	44	52	13
Broadband Access	**19**	36	47	47	25
Patents per Million Workers	**8**	26	46	47	18
Businesses Created from University R&D	**23**	38	44	10	43
Venture Capital and Entrepreneurial Indicators	**MN**	IA	ND	SD	WI
Number of Venture Deals	**15**	40	46	47	25
Value of Venture Capital Investments	**9**	31	49	48	25
Venture Capital Dollar Value Change	**9**	28	35	29	20
Economic Dynamism from 2008 State New Economy Index	**13**	45	34	31	38
Overall 2008 State New Economy Index	**14**	42	39	44	33

Source: "Minnesota R&D 2009;" "Iowa R&D 2009;" "North Dakota R&D 2009;" "South Dakota R&D 2009;" and "Wisconsin R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Minnesota's Rankings for a Variety of Indicators
General Demographic and Economic Indicators

Indicator	Minnesota's Rank	
	2002	2008
Gross State Product per Capita	9	10
Median Household Income	7	13

Source: U.S. Bureau of Economic Analysis. U.S. Census Bureau.

Indicator	Minnesota's Rank
Labor Force Participation Rate	6
Business Taxes as a Percent of Private Sector Economic Activity	13
America's Greenest States (Forbes)	15
Small Business Administration Loans	7
Most Livable State	4
Poverty Rate	2

Source: "Compare Minnesota." Minnesota Department of Employment and Economic Development. Available online at: www.positivelyminnesota.com/mwa/deed/comparemn.aspx.

Indicator	Minnesota's Rank
Population	21
Civilian Labor Force	21
Personal Income per Capita	11
Gross State Product	17
Unemployment Rate (1=lowest rate)	31

Source: "Minnesota R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Indicator	Minnesota's Rank (of 10 comparison states)
Population Growth Rate	4
Household Income	4
Households Spending 30% or More of Income on Housing	8
Housing Starts per 1,000 residents	3
Relocations to State by College Educated Adults From Another State	6
Relocations to State by College Educated Adults From Abroad	9
Corporate Sales per Headquarters	3
Growth Rate in Corporate Sales per Headquarters	2

Source: "2008 Index of the Massachusetts Innovation Economy." John Adams Innovation Institute. Available online at: www.masstech.org/institute2009/the_index/index2008-21909.pdf.

Indicator	Mpls.-St. Paul's Rank	
	2007	2008
Best City for Business	1	1

Source: "Best Cities for Business." Marketwatch. Available online at: www.marketwatch.com/story/players-change-twin-cities-still.

Education Indicators

Indicator	Minnesota's Rank
S&E Doctorates Awarded	18
S&E and Health Graduate Students	13
Expenditures per Pupil for Elementary and Secondary Public Schools	24

Source: "Minnesota R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Indicator	Minnesota's Rank (of 10 comparison states)
Percent of High School Seniors Planning to Major in Computer, Engineering or Information Science	3
Percent of High School Seniors Planning to major in Health or Biological Sciences	6
Public Higher Education Appropriations per FTE Student	8
Educational Attainment of Working Age Population (Bachelor's Degree or Higher)	4
Educational Attainment of Working Age Population (Some College, Less Than 4 year Degree)	1
Engineering Degrees per Capita	9

Source: "2008 Index of the Massachusetts Innovation Economy." John Adams Innovation Institute. Available online at: www.masstech.org/institute2009/the_index/index2008-21909.pdf.

Indicator	Mpls-St. Paul's Rank (of 11 comparison areas)	
	2005	2009
Life Sciences Bachelor's Degrees Awarded	4	11
Life Sciences Graduate Students	NA	7
Life Sciences Master's Degrees Awarded	9	9
Life Sciences Ph.D.s Awarded	5	8
Medical Doctor Degrees Awarded	6	6
Life Sciences Postdocs	NA	9
Number of Life Sciences Ph.D.-granting Institutions	10	10

Note: 'NA' indicates that the indicator was not included in the 2005 version of the report.
Sources: "The Greater Philadelphia Life Sciences Cluster 2009: An Economic and Comparative Assessment." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/PhillyLifeSciencesRprt.pdf.

"The Greater Philadelphia Life Sciences Cluster 2005: An Economic and Comparative Assessment." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/philadelphia_sciences_0605.pdf.

Knowledge Jobs

Indicator	Minnesota's Rank
High Tech Employment	17
High Tech Wages	22
High Tech Establishments	17
High Tech Jobs Gained (2001-06)	40
Industrial Diversity	17
High Tech Workers per Private Sector Worker	15
High Tech Employment Change	44
High Tech Payroll	17

Source: "Minnesota R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Indicator	Minnesota's Rank	
	2002	2008
Knowledge Jobs	**9**	**8**
IT Professionals	11	8
Managerial, Professional, Technical Jobs	13	7
Workforce Education	6	7
Immigration of Knowledge Workers	NA	31
Migration of U.S. Knowledge Workers	NA	15
Manufacturing Value Added	NA	15
High-Wage Traded Services	NA	4

Note: 'NA' indicates that the indicator was not included in the 2002 version of the report.
Sources: "The 2008 State New Economy Index." The Information Technology and Innovation Foundation. Available online at www.itif.org/files/2008_State_New_Economy_Index.pdf.
"The 2002 State New Economy Index." The Progressive Policy Institute. Available online at www.neweconomyindex.org/states/index.html.

Indicator	Mpls-St. Paul's Rank (of 11 comparison areas)	
	2005	2009
Current Impact of Therapeutics and Devices	NA	8
Current Impact of Pharmaceuticals	10	8
Current Impact of Medical Devices	1	1
Current Impact of Biotechnology	9	11
Current Impact of R&D in Life Sciences	9	11
Current Impact of Health Services	NA	10
Current Impact of Life Science Supporting Industries	8	4

Note: 'NA' indicates that the indicator was not included in the 2005 version of the report.
Sources: "The Greater Philadelphia Life Sciences Cluster 2009: An Economic and Comparative Assessment." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/PhillyLifeSciencesRprt.pdf.
"The Greater Philadelphia Life Sciences Cluster 2005: An Economic and Comparative Assessment." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/philadelphia_sciences_0605.pdf.

Globalization

Indicator	Minnesota's Rank	
	2002	2008
Globalization	**29**	**33**
Export Focus of Manufacturing and Services	13	27
Foreign Direct Investment	36	27

Sources: "The 2008 State New Economy Index." The Information Technology and Innovation Foundation. Available online at www.itif.org/files/2008_State_New_Economy_Index.pdf.
"The 2002 State New Economy Index." The Progressive Policy Institute. Available online at www.neweconomyindex.org/states/index.html.

Indicator	Minnesota's Rank (of 10 comparison states)
Manufacturing Exports per $ of State GDP	4
Growth Rate of Manufacturing Exports	6

Source: "2008 Index of the Massachusetts Innovation Economy." John Adams Innovation Institute. Available online at: www.masstech.org/institute2009/the_index/index2008-21909.pdf.

Economic Dynamism

Indicator	Minnesota's Rank
Businesses Created from University R&D (per $ spent on research)	23

Source: "Minnesota R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Indicator	Minnesota's Rank	
	2002	2008
Economic Dynamism	**19**	**13**
"Gazelle Jobs"	16	5
Job Churning	44	34
Fastest Growing Firms	NA	14
IPO's	13	16
Entrepreneurial Activity	NA	15
Inventor Patents	NA	7

Note: 'NA' indicates that the indicator was not included in the 2002 version of the report.
Sources: "The 2008 State New Economy Index." The Information Technology and Innovation Foundation. Available online at www.itif.org/files/2008_State_New_Economy_Index.pdf.
"The 2002 State New Economy Index." The Progressive Policy Institute. Available online at www.neweconomyindex.org/states/index.html.

Indicator	Minnesota's Rank (of 10 comparison states)
Spinout Companies from Research Institutions per $ of Research Expenditure	10
Spinout Companies from Research Institutions	8
Initial Public Offerings	9
Mergers by Location of Acquired Company	9
Technology Fast 500 Firms	10
Inc 500 Firms	9

Source: "2008 Index of the Massachusetts Innovation Economy." John Adams Innovation Institute. Available online at: www.masstech.org/institute2009/the_index/index2008-21909.pdf.

Indicator	Minnesota's Rank	
	2004	2008
Technology Concentration and Dynamism	11	19

Source: "State Technology and Science Index." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/StateTechScienceIndex.pdf.

Digital Economy

Indicator	Minnesota's Rank
Broadband Access (high speed lines per capita	19

Source: "Minnesota R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Indicator	Minnesota's Rank	
	2002	2008
Digital Economy	**9**	**29**
Online Population	2	7
Internet Domain Names	24	24
Technology in Schools	7	28
E-Government	26	14
Online Agriculture	24	15
Broadband Telecommunications	24	36
Health IT	NA	26

Note: 'NA' indicates that the indicator was not included in the 2002 version of the report.
Sources: "The 2008 State New Economy Index." The Information Technology and Innovation Foundation. Available online at www.itif.org/files/2008_State_New_Economy_Index.pdf.
"The 2002 State New Economy Index." The Progressive Policy Institute. Available online at www.neweconomyindex.org/states/index.html.

Innovation Capacity

Indicator	Minnesota's Rank
R&D per Capita	14
Private R&D per Worker	10
Gross License Income per Worker	4
SBIR Grants Awarded, 2000-2005	20
Industry R&D	11
Academic R&D	25
Federal R&D Expenditures at Universities	25
State and Local Govt. R&D at Universities	18
Industry R&D Expenditures at Universities	23
Institutional R&D Expenditures at Universities	27
Patents Issued per Capita	8
Venture Capital Investment Deals	15
Venture Capital Investment Dollars	9
Growth in Dollar Value of Venture Capital Investments	9

Source: "Minnesota R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Indicator	Minnesota's Rank	
	2002	2008
Innovation Capacity	**13**	**17**
High-Tech Jobs	7	13
Scientists and Engineers	20	18
Patents	8	13
Industry Investment in R&D	14	6
Non-Industry Investment in R&D	NA	43
Alternative Energy Use	NA	30
Venture Capital	16	10

Note: 'NA' indicates that the indicator was not included in the 2002 version of the report.
Sources: "The 2008 State New Economy Index." The Information Technology and Innovation Foundation. Available online at www.itif.org/files/2008_State_New_Economy_Index.pdf.
"The 2002 State New Economy Index." The Progressive Policy Institute. Available online at www.neweconomyindex.org/states/index.html.

Indicator	Minnesota's Rank (of 10 comparison states)
SBIR Awards to Companies per Capita	6
Dollar Value of SBIR Awards per Capita	6
Medical Device Pre-market Notifications	5
Medical Device Pre-market Approvals	3
Biotechnology Drugs in Development	10
Corporate R&D Expenditures per Headquarters	7
Federal R&D Expenditures per Capita	10
Federal R&D Expenditures at Academic and Non-profit Research Institutions per Capita	9
NIH Funding per Capita	7
Patents Issued per Capita	3
Dollar Value of Venture Capital Investments	9
Growth Rate of Venture Capital Investments (2003-07)	1

Source: "2008 Index of the Massachusetts Innovation Economy." John Adams Innovation Institute. Available online at: www.masstech.org/institute2009/the_index/index2008-21909.pdf.

Indicator	Mpls-St. Paul's Rank (of 11 comparison areas)	
	2005	2009
Innovation Pipeline: Life Sciences R&D	10	8
Innovation Pipeline: Risk Capital	6	7
Innovation Pipeline: Human Capital	9	8
Innovation Pipeline: Life Sciences Workforce	9	9
Innovation Pipeline: Innovation Output	7	6

Sources: "The Greater Philadelphia Life Sciences Cluster 2009: An Economic and Comparative Assessment." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/PhillyLifeSciencesRprt.pdf.
"The Greater Philadelphia Life Sciences Cluster 2005: An Economic and Comparative Assessment." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/philadelphia_sciences_0605.pdf.

Indicator	Minnesota's Rank	
	2004	2008
Research and Development Inputs	19	24
Risk Capital and Entrepreneurial Infrastructure	9	13
Human Capital	2	5
Science and Technology Workforce	13	12
Overall State Technology and Science Index	8	11

Source: "State Technology and Science Index." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/StateTechScienceIndex.pdf.

Indicator	Minnesota's Rank	
	2002	2008
SBIR Awards (All Agency Sources)	19	22

Source: "SSTI Weekly Digest: June 3, 2009." State Science and Technology Institute. Available online at: www.ssti.org/Digest/2009/060309.htm.

Overview of Comparison Studies

"Minnesota R&D 2009." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp. This two-page publication includes one page of indicators pulled from a variety of data sources. All 50 states are included in the comparison, as is Washington, D.C.

"2008 Index of the Massachusetts Innovation Economy." John Adams Innovation Institute. Available online at: www.masstech.org/institute2009/the_index/index2008-21909.pdf. Published since 1997, this report compares Massachusetts with nine other "leading technology states," including California, Connecticut, Illinois, Minnesota, New Jersey, North Carolina, New York, Pennsylvania and Virginia. The comparison states were selected based on the total number of 11 key industry clusters having an employment concentration above the national level. States with employment concentration exceeding the national level in three or more clusters are included. Minnesota was included because it had four clusters that exceeded the national level.

"The Greater Philadelphia Life Sciences Cluster 2009: An Economic and Comparative Assessment." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/PhillyLifeSciencesRprt.pdf. This study revised and extended a 2005 analysis of the Greater Philadelphia life sciences cluster relative to ten other leading clusters in the United States, including Boston, Chicago, Los Angeles, Minneapolis-St. Paul, New York, Raleigh-Durham, San Diego, San Francisco, Seattle and Washington, D.C.

"The 2008 State New Economy Index." The Information Technology and Innovation Foundation. Available online at www.itif.org/files/2008_State_New_Economy_Index.pdf. This report uses twenty-nine indicators to measure the differences in the extent to which state economies are structured and operate according to the tenets of the New Economy. In other words, it examines the degree to which state economies are knowledge-based, globalized, entrepreneurial, IT-driven, and innovation-based. With these indicators as a frame of reference, the report then outlines a state-level public policy framework aimed at helping states master forthcoming challenges and take advantage of opportunities. The report builds off earlier reports in 1999, 2002, and 2007.

"State Technology and Science Index." The Milken Institute. Available online at: www.milkeninstitute.org/pdf/StateTechScienceIndex.pdf. The 2008 study examined a host of indicators to paint a comprehensive picture of how well states are performing in the highly competitive knowledge-based economy. The report was previously completed in 2002 and 2004.

Minnesota Science and Technology Related Investments in Higher Education Facilities 2000-2009				
Infrastructure				
Year	**Institution**	**Investment**	**Match/ROI**	**Projects**
2000	U of M	$35,000,000		Twin Cities (TC) Molecular and Cellular Biology Building
		$10,000,000	$10,000,000	TC Microbial and Plant genomics Building
		$6,000,000		TC Plant Growth facilities - biocontainment facility
		$8,000,000		Morris Science and Math Building improvements
		$1,150,000		Waseca outreach center swine research
	MNSCU	$5,000,000		Northwest Technical College Lab Building
		$11,400,000		Normandale Community College Science Building
		$1,250,000		Northwest Technical College - Moorhead health sciences instructional center
		$1,600,000		Winona State science building
		$3,600,000		Itasca Community College Engineering Building
		$16,000,000		MSU Moorhead Hagen Hall
	DTED	$2,700,000		Koochiching County Cold Weather Testing Center
2002	U of M	$17,700,000		TC Plant growth facilities
		$25,500,000	$7,500,000	Duluth Lab science building
2003	U of M	$24,700,000	$12,300,000	Translational Research Facility
	MNSCU	$30,000,000		Winona State science building
		$1,900,000		Science labs at Southeast Technical College, Minnesota West, Mpls Community College
		$18,500,000		MSU Moorhead Hagen Hall
		$9,900,000		Normandale Community College Science Lab
2005	U of M	$1,010,000		Duluth Life Science Building
	UM/Mayo	$21,726,000	$25,000,000	Partnership for Biotechnology - ROI = $8M NIH Grants, $12M charitable support, $5 M corporate
	MNSCU	$1,000,000		Century College Science center
		$900,000		MCTC health sciences center
		$10,477,000		MSU Moorhead Hagen Hall Science Labs
		$5,540,000		Riverland Community College science labs at Austin and Albert Lea
		$900,000		SCSU Brown Hall
		$15,056,000		St Cloud Technical College science labs
		$11,100,000		Winona State science labs
		$6,668,000		Science Lab Renovations
2006	U of M	$5,000,000		UM Rochester Campus
		$40,000,000		TC Medical Research Building Phase 1
		$2,500,000		West Central Research
		$300,000		Willmar Poultry Testing Facility
	MNSCU	$840,000		Bemidji State Sattgast Science Building
		$19,000,000		Century College Science Building
		$420,000		Lake Superior CTC Science building

2006	U of M	$5,000,000		UM Rochester Campus
		$40,000,000		TC Medical Research Building Phase 1
		$2,500,000		West Central Research
		$300,000		Willmar Poultry Testing Facility
	MNSCU	$840,000		Bemidji State Sattgast Science Building
		$19,000,000		Century College Science Building
		$420,000		Lake Superior CTC Science building
		$18,874,000		MCTC Science Building
		$32,900,000		MSU Mankato Trafton Hall
		$9,880,000		MSU Moorhead Maclean Hall
		$14,000,000		SCSU Wick Science and Math Building
		$300,000		Southwest State Science Lab
		$5,100,000		Systemwide science labs
2008	U of M	$292,000,000		
		$1,750,000		Outreach Center Improvements for renewable energy - Morris
		$3,300,000		Lab Renovations Systemwide
		$10,000,000		Duluth - Civil Engineering Building
	MNSCU	$8,900,000		Bemidji State Sattgast Science Building
		$79,000,000		Phase 2 Century College Science Building
		$200,000		Emerging Technologies Lab DCTC
		$24,000,000		Hennepin Tech Science Labs
		$25,000,000		MSU Mankato Trafton Hall
		$900,000		STEM improvements at North Hennepin and Anoka CC
		$14,800,000		SCSU Brown Science Hall
		$900,000		SCSU Science Hall Renovation
		$9,000,000		Southwest State Science and Technology Building (and hotel technologies)
		$200,000		Southwest State Science Lab Renovation
		$5,775,000		Systemwide Science Labs
2009		$2,150,000		National Solar Rating and Certification Lab
		$931,266,000		

Minnesota Science and Technology Investments through General Fund Appropriations 2000-2009			
Other Investments			
Year	**Program**	**Funding**	**Purpose**
2000	DTED	$450,000	For the Duluth Technology Village
		$200,000	Minnesota Technology Inc for the e-Business institute
2001	DTED	$500,000	for the Duluth Technology Village, from the Workforce Development fund
		$150,000	Cuyuna Range Technology Center - match required
		$11,110,000	Minnesota Technology Inc base funding
	DTED/ U of M	$10,000,000	Biomedical Innovation and Commercialization Initiative (partner with U of M) - match required
2003	DTED/ U of M/ Mayo	$2,000,000	MN Partnership for Biotechnology and Medical Genomics
	DTED	$3,000,000	Minnesota Technology Inc. one-time funding
2004	Bio Zones	$1,000,000	Tax credits for bioscience companies in designated zones in Minneapolis, St Paul and Rochester
2005	**Bioscience Bonding**	$18,500,000	Bioscience Infrastructure Development - $14 million to support County Road J improvements
	DEED/ U of M/ Mayo	$15,000,000	MN Partnership for Biotechnology and Medical Genomics
	DEED	$200,000	Small Business Innovation Research Program/ Small Business Technology Transfer Program
2006	**Bioscience Bonding**	$2,500,000	Worthington Bioscience Park - match required
		$8,000,000	Rochester BioBusiness Center Parking Ramp - match required
		$467,000	Biobusiness Alliance of Minnesota

2007		$1,750,000	Biobusiness Alliance of Minnesota
	Bioscience Bonding	$500,000	Hormel Institute Expansion - road work - match required
	Bioscience Bonding	$750,000	Mankato State Emissions Testing Center - match required
		$250,000	University Enterprise Labs
	DEED	$200,000	To support SBIR/STTR and early stage companies
		$170,000	Minnesota Inventors Congress
		$750,000	Minnesota Technology Growth Acceleration Program
		$300,000	Worthington Testing and Training Center - match required
		$100,000	Elk Run
	Next Gen	$32,000,000	Next Generation Energy Act - $15 million for bioenergy, biomass electricity, biofuels, plug-in hybrid technologies, renewable hydrogen and solar technology projects. $17 million for energy research, including funding for the U of M Initiative for Renewab
		$25,000,000	MN Partnership for Biotechnology and Medical Genomics
		$125,000	Bioscience Business Marketing
2008	**Bioscience Bonding**	$1,000,000	Worthington Testing and Training Center - match required
	Bioscience Bonding	$3,500,000	Granary Road to serve biomedical campus - match required
	Ofc of Sci & Tech	$400,000	To support SBIR/STTR and early stage companies
		$250,000	Funds to support Green Industry development, marketing
	Bioscience Bonding	$4,500,000	Bioscience Business Development Public Infrastructure Grant Program
		$8,000,000	MN Partnership for Biotechnology and Medical Genomics
	Border Cities Allocations	Up to $112,500 / year	Seed Capital Investment Credit - from existing Border Cities Allocations

2009	DEED/Ag Board	$0	Statute change - Minnesota Ag and Economic Development Board may make alternative investments
	DEED	$0	Formation of a committee to address science and technology policy in the state and develop a long term strategy
	IRETI		$1.5 M from Stimulus Funding
		$5,000,000	U of MN IREE
		$1,750,000	Biobusiness Alliance of Minnesota
	Bioscience Bonding	$1,850,000	Elk Run - match required
	Bioscience Bonding	$1,250,000	Willmar Technology Campus - match required
	Bioscience Bonding	$350,000	MSU Moorhead Lab Space - match required
	Enterprise Minnesota	$500,000	Enterprise Minnesota GAP program
		$8,000,000	MN Partnership for Biotechnology and Medical Genomics
		$200,000	Office of Science and Technology
		$186,522,000	

Staffing Levels for Selected State Science and Technology Initiatives

Missouri:
The Missouri Technology Corporation has three full-time equivalent (FTE) positions and reported about $771,000 in administrative expenses in FY 2009.

New York:
The New York State Foundation for Science, Technology and Innovation (NYSTAR) has 28 employees.

Ohio:
The Ohio Third Frontier initiative has three FTEs, and there are 14 FTEs in programs and operational support in the Technology and Innovation Division of the Ohio Department of Development. Approximately $155 million a year is allocated for program funds, with the remainder for staff, overhead, and contracts for professional proposal reviewers.

Oklahoma:
The Oklahoma Center for the Advancement of Science and Technology has 24 FTEs, plus approximately 24 additional contractor positions.

Pennsylvania:
The Ben Franklin Technology Development Authority has five FTEs with an annual budget of $20-$50 million dollars. Overall, the Office of Technology Investment has 16 FTEs.

Texas:
The Emerging Technology Fund has eight FTEs.

Wisconsin: The Wisconsin Technology Council receives about $335,000 in state funds and has seven FTEs.