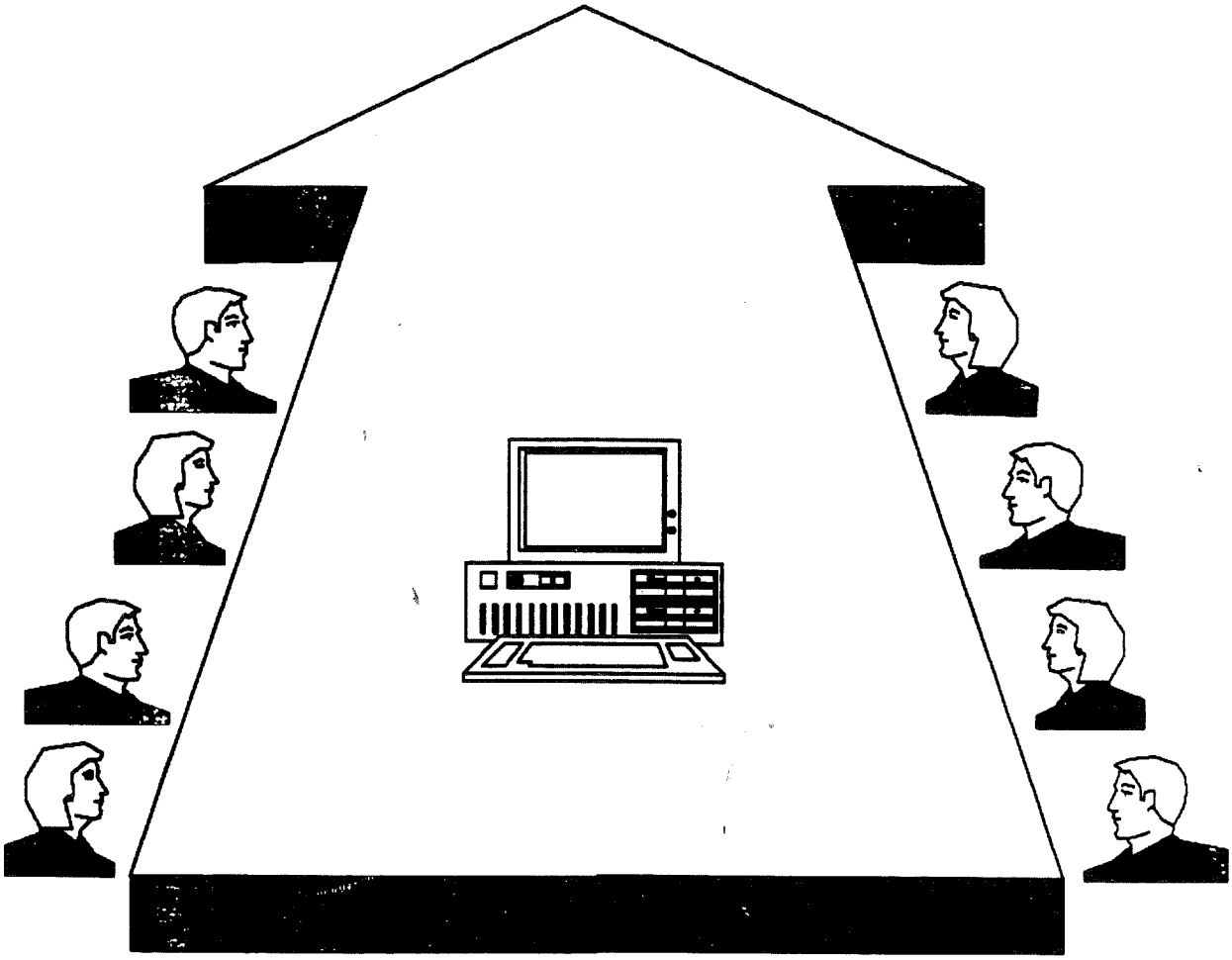

GOVERNOR'S TASK FORCE ON THE FUTURE OF THE MINNESOTA COMPUTER INDUSTRY

Governor's Task Force on the Future of the Minnesota Computer Industry

Preliminary Report
Prepared for the
Honorable Arne Carlson
Governor
of the
State of Minnesota
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MISSION

In August 1990, Governor Rudy Perpich appointed the Task Force on the Future of the Minnesota Computer Industry. The Task Force brings together leaders from industry, academia, government, and labor to identify ways these various constituencies can cooperate to enable existing computer technology firms to preserve and expand our vital computer industry base. To this end, the Task Force proceeded to:

- ❑ Isolate the most important issues facing Minnesota's computer industry.
- ❑ Identify global trends which will drive future growth of the computer industry.
- ❑ Explore ways to create an environment which will foster the formation, expansion, and relocation of computer technology companies in the state.
- ❑ Identify and promote opportunities which leverage current strengths of the Minnesota computer industry.
- ❑ Propose a strategy for the preservation and revitalization of the state's existing computer industry.
- ❑ Recommend actions and incentives to promote the economic health and growth of employment of the state's computer industry.

INTRODUCTION

A strong computer industry is vital to the success of Minnesota's economy. Despite a much-publicized downturn during the last decade, our computer industry remains the largest manufacturing sector in the state, accounting for over one-half of the value of all manufactured exports. In 1986, Minnesota firms exported over $2 billion worth of computer and office machinery. From an employment perspective, the computer industry, broadly defined, employs almost 70,000 Minnesotans.

However, the Minnesota computer industry has not kept pace with the growth of the global industry during the last decade. Minnesota companies, by and large, have not participated in the fastest growing industry segments. Many of the new computer industry jobs are only weakly anchored to the state because they are created in smaller companies in segments of the industry without major capital investments in plants and infrastructure in Minnesota. The higher mobility of jobs in the industry has caused a net displacement of ten thousand jobs from Minnesota in the last decade, and in an industry that has grown enormously worldwide, Minnesota has barely managed to hold steady in total employment. We are becoming an ever more static component in a fast-growing, dynamic industry.

For Minnesota to remain a world leader in computer technology over the next decade will require a concerted commitment by government, education, and industry to focus the state's considerable strengths, but limited resources, in pursuit of unparalleled excellence in a few carefully chosen fields of technological expertise.

Minnesota has a heritage of innovation and success in computer technology. Over the last two decades, Minnesota has benefited from the emergence of a successful computer industry in the state. During the period, our state has earned an international reputation for its highly trained, well motivated, and technologically oriented workforce. We are recognized for our world-class expertise in such fields as:

- Application software development
- Computer-aided design & manufacturing
- Computer-aided education
- Enterprise systems integration
- Management information systems
- Parallel processing systems
- Supercomputing
- Artificial intelligence & expert systems
- Computer architectures
- Embedded computing devices
- High-speed networking
- Microelectronics
- Real-time and transaction computing systems
- Systems software design

Minnesota has a well-deserved, worldwide reputation as a manufacturer of top quality large-scale computers, ranging from minicomputers to mainframes to supercomputers. As a case in point, last October, IBM's Rochester, Minnesota development and manufacturing facility was awarded the prestigious Malcolm Baldrige National Quality Award for excellence in quality management by the U.S. Department of Commerce. The award promotes national awareness about the importance of improving total quality management and recognizes quality achievements of U.S. companies.

As a state, we have also long been recognized for our exceptional educational system and superior quality of life. There is much to be proud of in our past achievements, but in this period of rapid industry change, we cannot simply rely upon our good reputation and past successes to ensure a successful future. In today's hotly competitive global marketplace, it is obvious that no state or country can excel in every critical technology and business discipline. Technological specialization is now a necessity. To remain a technology leader,

Minnesota must adapt to this trend. While we may currently enjoy technological superiority in selected markets, such as large-scale computer systems, our leadership is being challenged.

Minnesota's mainframe-oriented computer industry has experienced a traumatic restructuring in recent years. These challenges are driven by a revolution sweeping the information industry worldwide. The challenge now facing Minnesota's computer industry is to respond swiftly to these changes in order to preserve our vital computer technology infrastructure. Our response must reflect this simple fact:

In the future, we cannot be best at everything, but to compete we must be best at something!

The task force is unanimous in recommending that the single focus the state should pursue is the integration of computing and communications. The vehicle to achieve this should be a statewide information highway, a super-network of distributed computing and data resources and applications we call MINNLINK-2000. The creation of this data highway, the redirection of several state activities and resources, and a renewed emphasis on education in science and mathematics constitute the Task Force's recommended actions.

SUMMARY OF RECOMMENDATIONS

The Task Force has unanimously selected a set of initiatives which anticipate global computer industry trends over the next decade and focus the state's limited resources in areas that can capitalize on those trends. The Task Force recommends a four-point strategy:

1. Technology Focus

As the cornerstone of our proposal, we strongly recommend that our state government support the creation and rapid deployment of a state-of-the-art information highway, including the installation of a fiber optic trunk linking key facilities around the state into one network. The proposed network, to be called MINNLINK-2000, will create tremendous opportunities for the Minnesota computer industry to develop new uses for distributed networks, databases, software applications, networking and telecommunications systems.

State government policymakers and regulators should facilitate and coordinate the rapid implementation of MINNLINK-2000 strategy to tie together major educational institutions, medical facilities, state agencies, libraries, and corporations around the state.

The Task Force envisions a cooperative, essentially **self-funding** effort undertaken jointly by the state's businesses, government agencies, public utilities, and educational institutions. We believe that the design, construction, management, and availability of MINNLINK-2000 will:

- Tap Minnesota's unique blend of technological skills.
- Stimulate the creation of entrepreneurial ventures.
- Generate profit potential for Minnesota businesses.
- Give Minnesota businesses a competitive edge in global commerce.
- Create export opportunities for our technological expertise.

2. Excellence in Education

Access to a skilled workforce and technological expertise are among the highest priorities for any technology firm considering founding, expanding, or relocating in our state. To ensure that Minnesota's future workforce is technologically literate and globally competitive, we recommend that the state:

- Invest to develop a world-class K-12 educational program in math and science.
- Establish science and math proficiency standards for K-12 teachers.
- Fund retraining programs for teachers who need additional education to demonstrate proficiency.
- Establish science and math graduation standards based on outcome equivalency.
- Build the U of M computer science department to a top ten national ranking by 1995.
- Establish a Center of Excellence at the U of M in applied information technologies.
- Provide students at all levels with network access to computer-based educational resources.

3. Reallocation of State Resources

State spending on the computer industry is not commensurate with its importance to the Minnesota economy. State allocations for computer-related research and development activities accounted for 17 percent of all research dollars, compared to 37 percent for agricultural research and 19 percent for research in natural resources. When measured by the important criteria of total jobs, value of exports (which reflects the net external dollars brought into Minnesota), total payroll dollars, and total revenues, the computer and electronics industry is more important, to more people in the state, than any other industry. But the state efforts in support of this largest sector of the economy are enormously below the level of effort in support of agriculture or tourism. This needs to be adjusted by reallocating state funding from several departments to increase the commitment to the high technology industry.

Despite the obvious economic importance of this industry, the Department of Trade and Economic Development assigns only one person to promote the development of all technology-related industries. In recognition of the importance of science and technology to our state economy, we recommend that the Governor elevate the existing Office of Science and Technology to department-level stature. This new Department of Science and Technology would recommend, develop, and administer state initiatives in support of Minnesota's science and technology community.

4. Fostering Entrepreneurship

In spite of the current budgetary crisis, and as a positive step toward a long-term solution to the crisis, the Minnesota Legislature should devise a carefully targeted tax incentive plan to:

- Stimulate the creation of entrepreneurial technology ventures
- Foster the growth of emerging technology firms
- Act as a catalyst for job creation and investment within the state

We recommend that the following initiatives be analyzed for possible inclusion in the plan:

- Waive state capital gains taxes on long-term investments in all Minnesota start-up manufacturing and software development firms.
- Reinstate the corporate tax credit on research and development expenditures.
- Provide tax credits for corporate expenditures for employee education.

Any negative effect of these actions on state revenue will be relatively minor in the short term. Capital gains tax changes would not affect revenues to the state for several years, and the R&D and education tax credits would have a minimal effect on total tax revenues. Measured against short-term effects to state revenues is the certainty of long-term benefits derived from making Minnesota more attractive for companies in the industry to come here, stay here, and grow here.

Technology Focus

As the global computer industry evolves, centralized mainframe computers are being replaced by distributed networks of computing resources. Users are demanding ready access to suppliers, customers, information sources and training opportunities. Ultimately, national and global computer networks will be commonplace.

MINNLINK-2000

The Task Force believes that the rapid deployment of the state-of-the-art network we recommend as Minnesota's major thrust and focus in this industry for the decade, MINNLINK-2000, will position Minnesota at the leading edge of this explosive global trend. We believe Minnesota possesses expertise in a unique combination of applied technologies that are integral to the design and management of the complex networks that will be needed in the emerging information age. The presence of MINNLINK-2000 could make Minnesota an international test bed for the creation and development of new technologies that will be essential to bringing the promise of the information age to reality. Minnesota could lead the world in one of the most important new technology industries.

In addition to capitalizing on resources already in the state, MINNLINK-2000 will make Minnesota a magnet for attracting talented people from outside the state as well. If MINNLINK-2000 is successful, we will earn an international reputation that could fuel the growth of Minnesota's information technology industry well into the next decade.

MINNLINK-2000 represents a formidable technological challenge. It involves the complex task of integrating a collection of existing public and private data, voice, and satellite networks into a new high-speed, high-capacity fiber optic backbone network incorporating digital and fiber optic technologies. But the MINNLINK-2000 project presents some real opportunities to stimulate renewed growth in the state's computer industry.

On a different scale, there are several historical precedents for such an ambitious undertaking. The construction of our nation's railroad, interstate highway, and airline reservations systems are perhaps the most notable examples. The information age is driving the creation of vast information networks which are affecting commerce as profoundly as the transportation systems that preceded them. Minnesota can assume a leadership role by actively fostering the creation of a broadband fiber optic network across the state.

There are at least seven similar, if smaller and less ambitious, modern information highway efforts underway in the United States which can be studied: North Carolina, California, Michigan, Oklahoma, Utah, Tennessee, and New York. There are a few promising international projects as well which could serve as models, most notably in Japan and France. The French Minitel system, for example, links every home in France by means of a terminal attached through the phone system.

Implementation of MINNLINK-2000

MINNLINK-2000 cannot be just another expensive public works project. We recognize that in the face of the current fiscal crises at both state and federal levels, MINNLINK-2000 must be essentially self-funding, i.e. not require significant new public funds. We envision a cooperative effort funded jointly by the state's businesses, government agencies, public utilities, and education institutions through:

- Profit motivation for Minnesota businesses and telecommunications utilities
- Reallocation of existing and available public funds
- Tax incentives for long-term capital investments related to MINNLINK development
- Leveraging the state's investment in the STARS network

Minnesota computer and telecommunications companies, large and small, would be motivated to participate through their own investments. Industry will act in consort with higher education institutions and state government to create the vital information infrastructure.

The MINNLINK-2000 consortium of business, government, and education would use the network to tie together massive databases into one manageable and accessible information resource. This consortium will, whenever possible, preferentially select key technologies from Minnesota companies to provide the necessary hardware, software, service, system integration, and data service components for the creation of MINNLINK-2000.

The project would be implemented in stages over this decade with the goal to eventually link state agencies, schools, libraries, businesses, and homes to a wide range of databases, information sources, and communications resources.

What will MINNLINK-2000 do for citizens of Minnesota?

The charge of this task force was to propose a strategy for the preservation and revitalization of the state's computer industry. We think that MINNLINK-2000 provides the unifying vision needed to accomplish that end. But the benefits of MINNLINK-2000 could go well beyond that objective.

Initially, MINNLINK-2000 will provide students in K-12, vocational schools, and higher education alike with unique and powerful educational resources. Eventually, even private citizens could receive a tremendous range of interactive information resources directly in their homes. When operational, MINNLINK-2000 will offer Minnesota residents and businesses unparalleled access to local, national, and global information sources, including:

- Multimedia training
- Electronic mail
- Interactive video conferencing
- On-line data retrieval
- Supercomputing resources
- Electronic data interfacing
- Library and database services
- Real time remote testing
- Hardware and software applications

By the turn-of-the-century, MINNLINK-2000 could bring the power of information technology to businesses and private citizens alike by electronically uniting the state from the classroom to the office, from the factory floor to the farmer's field.

Excellence in Education

K-12 Education

To ensure that Minnesota's future workforce is skilled and literate in the use of information technologies, we must continue to support K-12 education programs in our state. The task force recommends that:

- High school students should be required to meet outcome-based equivalency graduation requirements of three years each in mathematics and science.
- Students planning to attend post-secondary school should be required to complete the equivalent of one additional year each in mathematics and science.
- Schools should ensure that non-college bound students are technically prepared for future demands of the workforce.

Teacher Proficiency

Equally important is the need to ensure that K-12 teachers are proficient in the mathematics, science, and computer literacy subjects that they teach. While the Task Force recommends that no teacher be penalized for failure to meet these standards, we propose the use of state or local resources to help fund retraining programs for teachers who cannot demonstrate proficiency. In cooperation with Minnesota information technology firms, we propose that the state provide annual summer science and mathematics workshops for Minnesota teachers.

Higher Education

We believe higher education institutions play a key role in the revitalization of the computer industry in Minnesota. Access to a skilled workforce and technological expertise are among the highest priorities for any information technology firm. Stanford, MIT, and the University of Texas at Austin are driving forces behind the development of many technology firms. Despite the long history of the Minnesota computer industry, the University of Minnesota has played a relatively minor role in the development of information technologies in the state.

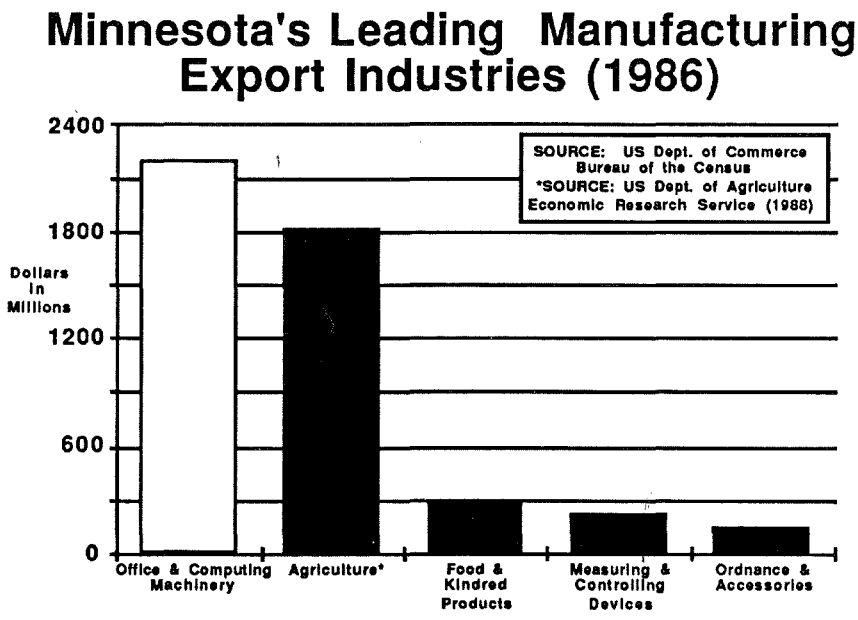
The University of Minnesota should be given the mandate and resources to rebuild its computer science department with a goal of achieving a top ten ranking by 1995. We strongly recommend that the University use available vacancies in the department to strengthen its expertise in computer applications and information systems. With the support of Minnesota technology firms, the University should establish a Center of Excellence in applied information technologies. We further propose that the University sponsor an industry exchange program to permit computer industry professionals to teach computer science classes and allow faculty to conduct R&D projects in information technology firms.

State universities such as Mankato State and St. Cloud State have made remarkable strides in developing training programs responsive to their local computer technology firms. Private institutions such as the University of St. Thomas have developed nationally recognized programs in software applications. The task force supports and encourages private and public institutions of higher education to continue these activities. To help meet the research and training needs of its local information technology industry, each state university should be encouraged to select one information technology area and focus its efforts on developing curricula and research activities which support that industry.

Reallocation of State Government Resources

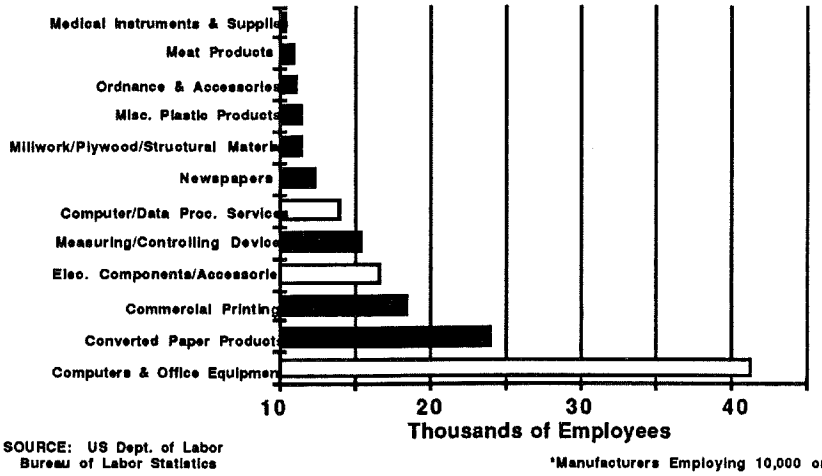
The computer industry has played a major role in making Minnesota a "high tech" state since the creation of Engineering Research Associates (ERA) in St. Paul in 1946. ERA's successors grew into world leaders such as Control Data Corporation, UNISYS, and Cray Research. But the 1980's saw major changes in the global computer industry which resulted in slower growth and declining revenues among Minnesota's computer companies. The resulting employee layoffs in the industry have been widely reported in the media.

Despite these trends, the computer industry remains a vital part of the Minnesota economy. The computer and office machinery industry is the largest manufacturing sector in the state. It accounts for over one-half of the value of all manufactured exports. In 1986, Minnesota firms exported $2.2 billion worth of computer and office machinery:



Total employment in the Minnesota computer industry is large, particularly when the electronics and software industries are included. According to the Minnesota Department of Jobs and Training, employment in the manufacture of computer and office machinery was 39,200 in 1989, down from a peak of 48,000 in 1984. During this same period, employment in electronic components manufacturing increased from almost 11,900 to 15,100, and employment in software and computer services increased from 10,700 to 14,500. The combined computer, electronics, and software industries employ almost 70,000 Minnesotans. But this tabulation shows that we have barely held even in an industry that is growing. Moreover, in areas such as applications software development, where much of the growth in the Minnesota industry has occurred lately, several companies have recently left the state, underscoring the fact that the roots of this newer part of the industry are not deep in Minnesota.

Employment in Minnesota's Largest Industries*



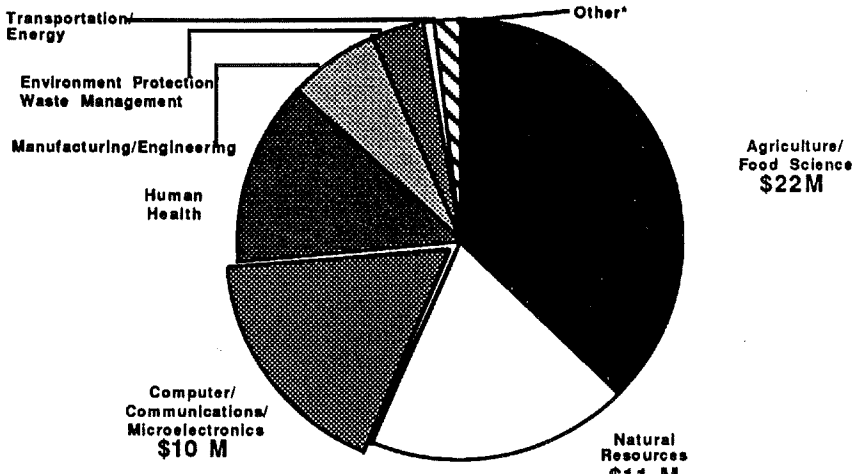
SOURCE: US Dept. of Labor Bureau of Labor Statistics

*Manufacturers Employing 10,000 or more

We need to reverse this trend toward defection and provide conditions for the industry to grow again in Minnesota. Either of two measures, people employed or dollars generated, indicate that Minnesota does not do enough to monitor or assist the computer industry compared with its historical efforts and interests in other major industries in the state. The task force believes that there are two principal avenues for the state to correct this imbalance.

1. State spending for research and development should be reallocated. If 56% of state supported R&D dollars goes to agriculture and natural resources while only one-third of that amount goes to the computer industry, something is wrong. While agriculture and natural resources are vital industries, state support to the computer industry should be proportionate to its significance to the state economy. The computer R&D allocation needs to be increased either by new appropriations or very substantial redirection to the industry from the proportionally over-supported agriculture and natural resource sectors.

State Supported Science & Technology R&D



Fiscal 1990
Total Dollars $59 M

2. State activities that monitor and support the computer industry should be elevated. It is a measure of the state's indifference toward the computer industry that while agriculture has an entire state department and a Commissioner to deal with the important problems and opportunities of the agricultural sector in the state, the larger and more economically significant computer industry is assisted and tracked by only one employee of the state.

This situation can be materially improved by the elevation of the Office of Science and Technology to department-level status and the consolidation of other state activities into this newly-created organization. By incorporating existing resources into this new agency the state can avoid major budget increases while still increasing the level of attention to the computer industry and giving greater weight to its problems.

The proposed Department of Science and Technology would:

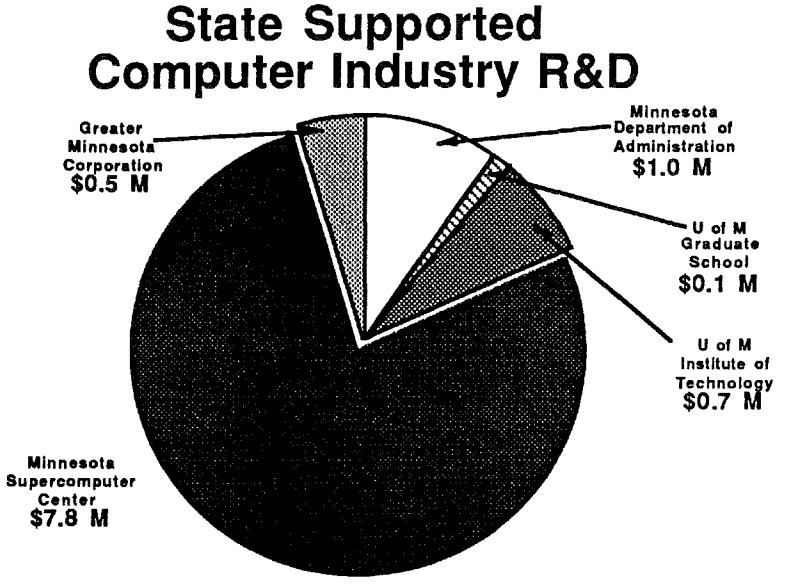
- Act as liaison between the governor, the legislature, and industry.
- Coordinate a long-term science and technology policy, including a focus on the computer industry.
- Provide policy advice and information on issues of industry concern to the governor and the legislature.
- Coordinate the establishment, expansion, and application of MINNLINK-2000.
- Promote and market Minnesota's computer industry outside the state.
- Conduct economic and policy research.
- Collect and analyze information on Minnesota's computer industry.
- Monitor and identify national and international political and technology trends.
- Develop industry/university/government alliances.
- Identify and pursue federal support for the industry.
- Propose legislative and executive action to enhance the industry.
- Help form supplier networks and strategic alliances among Minnesota firms.
- Provide opportunities for Minnesota firms to develop information technology applications for state government.
- Facilitate the transfer or licensing of state-developed information technology applications to Minnesota firms.

We further recommend that the charge to the existing Committee on Science and Technology Research and Development be expanded to provide a permanent voice for industry representatives within state government. The committee, renamed the Minnesota Commission on Science and Technology, would include representation from industry, higher education, and government to recommend short- and long-term strategies to enhance the state's science and technology community.

Among the changes this new department could affect would be the utilization of the Minnesota Supercomputer Center and the mandate and distribution of funding to the Greater Minnesota Corporation.

Minnesota Supercomputer Center

The Minnesota Supercomputer Center (MSC) has been one of the state's largest research and development investments in information technologies for many years. The MSC and the affiliated Supercomputer Institute together form one of the largest supercomputing resource centers for academic research in the world.



However, Minnesota information technology companies have not been able to take full advantage of this valuable resource for the design and manufacture of new products. The task force strongly encourages the MSC, as a state funded facility, to develop special incentives for Minnesota companies, such as training programs and limited free access to its supercomputers, which leverage our state's investment by driving the development of new companies and products.

The Greater Minnesota Corporation

Existing state efforts to promote the development of technology companies are not sufficient and do not address the real needs facing the industry. The mandate and current allocation of resources of the Greater Minnesota Corporation (GMC), which is the state's primary vehicle for promoting applied research, technology transfer, and product development, has had limited impact on the development of Minnesota's computer industry.

The GMC's political mandate requires it to concentrate primarily on the technology needs of Greater Minnesota, while 75% of the state's technology firms are located in the Twin Cities Metropolitan Area. Furthermore, information technologies are not among the GMC's technology focus areas, which include agriculture, natural resources, and manufacturing. Yet it is important to note that the use of information technologies can provide significant benefits to these industries. A redirection of some of the GMC's efforts would help the computer industry and should be undertaken.

Fostering Entrepreneurship

Minnesota's information technology industry must be viewed as a food chain, from the one-person software entrepreneur, to the five-person job shop, to the circuit board manufacturer, to the disk drive manufacturer, to the computer and systems vendor. Each link in the chain has its role to play, each is dependent on the others for its survival. This supplier network creates the critical mass that makes the information technology industry survive and grow.

The task force recommends that several important tax incentives be adopted to affect the investment climate and encourage business formation and expansion in the computer industry. Carefully targeted tax incentives for private investment in Minnesota's information technology are essential to stimulating the formation of new technology ventures in Minnesota.

- The first measure we recommend is the elimination of the state capital gains tax for investments made in Minnesota manufacturing and software development companies during their first three years, if those investments are held for five years. The point of this incentive is to modify the conditions of the last decade which have seen the state's strong position in the computer industry erode. After years of being a leader in new startups, very few new computer-related companies have become major players in the industry in the last ten years, and some of the ones which have are leaving or have left the state. We need to foster new companies in Minnesota so that they will be here when they are big companies; we need to give entrepreneurs a reason to stay and hire people from the still-existing pool of talent in the computer field here before these highly-trained people move elsewhere, further reducing the state's chances for a recovery in the industry.

- The task force also recommends that the state reinstitute a corporate tax credit for research and development expenditures. This initiative will encourage capital investments in computers and communications in all industries.

- In addition, the task force recommends that businesses be given tax credits for corporate expenditures for education of employees in Minnesota as a way to encourage companies to improve the skills of their workers in all areas.

- Finally, the task force recommends that workers' compensation insurance costs be lowered through legislative action.

We recognize that the financial impact of these measures on the tax revenues to the state needs to be more fully understood before a detailed implementation of any of the above recommendations can be enacted. We acknowledge that the details of how they would be phased in and how short-term effects could be accommodated require more study. We are, however, unanimous in our belief that the long-term effect of such incentives would be decidedly positive for the state's revenues. In fact, the most important short-term effect is likely to be not tax revenue reduction, but the prevention of erosion due to decisions of companies and employees to stay here.

VISION FOR 2001

The year is 2001. Minnesota has a strong and dynamic information technology industry which is recognized internationally for making computers and electronic devices universally useful. Minnesota achieved this stature by recognizing in 1991 that the computer industry was making a transition from **building computers** to **using computing power**. This awareness led to a concerted effort to link private companies, educational institutions, government agencies, libraries, and many homes to MINNLINK-2000, a statewide, digital, fiber optic broadband network which provided interactive voice, data, and video communications. In 2001 Minnesota has a well-established, diverse infrastructure of computer hardware and software development, manufacturing and services. This supportive infrastructure provides an attractive environment for the creation, expansion, and relocation of information technology businesses in the state. Minnesota has achieved this position through cooperation within the industry and among the industry, financial, government, and education communities.