MINNESOTA SCIENCE & TECHNOLOGY AUTHORITY

Minnesota Science and Technology Authority Strategic Plan

Turning Ideas into Jobs

Bringing together industry, government and academia.

Pathway to Prosperity:
Growing Minnesota's Innovation Economy

Minnesota, like other states across the country, is facing a prolonged period of high unemployment and budget deficits. Now more than ever, there is a critical need to make strategic investments in efforts that will accelerate job growth, and at the same time, set a foundation for sustained prosperity. The Minnesota Science and Technology Strategic Plan sets forth a framework that will foster the growth of high-value companies and enhance the state's economic competitiveness.

One of the most widely accepted economic development tenets in today's economy is that a region cannot sustain quality jobs and prosperity unless it continually innovates and finds new ways to be competitive. This requires an active entrepreneurial environment where startup and existing companies are encouraged and supported in seeking to develop new products and enter emerging markets. These new products and markets drive the growth of revenues and jobs. Making it all happen requires an ecosystem that provides strong research and development (R&D) capacity, supports the formation of new businesses, attracts new investment, and offers a skilled workforce.

So, how does Minnesota stack up when it comes to the ecosystem components necessary to drive innovation and competitiveness? The 2010 State New Economy Index (annual benchmark of economic transformation) ranked Minnesota 13th among all states, down from 11th in 2008. While the overall ranking is above average, what concerns the advisory commission is the fact that the state is losing ground and the economic factors where Minnesota does not perform well are those related to our long-term vitality.

- Minnesota ranked high on indicators related to a highly skilled and technical workforce. Not surprising with the companies that call Minnesota home. (Appendix Table A-12)
- Minnesota also ranked relatively high in the ability of industry to generate new ideas through patents and R&D. (Appendix Table A-2 and A-9)
- Minnesota begins to lose ground in areas of competitiveness, including value-added manufacturing, the focus on exports, and the number of fast-growing companies. (Appendix Table A-4)
- Minnesota falls further behind in entrepreneurial activity, non-industry R&D and the ability to obtain federal funding—all critical elements that prime the pump for company and job growth. (Appendix Table A-4 and A-14)

The Minnesota Science & Technology Strategic Plan is a roadmap for getting back on our entrepreneurial feet and building competitive companies throughout the state. These companies will be the basis for our ongoing prosperity and the next generation of Fortune 500 firms.

Reports by the Milken Institute, National Science Foundation, and others, point to a similar picture—that Minnesota is strong in its presence of large companies and skilled workforce, but it is at significant risk for losing this advantage because of a weakening entrepreneurial and innovation culture.

Purpose of the Authority and a Statewide Science and Technology Plan

In 2010, the state legislature passed The Minnesota Science and Technology Act, Section 11, 116W.01 that created the Minnesota Science and Technology Authority, largely due to the recognition that innovation-based companies are key to our sustained prosperity, and that coordinating and leveraging state investment with private and federal funds would accelerate economic growth. Compared to governing structures employed by S&T initiatives in other states, the Minnesota S&T Authority is unique because it is under the direction of the commissioners of Employment and Economic Development, Revenue, Agriculture, Commerce, and Management and Budget, and guided by an Advisory Commission comprised of leaders from industry, the investment community and academia. The Advisory Commission believes that this governance structure provides appropriate checks and balances and will help to ensure strong coordination among agencies entrusted with the prudent use of public resources.

Mission
The Authority will promote a business climate that fosters lasting and inclusive prosperity through the growth of innovation-based businesses and jobs.

Goals

- Accelerate Minnesota's ability to turn new discoveries and technologies into commercial products and services.
- Foster the start-up and success of new high-growth companies in the state.
- Enhance the ability for our existing industries to remain competitive and be leaders in their market.

While the legislation clearly spells out the role for the Authority in terms of programmatic issues and investment oversight, the Authority assumes several fundamental responsibilities that are as important as the programs they oversee. The Authority will serve:

- As the "go-to" agency for innovation within state government to minimize the overlap of services and maximize the ability to effectively leverage resources.
- As a facilitator and connector between industry, academia, and state and federal government to make sure public investment is being used to its greatest advantage. For example, the Advisory Commission is comprised of representatives from LifeScience Alley, BioBusiness Alliance of Minnesota, The University of Minnesota, the Mayo Clinic, The Nanotechnology Center and others to help ensure that programs within the statewide plan add value to existing efforts, minimize overlap and maximize the use of limited resources.
- As a steward to help rural regions and traditional industries tap into the innovation that contribute to economic growth throughout the state.

One of the first tasks was to develop a strategic plan that would identify what Minnesota needs to do to be competitive in an economy driven by innovation. The intent of the plan is two-fold:

- To establish a shared vision and strategy among industry, academia, and government to stimulate innovation and encourage investment that will accelerate and promote S&T-related job growth in the state of Minnesota.
- To provide a roadmap for the legislature that indicates how state investments and policies can support and encourage a healthy environment for growing our innovation-based economy.

Why Is an Innovation Economy Important to Minnesota?

In a globally competitive economy, companies need to continually develop new products and services, and regions need to aggressively support entrepreneurs. New discoveries and technologies along with innovative business processes have driven the growth and productivity in agriculture and mining, as well as biosciences and computer systems, and industries in between. For example, the development of global positioning systems (GPS) systems for the military has resulted in commercial applications with GPS now found in planes, cars, tractors, and animals. Companion sensor technology is used in medical devices, water conservation systems, early-warning emergency systems and more. In other words, investing in S&T is an investment in long-term competitiveness for many industries.

Minnesota recently achieved a new milestone of having the most Fortune 500 companies per capita in the country -- a noteworthy accomplishment, and one to which other states aspire. One of the few things these leading companies have in common is that each was, at one time, an entrepreneurial company that through continual innovation grew its enterprise. So the question for Minnesota is not only how do we maintain our current Fortune 500 companies, but how do we foster the growth of new businesses that will form the next generation of high-value companies?

Partnerships Pay Off

In 2004, Dakota County Technical College (DCTC) received a $900,000 grant from the National Science Foundation to create a two-year nanoscience associate degree program that now serves as a national model for emerging technology education. The project started as partnership between DCTC, the University of Minnesota, and companies such as 3M, Hysitron, RJA Dispersions, General Mills, Medtronic and others. It initially reached thousands of high school students, trained dozens of teachers, and graduated over 35 highly trained employees. The program's success resulted in a $3 million Regional Center for Nanotechnology Education led by DCTC and involving over 13 educational institutions across 5 states. To date, more than 70 companies are involved and the expanded program has reached over 5,000 high school students, trained hundreds of high school and college educators, and supported museum and public exhibits. What started out as a simple idea has expanded to a state and national asset.

States with successful innovation economies share two critical attributes: their average wages are higher than other states, and they excel in creating and attracting new companies. Together, these factors build lasting prosperity for residents and a stronger tax base for the state. A recent research report published by the American Economic Review noted that adding one additional skilled job in industry sectors that sell goods and services outside the state generates 2.5 jobs in local goods and services sectors. By comparison, adding one job in a high-tech sector generates more than four additional jobs.[1] Thus, the ability

1 Enrico Moretti, Local Multipliers, American Economic Review , May 2010

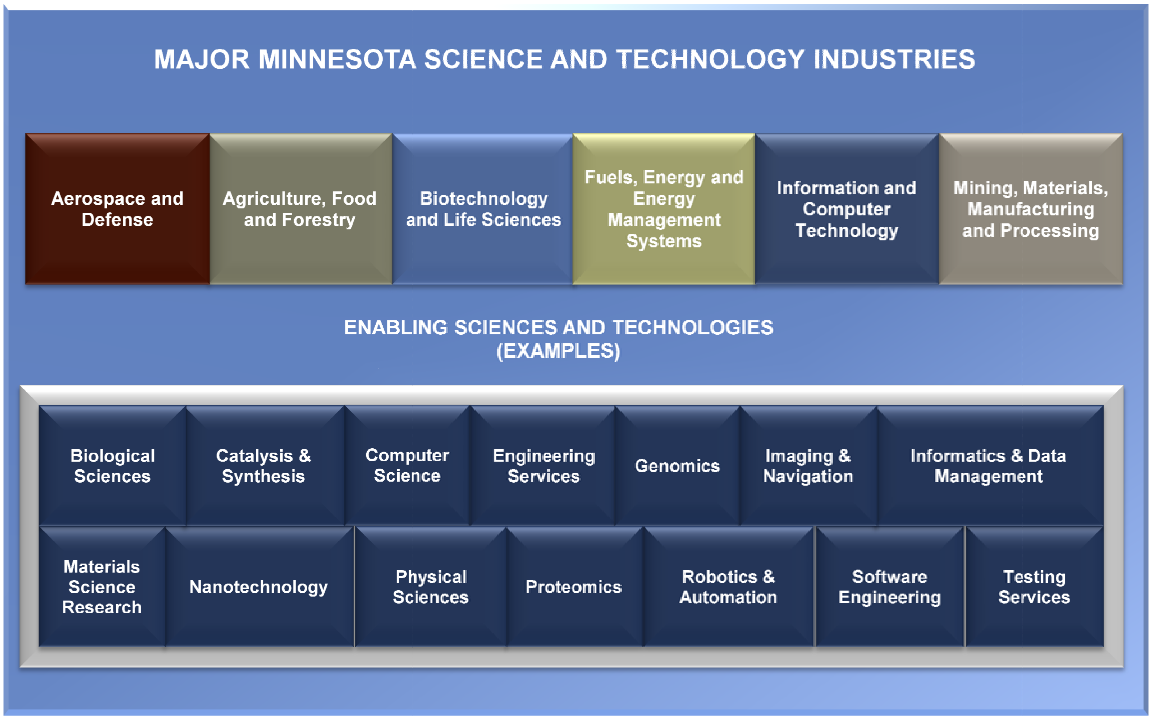
to generate new technologies and quickly take them to market becomes a competitive advantage for building strong economies, and one of the most promising ways to recover from the job losses of recent years.

An overarching component of this plan will be to create a robust, strategic, and coordinated approach to innovation-based economic development. To date, Minnesota is one of the few states in the nation without a comprehensive strategy in place to create these jobs of the future. The plan provides both short-term strategies to turn ideas into jobs, and proposes a framework that over time will solidly position Minnesota as a leader in the global, knowledge-based economy. In much the same way that early leaders of Minnesota saw the importance of preserving our lakes and other natural resources, the goal of this plan is to build on Minnesota's heritage as a center of science and technology innovation by creating the most fertile environment possible for existing and emerging science and technology firms to grow and spread economic prosperity to the state's citizens.

Building an Innovation Economy Through Minnesota's Science & Technology Sectors

Industries from agriculture and mining, to electronics, medical devices, energy – all rely on advances in science and technology. The science used in plant and animal health, and the technologies used in food production and processes are state-of-the-art. The talent and core technology that developed an electronics industry here more than 20 years ago not only remain within this industry, they are embedded in technologies driving medical devices, energy systems, and more. Our consumer product companies have long been innovators in advanced materials and chemicals, as well as advanced manufacturing processes. The list goes on, and so does the opportunity, especially as we recover from a prolonged economic downturn.

The Advisory Commission recognizes that science and technology is the foundation for competitiveness. If we are to maximize the potential that a science and technology strategy can have on our economy, it must be inclusive of an array of industries across the state. It is from this perspective that we developed the strategy described in this plan. The following graphic illustrates the range of innovation-based industries in Minnesota, as well as the sciences and technologies that enables the continued development of new products and companies.



Conservative estimates indicate there are more than 160,000 jobs in Minnesota's core industry sectors of science and technology, with an annual payroll of over $12 billion[2]. In addition, Minnesota industries spend over $6.3 billion in research each year, and academic institutions brought in more than $750 million of research funding in 2009, and the Mayo Clinic $437 million more.[3] Venture capitalists invested on average $300 million per year in Minnesota companies during 2008 and 2009.[4]

There is one thing that science and technology efforts across the country have learned over the past several decades -- while it's important to invest in the research and development (R&D) that creates ideas and new products, it is equally important to invest in the start-up and growth of the businesses that will take these ideas to market, and in turn create jobs and revenues for the state. You might say it's a catch 22 -- without a strong foundation of R&D to prime the pump there are few ways for businesses to stay competitive; yet absent a focus on getting businesses started and growing to a point of sustained revenues, the maximum economic impact cannot be achieved. That is why the Minnesota Science and Technology Strategic Plan focuses on the entire innovation ecosystem from discovery and idea generation, to new product development, to new businesses starts, and a competitive business environment.

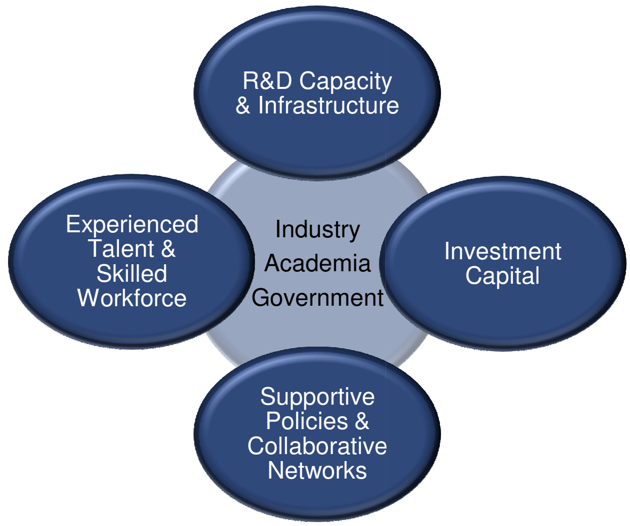
Regardless of industry sector, the elements of an innovation ecosystem required to support quality companies and job growth are similar. The Minnesota Science and Technology Strategic Plan proposes a partnership between industry, academia and state government designed to build a robust innovation ecosystem that will continually support the complete pathway from new

2 Calculations from the Minnesota Department of Labor
3 Data from the National Science Foundation State Profiles
4 Data from PricewaterhouseCoopers Moneytree

ideas to successful company formation to ongoing market growth. The plan recommends support of a set of coordinated initiatives in four investment areas that offer immediate and long-term economic benefits:

- **Accelerating our ability to commercialize ideas**: Build Minnesota's R&D capacity and infrastructure to generate ideas and commercialize new products for Minnesota companies.
- **Attracting investment for new and existing businesses**: Leverage investments that drive speed and scale of new company formation and existing company growth.
- **Enhancing Our Science & Technology Talent & Workforce**: Continue to grow the talent and workforce to support the jobs that will drive our recovery and grow our economy.
- **Creating Supportive Policies and Collaborative Networks**: Foster a competitive business climate and dynamic network that helps entrepreneurs build strong businesses and seize global opportunities.

The Innovation Ecosystem



An innovation ecosystem is not just about having all the pieces; the real advantage comes when the pieces are coordinated and connected—within the state and with opportunities outside the state. It's about entrepreneurs being able to quickly find and access the right business development resources; companies being able to easily connect with research institutions; and, investors being able to find high-quality businesses in which to invest. This is why Minnesota's science and technology strategic plan focuses not only on making each element strong, but on supporting organizations and processes that facilitate the coordination of programs that effectively leverage resources.

Minnesota's Science & Technology Assets and Gaps

Minnesota has significant assets in place to drive innovation. Yet, the state is missing some critical pieces that are inhibiting our capacity to start and expand high growth businesses or limiting our ability to make the most out of our existing investments.

Over the years, the state of Minnesota has made investments in an array of science and technology related facilities and programs, ranging from the Mayo/University of Minnesota Biotechnology and Medical Genomics Partnership to the Agricultural Utilization Research Institute. These investments have been instrumental in building the science and technology assets our state enjoys today, and enhance Minnesota's competitive position among other states.

A historic $58.6 million angel tax credit was passed in 2010 that is reinvigorating investments in start-ups. In just a few months, more than $30.6 million has been invested in new Minnesota start-ups, with 8 percent of those dollars coming from outside Minnesota.

These investments seem to have been effective as there is a good correlation between the areas where the state has made strategic investments and Minnesota's competitive position among other states. For instance, Minnesota's investment in R&D and in STEM (science, technology, engineering and math) education has placed Minnesota among the top 10 states in most rankings. On the other hand, Minnesota has invested far less to date in entrepreneurship and early-stage business growth in science and technology sectors, or the pursuit of federal research; consequently, our rankings among states are much lower in these areas.

Table 1: State Ranking for Measures of Innovation

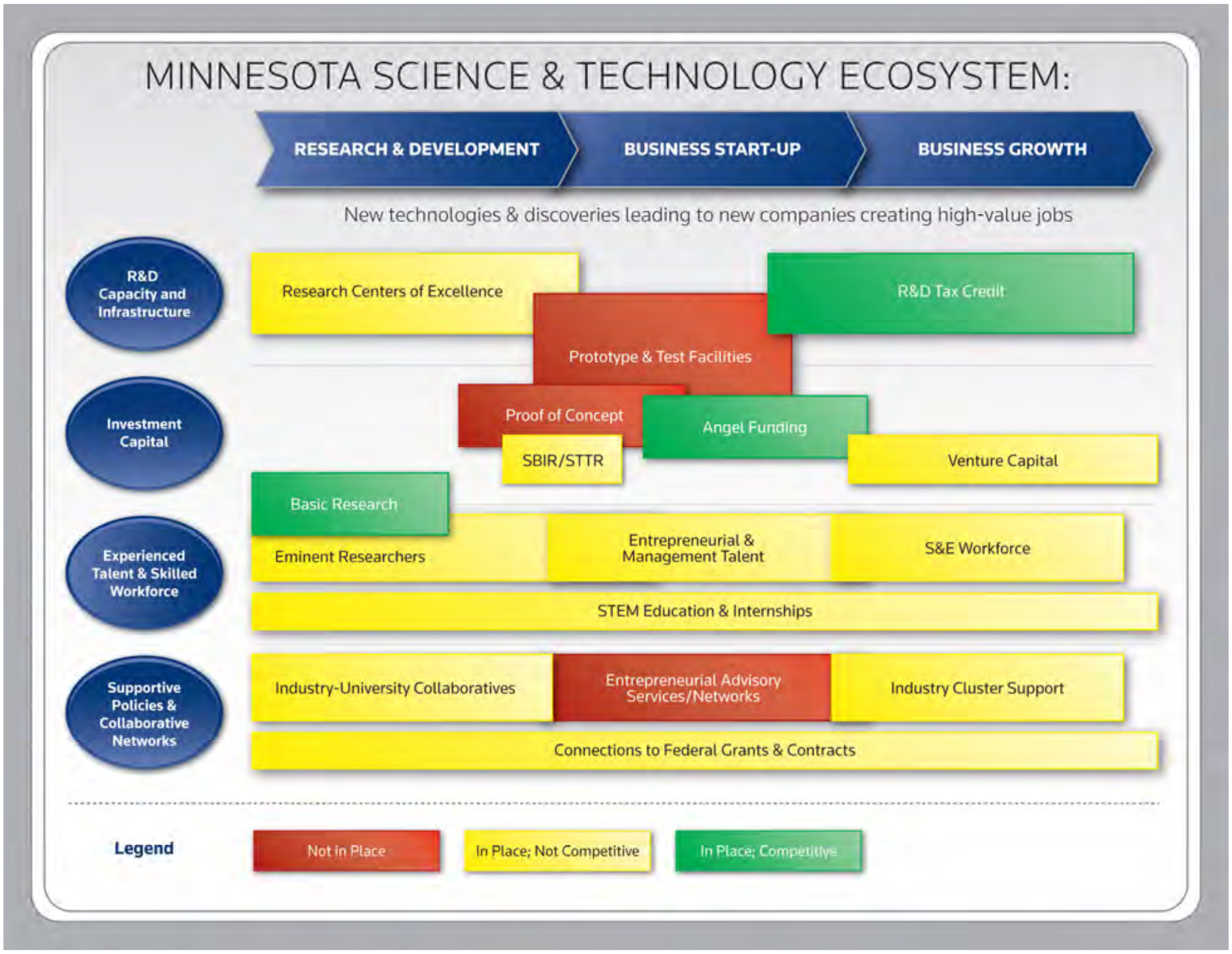
Where Minnesota excels	*Where Minnesota should be more competitive*
▪ 7th in industry investment in R&D	▪ 42nd in entrepreneurial activity (people starting new businesses)
▪ 8th in workforce education (educational attainment)	▪ 21st in fastest-growing firms
▪ 8th in number of scientists and engineers	▪ 23rd in federal obligations for R&D
▪ 9th in inventor patents	▪ 24th in export of manufacturing & services

Source: 2010 New Economy Index, and the National Science Foundation (See Appendix for details)

Gap analyses suggest that we are doing the right things to generate new ideas, however, our ability to turn ideas into businesses and jobs lags that of many other states. In-depth analyses suggest that *there are several key gaps in our innovation ecosystem that are preventing us from maximizing the economic return associated with our current investments in terms of business starts, corporate growth and job creation.* To close these critical gaps, Minnesota needs to:

- **Establish programs to convert innovations into products and businesses.** This includes establishing adequate proof-of-concept funding that bridges the "valley of death" (the point where a new idea has strong commercial potential yet isn't proven enough for private investors); enhancing the facilities that can develop prototypes and test new products; and developing a strong statewide system of advanced advisory services to accelerate the growth of new start-up businesses.
- **Take existing programs to a more competitive scale.** In some cases, the state has critical programs in place, yet they have inadequate investment to make them competitive or to reach the number of businesses throughout the state that would benefit from these programs. Examples of this include assistance for companies in securing SBIR and other research awards from the federal government, or internships in science and engineering that can draw and keep bright new talent in Minnesota.

The following graphic uses the key components of the innovation ecosystem to illustrate our strengths and gaps in Minnesota.



The Science and Technology Strategy

Minnesota, like most states, has been investing in various aspects of science and technology for years, using public funds to leverage private and federal investment that has resulted in new jobs and nationally recognized research and industry clusters. As previously noted, those areas where Minnesota is highly ranked among other states correspond to areas in which the state has made strategic investments. This indicates that when the state focuses attention on filling a gap, it can make significant progress with targeted investments. A decrease or outright loss of our innovation assets would be devastating to the state precisely at a time when new jobs and businesses are needed, and when other states have fortified their own competitive efforts in this regard. Implementation of the recommendations in this Science and Technology Plan will help level the playing field and keep Minnesota in the game.

RESULTS

The programs outlined in this Science & Technology Plan will help industry and research institutions create 30,000-45,000 direct jobs and at least 100,000 indirect jobs over the next ten years, and leverage at least six dollars of federal, private and philanthropic funding for every state dollar invested.

The objective of the Minnesota Science and Technology

Strategic Plan is to guide state investment in science and technology opportunities that will create mechanisms and partnerships by which the state can leverage significant resources from the private sector, the federal government and philanthropic foundations. Based on the effectiveness of similar programs in states across the country, the funding provided via the Minnesota Science and Technology Strategic Plan can be expected to:

- Act as an incentive for much greater funding from outside sources (e.g., using the Angel Tax Credit to attract new private-sector investment)
- Be a match to attract new funds (e.g., helping business apply for and receive federal research awards with a return that averages 10:1)
- Fill strategic gaps that greatly enhance the return on investment of existing programs (e.g., establishing a proof-of-concept fund that can help turn investments in research into commercially viable businesses and products)

Areas of Investment

The Minnesota legislature tasked the S&T Authority with identifying strategic areas of investment that would strengthen the state's ability to grow quality jobs and strong innovative businesses. These areas of investment recommended by the Advisory Commission were identified by analyzing the gaps in Minnesota's current science and technology ecosystem and closely examining best practices for science and technology initiatives operating in other states. Based on its analysis, the Advisory Commission identified four strategic areas that require new or additional investment in order to build and sustain competitive economic capacities in the state of Minnesota.

Recommended Investment Areas

A. Accelerating our ability to commercialize ideas (R&D capacity & Infrastructure)

Why is this needed? Investing in research, while neglecting to support commercialization, is like planting seeds but neither tending nor harvesting the resulting crops. Funding basic research is necessary, yet not sufficient to support a vibrant, innovation-based economy. There also needs to be targeted pathways by which research with commercial potential can be turned into new products and businesses. Without the programs that create a bridge between research and business development, we cannot maximize the economic value of the state's considerable research investments.

Desired Outcomes

- To increase the number of new products and services introduced into the market by Minnesota companies
- To build renowned centers of excellence by which Minnesota will emerge as a leader in areas of new high-value product development
- To attract new R&D facilities and federal research programs that establish or improve Minnesota's competitive strengths

- To enhance the ability for industry, especially small- and medium-size firms, to access research expertise and facilities of our research institutions

B. Attracting investment for new and existing businesses

Why is this needed? Starting or expanding a business requires capital, which when strategically applied helps to accelerate the growth of that company. The availability of investment capital has repeatedly been identified by entrepreneurs as a current limitation in Minnesota. Programs in many states have demonstrated that targeted public funding through S&T initiatives can result in significant leverage of additional private investment.

Desired Outcomes

- To fill the funding gap between basic research and commercial products so that technologies and start-up companies are attractive to early-stage and angel investors
- To increase Minnesota's ability to obtain and leverage federal funding for research and product development
- To attract venture and growth capital that accelerates the expansion of existing Minnesota companies

Leveraging State Funds

Twin Star Medical received a $3M National Institute of Health grant over 3 years to continue research using an innovative catheter to treat a life threatening condition affecting a significant population of traumatic brain injury and stroke patients. The application for this award was supported by a $10,000 grant from the Phase II Commercialization Plan program from the Office of Science & Technology.

ARCNano's Data Eradication System (DESY) technology development was partially funded by an Office of Science & Technology Matching Grant. IBM Global Services agreed to be the DESY beta site tester for deployment of the process into its large data centers. The DESY process will enable new best practices for the reuse and resale of existing tapes, making the large data center much more efficient economically and environmentally.

C. Building a Strong Base of Science & Technology Talent

Why is this needed? A breadth and depth of executive, scientific and technical talent is needed to support the growth of innovation-based companies. Minnesota currently ranks among the top 10 states in many aspects of a skilled workforce, but has limited access to experienced business executives critical to new company formation. Maintaining this level of workforce talent augmented by increased access to successful entrepreneurs will be the foundation for the state's competitive advantage in growing high-quality jobs for years to come.

Desired Outcomes

- To develop strong entrepreneurial talent that will start successful new companies and grow existing companies to new levels
- To attract world-class researchers who bring with them the ability to attract research funding and other top talent
- To create and retain science and engineering graduates and increase opportunities for students to find job and internship opportunities with Minnesota companies

- To enhance the capacity of K-16 education providers to build a pipeline of STEM-literate students

D. Establishing Supportive Policies and Collaborative Networks

Why is this needed? Maintaining a competitive advantage requires both public policies that create a fertile environment for innovation, and networks that enable one to find the right resources at the right time -- whether those resources are funding, people, or facilities. Currently, there is little coordination among the various regional and statewide science and technology programs. Strong collaborative networks supported by informed public policies will create an entrepreneurial environment that can leverage resources and build speed and scale.

Desired Outcomes

- To strengthen the capacity of new companies to be successful by connecting them to professional advisors, investors, markets and research expertise
- To provide a business climate that is attractive to companies and that accelerates the development of products and growth of new jobs
- To enhance the means by which industry and universities can work collaboratively on research and new product development
- Incent universities and corporations to spin out promising technologies that otherwise are lost or shelved

A summary of recommended programs to be managed by the Authority under the auspices of the Minnesota Science and Technology Act, along with a proposed priority ranking for each, is included in Table 2. Shaded cells in the Table indicate how each program will contribute to the individual ecosystem elements.

Table 2: Summary of Program Descriptions

Program title (Recommended Priority)	Innovation Ecosystem: R&D Capacity & Infrastructure	Innovation Ecosystem: Investment Capital	Innovation Ecosystem: World-Class Talent	Innovation Ecosystem: Supportive Policies & Collaborative Networks	Description
Science & Technology Authority Immediate Priority	■	■	■	■	Established in 2010 to act as the state's central agency for programs related to growing an innovation-based economy. The Authority funding will cover staff and operating expenses required to oversee S&T programs, evaluate public policy needs, track the progress of our innovation efforts, and work with state and regional partners to promote the states vast innovation assets and create a stronger brand image for Minnesota.
Technology Commercialization Fund Immediate Priority	■	■		■	Establishes a competitive gap fund to take discoveries with strong commercial potential and help launch companies and technologies to the stage where they are attractive to private investment. This is a critical gap in Minnesota's capital flow and connects the existing investment in university and nonprofit research with the strong potential for private investment from programs like the angel tax credit. Results in other states show at least 10:1 leverage of private capital.
Business & Entrepreneurial Acceleration Program Immediate Priority		■	■	■	Establishes an advanced advisory network for entrepreneurs and innovation-based businesses that provides mentoring from experienced executives, professional advisors for intellectual property and business development, connections to investors and markets, etc). Results of similar programs in other states show significant increases in the success rate of businesses and the ability to find capital. Program should support 75-100 companies per year statewide.
Federal Liaison & SBIR/STTR Enhancement Program Immediate Priority	■	■		■	Establishes a program to help companies and research institutions to identify and receive funding from federal agencies, which support commercialized research and business development statewide Expands funding for the existing and successful Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) assistance program. The leverage potential is very high for this effort since a single federal award could pay for the program.
STEM Internship Program Immediate Priority			■	■	Establishes a program would support the ability of science and technology companies to employ students as interns by reimbursing qualified companies for 50 percent of each intern's stipend. The program would provide employers with access to new talent while providing students with an applied learning experience, opening the pipeline of young people choosing STEM careers and increasing the likelihood that students will build connections with local companies that keep them in Minnesota once they enter the workforce.

Program title	Innovation Ecosystem				
	R&D Capacity & Infrastructure	Investment Capital	World-Class Talent	Supportive Policies & Collaborative Networks	Description
Advanced Commercialization Program for Industry					A program to provide funds to accelerate the growth of advanced S&T businesses and industries in MN. Funds would support further development of technologies or advanced manufacturing processes that would contribute to a comparative edge for MN-based companies. A 1:1 match is required. Eligible technologies must be advanced beyond technical proof-of-concept stage
MN Collaborative Centers of Excellence Program					A program to support collaborative R&D efforts that would establish cutting-edge research facilities and infrastructure in areas of relevance to the state's S&T priorities. A match would be expected.
Industry-University R&D Partnership Program					A program to support commercialization of breakthrough technologies or products that would have a lasting economic impact for MN and which would enhance research collaborations between MN businesses and MN research universities/Mayo Clinic. Funding would be limited to research presenting high commercialization potential and require a 1:1 match.
Research and Development Attraction Program					A program designed to support competitive applications for the attraction of large, nationally-designated research centers or facilities to MN. Funds would be provided on an "opportunity" basis in response to RFPs. These funds could be used to provide matching support or cost-share for large grants proposals.
Venture Capital Expansion & Attraction Program					The Authority will continue to evaluate means by which the state can expand the amount of local venture capital and attract additional capital from equity funds and firms outside the state.
STEM Innovation & Equipment Exchange Program					A program to fill strategic gaps in STEM education and workforce efforts that support future pipeline and near-term workforce needs through matching grant for high schools, two-year colleges, nonprofits, labor unions. Establishes an equipment donation exchange to accept donated equipment from private corporations and make available to public/nonprofit educational organizations
Attraction of Senior Research Talent					A program to attract world-class researchers through endowed chairs and eminent scholar positions. These positions bring with them large research projects and attract other key talent to the state.
Image Development & Marketing Program					A program to grow the positive image of the state as having a strong set of innovation assets and being a good location for starting or locating an innovation-based company. To be coordinated with state and regional economic recruitment efforts.

Measuring Progress and Impact

To realize the estimated creation of over 130,000 direct and indirect jobs[5] support by this plan, the state needs a churn of new businesses entering the marketplace; and to start new businesses will require new ideas and skilled talent. Tracking key indicators throughout this continuum will help assess the progress of the Authority and the growth of the innovation economy, as well as provide opportunities, as needed, to fine tune or overhaul programs based on progress toward stated objectives or in response to changing circumstances.

The performance of programs managed by the Authority will be measured by a set of indicators consistent with those used on a national level and by other states, and will allow the Authority to measure progress within the state and in comparison with other regions. In addition to overall metrics, each investment area will have a set of specific metrics that track results of Authority-led programs. To the extent possible, all metrics will be reviewed on a yearly basis and included in the annual report to the legislature.

Table 3: Overview of S&T Metrics

Investment Area	**S&T Indicators** (will measure Minnesota performance and compare to U.S. average and competitor states)	**Proposed Program Metrics** (will measure targeted objectives of programs within each investment area of the Authority)
Idea Generation and Product Development	▪ Growth in industry R&D as a percent of Gross State Product ▪ Growth in academic R&D expenditures	▪ Total federal R&D funding and leverage of federal to state dollars ▪ SBIR/STTR awards ▪ Patents and licenses issued
New Business Development & Support	▪ New firm growth in S&T sectors ▪ Job growth in S&T companies with fewer than 100 employees	▪ Angel capital investment in Minnesota ▪ Number of entrepreneurs receiving mentoring and support
Talent Development	▪ Professional and technical occupations as a percent of the workforce ▪ The numbers of STEM degrees conferred by higher education institutions ▪ Retention of Eminent Scholars	▪ Number of S&T internships supported ▪ Eminent scholars recruited to the state and the leverage of federal funding per scholar ▪ Undergraduate STEM related programs
Business Growth & Competitiveness	▪ Job growth in S&T sectors, and compared to state average for all industries ▪ Wage growth in science and technology sectors, and compared to state average for all industries	▪ Venture and private equity capital invested in Minnesota companies ▪ Federal contracts and awards received by Minnesota companies
OVERALL METRICS ▪ Leverage of state funds: The dollar amount of federal and private sector investment leveraged for every state dollar spent on S&T programs ▪ Return on Investment: Increase in tax revenues as a result of S&T programs ▪ Growth in S&T jobs compared to growth in all private-sector jobs		

[5] *The recommended 10-year funding allocation applied to job creation ratios of existing programs in Minnesota and other states is estimated to create 30,000-45,000 direct jobs in science and technology sectors and approximately 100,000 indirect and induced jobs using economic multipliers associated with S&T industries.*

Funding S&T Efforts

Full realization of the benefits that can be expected from science- and technology-based economic development strategies requires long-term investment and commitment. However, immediate outcomes can be realized from well-crafted and managed programs implemented as part a larger S&T strategy. Although the plan outlined here spans decades, and includes an initial 10-year funding horizon, the proposed programs have been selected and designed to set milestones that offer early returns and benefits. These nearer-term milestones will also allow step-stone assessment of progress and allow for mid-course corrections as needed. The initial programmatic and funding recommendations are based on what Minnesota needs to be competitive and as economically resilient as possible in the short term. To that end, the state must:

1. Maintain support for existing initiatives that have proven return on investments and which are critical foundation elements for other programs (for example, the BioBusiness Alliance of Minnesota, the Mayo/University of Minnesota Biotechnology and Medical Genomics Partnership and the Agricultural Utilization Research Institute.)
2. Fill the most critical gaps that are inhibiting economic progress (in particular, our ability to turn innovation into economic results)
3. Use state money as a catalyst and lever for attracting significant amounts of federal and private investment needed to build scale and competitiveness

Data, as well as experience, demonstrates unequivocally that state investment and policies can be critical catalysts for growing new businesses and jobs. States with science and technology or innovation strategies have typically allocated between $10 and $100 million each year toward a set of programs similar to those recommended in this plan. For example, Ohio has allocated $1.6 billion since 2002 towards its Third Frontier Program. In recognition of the successes of that initiative, voters approved another $700 million in bonds in 2010. Massachusetts has allocated $1 billion over 10 years to support the growth of its already nation-leading life science sector. Pennsylvania's Ben Franklin Technology Development Authority (BFTDA) receives up to $50 million each year to run commercialized research and business development efforts (not counting tax credits and business loan programs). Kansas allocated $580 million to biosciences starting in 2004, and states like Oregon have allocated approximately $20 million each year for signature research efforts around the state's leading and emerging industries.

We are recommending an initial appropriation of $10 million annually starting in fiscal year 2012 and a ramp-up of funding over the ensuing years.

Filling critical gaps, supporting existing programs and being on a competitive playing field with other states will require ongoing support and a 10-year funding allocation in the range of $750 million. This 10-year goal includes funding to support science and technology programs, tax credits and bonds for capital improvements as outlined in Table 2. While this budget is considerable, it is a very small fraction of the $20 billion that the state's science and technology companies and institutions contribute to the state each year.

Using past performance of Minnesota S&T programs and those of other states indicators, we can expect state investment to leverage up to 30 times the amount in federal and private sector funding or at least $3 billion over ten years. (See Appendices for examples) With the average wage of $73,313 (Appendix A-1) per job and an economic multiplier of at least three indirect jobs for each science and technology job, there would be an estimated 30,000-45,000 direct jobs and over 100,000 indirect and induced jobs created as a result of S&T investments.

Table 4: Investment Areas and Funding Estimates

Investment Area: Goal	Ten-Year Funding Estimates
R&D Capacity: Increase commercialized research efforts that result in new products and companies	$200 million (programs) $150 million (facilities)
Talent Development: Strengthening the depth of entrepreneurial and management talent and increasing the skilled workforce	$150 million
Capital and Business Development: Attract new investment and build strong science and technology companies	$250 million (includes Angel Tax Credit)

While the strategic plan will rely on some direct allocation each year from the general fund, it also will be important to establish more dedicated sources of funding that will help sustain science and technology efforts over the lifetime of this plan. These dedicated sources need to be carefully considered to have the least impact on or competition for other needed state programs including public safety, education and health and human services. The Advisory Commission will encourage the Authority to evaluate options that other states have used, including funding from bonds or tax increment financing as part of the overall Science and Technology Strategic Plan.

The Advisory Commission recommends the establishment of a Minnesota Science and Technology Fund (MSTF) to carry out the goals of the Authority and administer the programs detailed in this plan. The immediate request for the Minnesota Science and Technology Strategic Plan is $20 million for 2012-13 budget cycle. While more could be done, there is strong recognition that our current state budget significantly limits resources. The Advisory Commission strongly believes that the state would see rapid return on this investment.

Short-Term Priorities

After years of an economic recession, there is a great need to focus on programs that will provide the greatest assistance to our economic recovery. The Minnesota Science and Technology Strategic Plan will target its initial funding on:

> ***Programs that will create new business and jobs and bring outside investment into the state***. These include more robust entrepreneurial services to connect start-up companies to investors and federal funding programs, as well as access to new markets.

Programs that add increased economic value to existing state investments. For example, the state has made investments in research and development that have produced an array of new technologies with strong commercial potential. These technologies need a modest amount of bridge funding to move them from the lab into companies that are attractive to an increased number of private investors due to the Angel Tax Credit.

These programs not only focus on immediate business, investment, and job growth, they have applications relevant to the full array of science and technology industries that are located throughout the state, providing opportunities from the Iron Range to Rochester, from Bemidji to Worthington, from Mankato to Willmar.

Table 5: Short-term Funding Priorities

Priorities 2012-2013	State Investment	Program Descriptions and Performance Targets
Authority Funding	$1.25 m/year	Supports the operations of the Authority, including staffing for programs, metric evaluation and efforts to market the state's vast array of innovation assets.
Technology Commercialization Fund	$2m/year	Fills a critical gap in turning discoveries into commercial products by leveraging investments already made by the state and bridging the gap in capital between university R&D and the new Angel Tax Credit. Annual goal of moving 15-20 promising technologies into companies or business concepts, and leveraging at least $6 for every state dollar in follow-on investment.
Business & Entrepreneurial Acceleration Program	$2-3m/year	Establishes a statewide network of advanced advisory services for entrepreneurs that provides mentoring, hands-on market and business development, connection to investors, and a network of professionals. Included in this program is a strategy to coordinate angel investors and help connect the pipeline of promising deals to the growing number of investors. Goal is to assist at least 75-100 entrepreneurs/companies each year and to help leverage at least $8 for every state dollar in private funding.
Federal Liaison & SBIR Enhancement Program	$3-4m/year	Enhances the state's existing and successful Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs by expanding the capacity to support additional companies seeking SBIR funding, and developing a coordinated strategy to work with federal agencies to identify and access other grants and contracts available to Minnesota businesses. Goal is to leverage at least $6 for every state dollar.
S&T Internships	$750,000/year	Help to place STEM students into internships with Minnesota companies to attract and retain talent and provide companies a pipeline of talent that can support their growth. Company would match state funds. Supports approximately 200 internships across the state.

In addition to programs that the Authority would oversee, there are existing science and technology programs for which we highly recommend immediate and continued support. These include the Angel Investment and R&D tax credits, the BioBusiness Alliance of Minnesota, the Agricultural Utilization Research Institute and the Mayo/University of Minnesota Biotechnology and Medical Genomics Partnership.

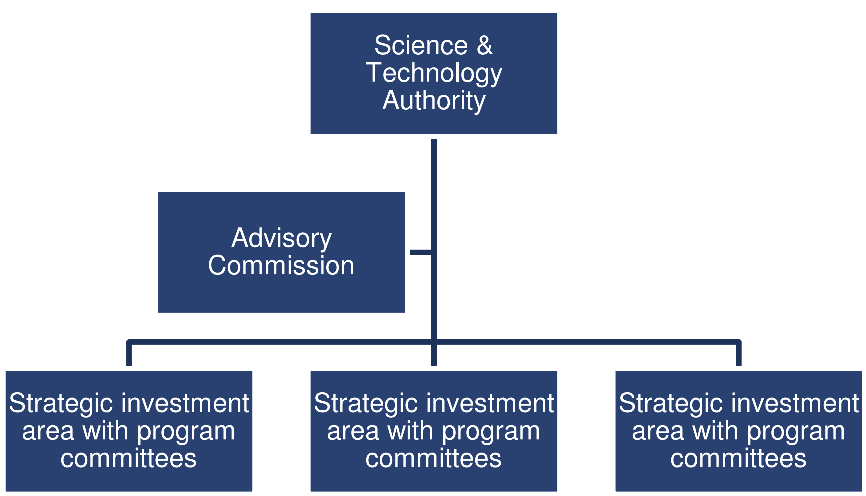
The Role of the Authority In Implementation

Each year, the Authority will provide a written report to the legislature detailing program expenditures and performance, and provide updated estimates for new budget cycles. The Authority will also continually seek options for new funding sources (public and private) and will consider recommendations for additional programs based on input from the Advisory Commission and program committees. When needed, the Authority will recommend legislation to accelerate the growth of new innovative companies, supporting the creation of new jobs.

Advisory Commission and Committees

The Authority's Advisory Commission will continue to assist with identifying strategies to grow the state's science and technology economy and with evaluating the results of programs and incentives developed by the Authority. In addition to the Commission, other research and industry expertise may be tapped to help develop or review specific programs. For instance, angel and venture capital investors may be asked to review seed funding programs to verify that the structure of such programs would indeed fill a strategic gap not covered by existing sources and accelerate follow-on funding from private investment.

Figure 6: Science & Technology Authority Organizational Structure



Summary

Minnesota is a state with significant innovation assets. These assets have helped grow a number of internationally recognized companies and numerous successful small businesses. Ongoing investment is needed if we are to remain competitive and revive the entrepreneurial spirit that is so important to our economic future.

> ***The legacy of this plan, if adopted, will be the creation an innovation ecosystem capable of growing high-quality jobs, today and in the decades***

We have proven that making prudent and targeted investment can result in jobs and bring new investment into the state. Now, perhaps more than ever, there is a great need to create quality jobs. The industry, investment community, academic and government representatives and of the Advisory Commission believe that the framework included in this document provides a pathway to prosperity that can foster short-term economic gains, and enhance the business ecosystem for years to come. With industry, academia and government working together, we can effectively leverage limited resources to address the economic challenges we face today and into the future.

Minnesota Science & Technology Authority

S&T Authority Commissioners, 2010

Dan McElroy	Department of Employment & Economic Development
Tom Hanson	Management and Budget
Ward Einess	Revenue
Gene Hugoson	Department of Agriculture
Glenn Wilson	Commerce

S&T Advisory Commission

Dan McElroy, Chair	Commissioner	MN Department of Employment & Economic Development
John Alexander	Chairman & Founder	Twin City Angels
Art Erdman	Director, Medical Device Center	University of Minnesota
Don Gerhardt	President	LifeScience Alley
Todd Hauschildt	President & CEO	SWAT Solutions
Randal Giroux	Director, Regulatory & Scientific Affairs	Cargill Incorporated
Rick King	Chief Technology Officer	Thomson Reuters
Chip Laingen	Director, Communications Executive Director	Minnesota Wire & Cable Defense Alliance
Joy Lindsay	President & Co-Founder	StarTec Investments LLC
Dan Mallin	Managing Partner	Magnet 360
Tim Mulcahy	Vice President of Research	University of Minnesota
Deb Newberry	Director, Nanoscience Technology Program	Dakota County Technical College
Jim Nimlos	Apprentice Training Center Training Director	International Brotherhood of Electrical Workers
Gail O'Kane	System Director for Education-Industry Partnerships	Minnesota State Colleges and Universities
Pat Ryan	Vice President R&D	Seagate
Joe Shaw	CEO & Chair	Syntiron
Dale Wahlstrom	CEO	BioBusiness Alliance of Minnesota
Eric Wieben	Director, Mayo Clinic Genomics Research Center	Mayo Clinic
Mark Willers	CEO	Minwind Energy

S&T Authority Staff

Betsy Lulfs	Executive Director
Becky Aistrup	SBIR/STTR Program Director

APPENDICES OF TABLES

Primary Data Sources

These data source were chosen because they are nationally recognized and commonly used by other states.

"The 2010 State New Economy Index." The Information Technology and Innovation Foundation. Available online at www.itif.org/files/2010-state-new-economy-index.pdf. Released in November 2010, this is the most recent data on states and most commonly used by states. The report uses twenty-nine indicators to measure the differences in the extent to which state economies are structured and operate in a new economy based on knowledge workers, entrepreneurialism, global competitiveness and agility. The report builds off earlier reports in 1999, 2002, 2007 and 2008.

"Minnesota R&D 2010" 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. While the release of the report was 2010, most data represents performance during 2006, 2007, 2008, or 2009; accounting for differences with other sources for similar measures. All 50 states are included in the comparison, as is Washington, D.C.

Other sources include

National Science Foundation, state profiles.

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

"The Annual State Competitiveness Report" has been published since 2001. Using more than 40 variables, grouped into eight categories, the report identifies competitive strengths and weaknesses. Available at: www.beaconhill.org/Compete10/Compete2010State.pdf.

The National Telecommunications and Information Administration is an agency in the U.S. Telecommunications data is provided by the Census Bureau: www.ntia.doc.gov/data/CPS2009_Tables.html

Table A-1: Number of Firms, Jobs & Wages of Selected Minnesota Science & Technology Sectors: 2009 Data

NAICS	Industry Description	Establish-ments	Employment	Wages
3241	Petroleum and coal products manufacturing	26	2,149	$188,223,285
3251	Basic chemical manufacturing	49	1,162	$70,519,617
3252	Resin, rubber, and artificial fibers mfg.	10	355	$20,643,993
3253	Agricultural chemical manufacturing	24	142	$7,061,958
3254	Pharmaceutical and medicine manufacturing	54	3,454	$246,792,902
3255	Paint, coating, and adhesive manufacturing	36	1,191	$120,468,592
3259	Other chemical product and preparation mfg.	81	2,070	$136,341,932
3331	Ag., construction, and mining machinery mfg.	127	6,734	$326,700,349
3332	Industrial machinery manufacturing	109	2,495	$151,027,557
3333	Commercial and service industry machinery	92	3,495	$216,889,620
3336	Turbine and power transmission equipment mfg.	18	363	$17,417,455
3339	Other general purpose machinery manufacturing	216	9,147	$504,118,121
3341	Computer and peripheral equipment mfg.	84	10,506	$965,614,791
3342	Communications equipment manufacturing	39	2,167	$133,763,591
3343	Audio and video equipment manufacturing	22	370	$13,752,919
3344	Semiconductor and electronic component mfg.	147	8,733	$430,671,640
3345	Electronic instrument manufacturing	219	25,385	$2,092,653,425
3353	Electrical equipment manufacturing	70	4,654	$278,349,863
3359	Other electrical equipment and component mfg.	70	1,831	$95,346,320
3364	Aerospace product and parts manufacturing	31	N/A	N/A
3369	Other transportation equipment manufacturing	42	2,817	$130,663,143
3391	Medical equipment and supplies manufacturing	399	15,794	$1,024,108,986
5112	Software publishers	257	5,553	$523,553,215
5172	Wireless telecommunications carriers	146	3,218	$169,785,987
5182	Data processing and related services	330	6,691	$492,814,731
5415	Computer systems design and related services	4,076	27,442	$2,435,954,041
5417	Scientific research and development services	389	6,860	$599,198,424
541330	Engineering services	1,028	11,209	$844,601,304
541380	Testing laboratories	151	2,234	$117,314,624
541620	Environmental consulting services	129	910	$57,991,676
541690	Other technical consulting services	603	1,687	$111,502,384
	TOTAL	***9,074***	***170,818***	***$12,523,846,445***
	Average Wage = $73,313			

Source: Minnesota Department of Employment & Economic Development

Table A-2 New Economy Index Data with Comparison States

The following table highlights the November 2010 release of the New Economy Index for states, comparing MN to states of similar size (MD and CO), competitive states (PA, OH, NC, and WI), and states with similar overall ranking (OR). Numbers represent ranking among 50 states, 1= highest-ranking state.

	Maryland (similar population)	Colorado (similar population)	Minnesota	Oregon (similar ranking)	Pennsylvania (comparison state)	North Carolina (comparison state)	Ohio (comparison state)	Wisconsin (comparison state)
Overall Rank	3	9	13	14	22	24	25	29
IT Professionals	5	7	6	30	19	14	15	24
Management, Professional and Technical Jobs	2	13	8	26	15	27	22	29
Workforce Education	2	3	8	16	32	37	38	26
Manufacturing Value-added	7	27	22	14	16	25	19	17
High-wage Traded Services	26	19	5	17	12	22	15	25
Export Focus on Manufacturing	25	42	24	11	31	27	26	36
Foreign Direct Investment	19	28	29	43	17	7	22	39
Job Churning	20	5	23	14	25	17	39	37
Fastest-growing Firms	4	11	21	19	14	17	25	29
IPOs	21	5	20	45	27	23	30	28
Entrepreneurial Activity	33	8	42	12	50	41	32	34
Inventor Patents	17	14	9	2	30	44	27	19
Online Population	10	8	7	4	37	39	32	15
E Gov't	14	8	12	5	7	37	21	33
Online Agriculture	35	13	14	11	43	28	32	20
Broadband-Telecom	2	22	25	21	20	27	30	26
Health IT	36	24	4	5	10	15	26	43
High Tech Jobs	4	5	13	15	16	20	32	33
Scientists and Engineers	3	5	8	24	22	26	20	28
Patents	13	6	12	7	24	22	28	32
Industry R&D	22	8	7	10	11	20	14	16
Non Industry R&D Investment	2	14	39	32	19	16	18	27
Alternative Energy Use	22	48	31	6	10	15	34	25
Venture Capital	9	4	11	12	15	13	31	40

Source: 2010 New Economy State Index, ITIF and Kauffman Foundation, November 2010

Table A-3 Comparison of Rankings for Minnesota and Leading Technology States

Like the New Economy Index, this data source measures various innovation indicator. Note that the year used for each indicator may result in slight variations with other data sources, however, Minnesota's relative standing compared to other states are similar among data sources.

General Demographic & Economic Indicators	MN	CA	CT	IL	MA	MD	NJ
Population (July 2009)	**21**	1	29	5	15	19	11
Civilian Labor Force (2009)	**20**	1	28	5	14	21	11
Personal Income per Capita (2008 $)	**12**	10	2	15	4	7	3
High Tech Employment (2008)	**16**	1	21	7	8	12	11
Employment in High Tech Establishments (2006)	**15**	1	23	4	10	16	6
High-Tech Share of Business Establishments	**15**	9	18	14	8	5	6
Gross State Product (2009)	**16**	1	23	5	13	15	7
Academic Indicators & Degree Production							
Advanced S&E Degrees Awarded (2007)	**21**	1	22	4	5	10	12
Bachelor's Degree Holders or Higher Among Individuals 25-44 Old (2007)	**17**	1	23	5	10	14	7
Federal R&D Expenditures at Universities (2006)	**25**	1	19	7	6	3	20
State and Local Govt. R&D Expenditures at Universities (2006)	**18**	2	41	12	19	14	16
Industry R&D Expenditures at Universities (2006)	**23**	1	25	10	7	9	16
Institutional R&D Expenditures at Universities (2006)	**27**	1	29	4	22	5	14
Expenditures per Pupil for Elementary and Secondary Public Schools (2007-2008)	**23**	30	4	22	8	11	1
Workforce Indicators							
Individuals in S&E Occupations as a Share of Workforce (2008)	**7**	9	10	25	2	4	8
Employed S&E Doctorate Holders in the Workforce (2006)	**18**	1	19	7	4	6	8
Engineers in the Workforce (2008)	**20**	1	23	8	10	14	13
Life & Physical Scientists as a Share of Workforce (2008)	**13**	12	22	38	3	6	8
R&D Indicators							
SBIR Funding for Small Businesses, 2006-2008	**19**	1	23	17	2	7	13
Business R&D (2007)	**13**	1	10	7	2	19	3
Academic R&D (2008)	**24**	1	22	8	6	4	19
Patents Awarded per 1,000 Individuals in S&E Occupations (2008)	**5**	4	6	17	8	32	14
Venture Capital and Entrepreneurial Indicators							
Number of Venture Deals (2009)	**16**	1	14	12	2	9	7
Venture Capital Investments (2009)	**13**	1	18	15	2	12	6
Net High-Tech Business Formation (2006)	**41**	1	39	16	22	13	42
Overall 2010 State New Economy Index	**13**	7	5	15	1	3	4

Source: "Minnesota R&D 2010;" "Iowa R&D 2010;" "North Dakota R&D 2010;" "South Dakota R&D 2010;" and "Wisconsin R&D 2010." Alliance for Science and Technology Research in America (www.aboutastra.org/toolkit/state.asp).

Table A-4 Trends in Innovation Performance 2002-2010

Using the State New Economy Index, this table compares Minnesota's 2002, 2007 and 2010 rankings Indicators are arranged by measures that are relatively unchanged, those in decline, those improving and new measures.

Indicator	Minnesota's Rank		
	2002	2007	2010
Indicators that are relatively unchanged (+/- 3 rankings)			
IT Professionals	8	7	6
Managerial, Professional, Technical Jobs	7	7	8
Workforce Education	7	10	8
Immigration of Knowledge Workers	31	28	28
Migration of U.S. Knowledge Workers	15	N/A	14
High-Wage Traded Services	4	4	5
Broadband Telecommunications	24	27	25
Indicators that are declining			
High-Tech Jobs	7	12	13
Patents	8	13	12
Manufacturing Value Added	15	9	22
"Gazelle Jobs" (percent of high growth companies)	16	7	23
IPO's	13	17	20
Export Focus of Manufacturing and Services	13	27	24
Online Population	2	4	7
Fastest Growing Firms	NA	13	21
Entrepreneurial Activity (people starting companies)	NA	24	42
Inventor Patents	NA	5	9
Indicators that are improving			
Scientists and Engineers	20	22	8
Industry Investment in R&D	14	8	7
Online Agriculture	24	22	14
E-Government	26	9	12
Job Churning	44	31	23
Foreign Direct Investment	36	30	29
Venture Capital	16	19	11

Sources: "The 2010 State New Economy Index." The Information Technology and Innovation Foundation (www.itif.org/files/2010-state-new-economy-index.pdf).
"The 2002 State New Economy Index." The Progressive Policy Institute. Available online at www.neweconomyindex.org/states/index.html.

General Demographic and Economic Indicators

Table A-5

Indicator	Minnesota's Rank
Population	21
Civilian Labor Force	20
Personal Income per Capita	12
Gross State Product	16

Source: "Minnesota R&D 2010." Alliance for Science and Technology Research in America. Available online at: www.aboutastra.org/toolkit/state.asp.

Table A-6

Indicator	Minnesota's Rank
Labor Force Participation Rate	5
Business Taxes as a Percent of Private Sector Economic Activity	16
America's Greenest States (Forbes)	15
Small Business Administration Loans	7
Most Livable State	4
Poverty Rate	8

Source: "Compare Minnesota." Minnesota Department of Employment and Economic Development (http://www.positivelyminnesota.com/mwa/deed/comparemn.aspx).

Table A-7

Indicator	Minnesota's Rank	
	2006	2009
Real Gross Domestic Product per Capita	12	14
Median Household Income	10	13

Source: U.S. Bureau of Economic Analysis (http://bea.gov/regional/index.htm#gsp).
U.S. Census Bureau (http://factfinder.census.gov/servlet/GRTSelectServlet?ds_name=ACS_2006_EST_G00_&_lang=en) .

Table A-8

Indicator	Minnesota's Rank
Percentage of People Using Internet	4

Source: National Telecommunications and Information Administration (www.ntia.doc.gov/data/CPS2009_Tables.html).

Innovation Capacity Indicators

Table A-9

Indicator	Minnesota's Rank
Federal R&D Obligations Per Civilian Worker	22
Business R&D	13
SBIR Funding for Small Businesses, 2006-2008	19
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 Awarded per 1,000 Individuals In S&E Occupations	5
Venture Capital Investment Deals	16
Venture Capital Investment Dollars	13

Source: "Minnesota R&D 2010." Alliance for Science and Technology Research in America www.aboutastra.org/toolkit/state.asp.

Table A-10

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.

Education & Knowledge Jobs Indicators

Table A-11

Indicator	Minnesota's Rank
Advanced S&E Degrees Awarded	21
Bachelor's Degree Holders or Higher	17
State & Local Govt. Expenditures at Universities & Colleges	18
Individual in S&E Occupations as Share of Workforce	7
Employed S&E Doctorate Holders in Workforce	18
Life & Physical Scientists as Share of Workforce	13
Hi-Tech Share of Business Establishments	15
Net High-Tech Business Formations	41

Source: "Minnesota R&D 2010." Alliance for Science and Technology Research in America www.aboutastra.org/toolkit/state.asp.

Table A-12

Indicator	Minnesota's Rank	
	2008	2010
Knowledge Jobs (overall indicator)	8	6
IT Professionals	8	6
Managerial, Professional, Technical Jobs	7	8
Workforce Education	7	8
Immigration of Knowledge Workers	31	28
Migration of U.S. Knowledge Workers	15	14
Manufacturing Value Added	15	22
High-Wage Traded Services	4	5

Sources: "2008 State New Economy Index." (www.kauffman.org/uploadedfiles/2008_state_new_economy_index_120908.pdf). "2010 State New Economy Index." (www.kauffman.org/uploadedfiles/snei_2010_report.pdf).

Table A-13: National Science Foundation Science and Engineering Profile: Minnesota 2010

Characteristic	State	U.S. total	Rank
Employed SEH doctorate holders, 2006	11,800	620,140	18
S&E doctorates awarded, 2007	571	31,801	19
Life sciences (%)	27	26	–
Engineering (%)	22	24	–
Social sciences (%)	14	14	–
SEH postdoctorates in doctorate-granting institutions, 2006	1,057	49,201	15
SEH graduate students in doctorate-granting institutions, 2006	15,818	542,073	10
Population, 2008 (thousands)	5,220	308,014	21
Civilian labor force, 2008 (thousands)	2,933	155,366	21
Personal income per capita, 2007 (dollars)	41,105	38,615	13
Federal spending			
Total expenditures, 2007 ($millions)	40,075	2,532,073	23
R&D obligations, 2006 ($millions)	1,237	107,545	23
Total R&D performance, 2006 ($millions)	7,149	335,377	15
Industry R&D, 2006 ($millions)	6,296	243,853	12
Academic R&D, 2007 ($millions)	637	49,406	24
Life sciences (%)	72	60	–
Engineering (%)	10	15	–
Social sciences (%)	5	4	–
SBIR awards, 2000–07	619	44,157	20
Utility patents issued to state residents, 2008	2,535	77,493	9
Gross domestic product, 2007 ($billions)	255	13,832	16

– = no value possible.

S&E = science and engineering; SEH = science, engineering, and health; SBIR = small business innovation research.

Source: National Science Foundation, 2010

Table A-14: Federal Obligations For Research and Development, By Agency and Performer: Minnesota, FY 2006
(Thousands of dollars)

		Performer					
Agency	Total	Federal intramural	Industrial firms	Universities and colleges	Other nonprofits	State, local governments	Rank
All agencies	1,237,266	52,182	659,534	326,009	193,583	5,958	23
Department of Agriculture	45,438	27,084	0	18,352	2	0	16
Department of Commerce	730	15	0	715	0	0	43
Department of Defense	648,352	2,882	627,610	9,120	8,740	0	19
Department of Energy	11,656	0	4,000	7,415	241	0	32
Department of Health and Human Services	433,836	0	16,980	226,661	184,237	5,958	15
Department of Homeland Security	5,260	574	1	4,685	0	0	21
Department of the Interior	2,932	2,615	0	317	0	0	29
Department of Transportation	1,390	0	120	1,234	36	0	37
Environmental Protection Agency	19,283	19,012	0	271	0	0	6
National Aeronautics and Space Administration	12,559	0	8,565	3,994	0	0	31
National Science Foundation	55,830	0	2,258	53,245	327	0	21
Rank	23	33	18	23	8	21	–

– = no value possible.

FFRDC = federally funded research and development center.

NOTES: Federal R&D obligations are as reported by funding agencies. Rankings and totals are based on data for the 50 states, District of Columbia, and Puerto Rico.

SOURCES: Prepared by the National Science Foundation/Division of Science Resources Statistics. Data compiled from numerous sources; see the section, "Data Sources for Science and Engineering State Profiles."

Source: National Science Foundation, 2010

Comparisons to Selected States

"2009 Index of the Massachusetts Innovation Economy" published by the John Adams Innovation Institute since 1997, 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. Available online at: http://web27.streamhoster.com/mtc/index_2009.pdf.*

Table A-15

Indicator	Minnesota's Rank (of 10 comparison high-tech states)
Three-Year Household Median Income	6
Households Spending 30% or More of Income on Housing	9
Relocations to State by College Educated Adults From Another State And Abroad	5
Relocations to State by College Educated Adults From Abroad	9
Manufacturing Exports per $ of State GDP	5
Growth Rate of Manufacturing Exports	9
Spinout Companies from Research Institutions	8
Initial Public Offerings	9
Mergers by Location of Acquired Company	8
Number of Companies Bought Per Company Sold	4
Bachelor's and Graduate Degrees in Health Professions and Biological Sciences	10
Bachelor's and Graduate Degrees in Computer & Information Science Engineering	4
Public Higher Education Appropriations per FTE Student	8
Educational Attainment of Working Age Population (Bachelor's Degree or Higher)	6
Educational Attainment of Working Age Population (Some College, Less Than 4 year Degree)	1
Dollar Value of SBIR Awards per Capita	7
Medical Device Pre-market Notifications	4
Medical Device Pre-market Approvals	4
Biotechnology Drugs in Development	10
Industry Funding of Academic R&D per Capita	10
Percent of Academic R&D Funded by Industry	8
R&D Intensity	8
Patents Issued per Capita	3
Venture Capital Investments Per Capita	5

Source: "2009 Index of the Massachusetts Innovation Economy." John Adams Innovation Institute.

Table A-16: Comparison of State Investments in S&T

While states like California and Massachusetts are known for large S&T investments, this table illustrates the investments by other states of all sizes

State	Budget	Population 2009
Arizona	$100 m to Science Foundation of Arizona $50-60 m per year to AZ Technology and Research Initiative Fund $35 million to strengthen scientific and engineering research programs. (.6% sales tax has dedicated over $50m per year to commercialized research	6,595,778
Georgia	$5m m for Seed Capital Fund; $2-5 m per year for Venture Lab and patent funding $4.7 M Eminent Scholar funding in 2006 only	9,829,211
Indiana	$100 m of pension funds for VC programs $80 m of general fund and $189 m of bonding for life science initiatives	6,423,113
Iowa	$100 m for renewable energy, fuels, and cleantech $50 m for GAP and industrial Research Matching Funds $45 m for various commercialization projects and facilities	3,007,856
Maryland	$1.3 b for biosciences and nanotechnology centers of excellence $XX m for technology commercialization and entrepreneurial start up finds	5,699,478
Maine	$50 m bond for commercialized research projects engaging industry and universities $6 m Marine Research Fund $42.5 m Biomedical Research Fund	1,318,301
North Carolina	$1.2 b over 10 years for biosciences, nanotechnology, biomedicine, biofuels ($857 m in facilities & $135 m in workforce training)	9,380,884
Kentucky	$21m seed fund Up to $6 per year for SBIR assistance and match $20 m for seven other S&T initiatives	4,314,113
North Dakota	$20 m for centers of excellence $4m for gap financing for business start-ups Funding for Innovate ND to be match 1:1 with privately raised dollars	646,844
Ohio	$1.6 b in 2005 for Ohio Third Frontier Program that XXXXXXXX	11,542,645
Oklahoma	$ 19 m for the state seed fund $1 m per year for proof of concept fund for entrepreneurs; $2+m per year to help entrepreneurs launch S&T companies $300 m toward EDGE fund to commercialize applied research ($1 b goal);	3,687,050
Oregon	$100 m of pension funds for VC programs $5-15 m per year for centers of excellence	3,825,657
Pennsylvania	$100 m for regional centers focused on growing companies from research $60 m to support venture capital $230 m for life science initiative (from Tobacco Settlement) $55 m per year appropriation for Ben Franklin Development Authority	12,604,767
Texas	$200 m for the Emerging Technology Fund to commercialize new ideas (industry and university uses)	24,782,302
Utah	$19 m for commercialization of research $165 m for the state's USTAR program focused on building excellence in various industry clusters.	2,784,572
Washington	Ongoing appropriation for the Washington Technology Center, including a $1m per year for entrepreneurial assistance $350 m for the Life Sciences Discovery Fund	6,664,195
Wisconsin	$150 m for the Wisconsin Discovery Institute $185 m over 12 years for VC	5,654,774

MINNESOTA SCIENCE & TECHNOLOGY AUTHORITY

1st National Bank Building • 332 Minnesota Street, Suite E200 • St. Paul, MN 55101-1351
651-259-7441 • Toll Free: 800-657-3858 • TTY: 651-296-3900
www.mnscienceandtechnologyauthority.org

January 2011