

SCIENCE AND TECHNOLOGY STRATEGIC PLANNING

CREATING ECONOMIC OPPORTUNITY



ECONOMIC DEVELOPMENT ADMINISTRATION
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The State Science and Technology Institute is a non-profit corporation designed to enhance government-industry programs, particularly those at the state level, that encourage the growth of business and industry through the application of science and technology. The Institute also seeks to advance cooperation between the states and the federal government in these government-industry programs. The Institute is a resource center for policy makers, program managers and staff, legislators and users of government-industry science and technology programs.

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Acknowledgments

In 1996, the Economic Development Administration (EDA) funded a review of state science and technology strategic planning in the United States. The State Science and Technology Institute (SSTI) was selected to undertake the study. SSTI would like to thank the many individuals who contributed time and information to the development of this report.

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Executive Summary

Best Practices in Science and Technology Strategic Planning

In FY 1996, the Economic Development Administration (EDA), solicited a proposal to 1) identify best practices in science and technology strategic planning; 2) determine how states were addressing the needs of distressed areas in their strategic planning initiatives; and 3) recommend ways in which states and the federal government could leverage science and technology investments to benefit distressed areas. Between September 1996 and September 1997, the State Science and Technology Institute (SSTI) conducted the study. This report presents the project's findings.

After canvassing all fifty states, the project team received twenty-nine economic development and thirteen science and technology strategic plans created between 1991 and 1995. Based on reviews of the plans and with input from practitioners and other economic development professionals, the project team identified the following ten "best practices."

- To be successful, the strategic planning process had a champion with the ability to bring all of the relevant players to the table and the means to see that recommendations were implemented. The Governor often played a critical role in initiating the strategic planning process, although in some cases the private sector initiated the process.
- The process was structured to obtain a wide range of viewpoints. Successful planning processes provide an opportunity to hear the views of all stakeholders, including businesses, workers, academic institutions, and communities.
- The strategy articulated a vision for the state's future and was based on a thorough understanding of the state's industry and technology resources. The vision provides the framework for developing strategies and establishing measures that can be used to determine if progress is being made toward achieving the vision.
- The strategy was designed to benefit all areas of the state, including distressed areas. An effective statewide strategy must take into account the needs of all of the state's regions.
- The strategy was built on existing delivery systems. Prior to developing recommendations for implementing new policies or undertaking new actions, existing resources and organizations should be reviewed to determine how well

Leveraging Science and Technology Resources to Benefit Distressed Areas

existing systems are working and to determine if changes are needed.

- The strategy addressed the key elements needed to support technology-based development, including human resources, technology resources, capital, information infrastructure and tax and regulatory policy.
- The strategy included performance measures related to specific outcomes.
- The strategy included a detailed implementation plan assigning responsibilities and timelines.
- The strategy was tied to the state budgeting process.
- Strong leadership was provided to oversee implementation of the strategy over the long-term.

Another major objective of the project was to determine in what ways state science and technology strategies are addressing the needs of distressed communities and disadvantaged populations, and to recommend ways in which states and the federal government could leverage science and technology investments to benefit distressed areas. The review of science and technology strategic planning suggests that benefitting distressed areas has not been a priority for state technology initiatives.

The state practitioners interviewed indicated this is due, in part, to the fact that the entities responsible for implementing technology policies and programs often operate independently of economic and community development organizations, agencies traditionally responsible for developing and administering programs to revitalize distressed areas. They also suggested that technology-based companies are not likely to locate in distressed areas. The review however, uncovered specific instances in which states and localities are supporting technology-based economic development in urban and rural distressed communities.

A Roundtable of senior state and federal, technology and economic development practitioners was held in April 1997 to discuss barriers to promoting technology-based development in distressed areas, identify initiatives that have been used successfully, and recommend ways in which states and the federal government can leverage their science and technology

investments to benefit distressed areas. The Roundtable participants recommended that:

- States consider the needs of distressed areas in developing science and technology strategic plans by identifying components of the strategy that can most effectively meet the needs of distressed areas. Technology-based incubators, manufacturing extension services, investment in technology infrastructure and skills training, can all play a role in revitalizing distressed areas.
- States help develop the foundations needed to support a technology driven economy, including a skilled technical work force, research and development base, and available investment capital.
- States support the creation and growth of businesses in distressed areas. Such efforts might include helping industry access technology and incorporate state-of-the-art and/or advanced technologies into processes and products, providing support services for entrepreneurs, and providing access to investment capital.
- State technology programs enter into partnerships with local economic and community development organizations. The needs of distressed areas are complex and often require a comprehensive set of solutions. Technology can be used to help communities become competitive; however, real change in distressed areas will require a partnership among business, community-based organizations, educational institutions, and all levels of government.

This review of state science and technology strategic planning suggests a number of initiatives EDA can undertake to encourage states in their science and technology strategic planning efforts to give particular focus to how their investments can benefit distressed areas. EDA can fund pilot projects and demonstrations and provide technical assistance to state and local science and technology policymakers on the issues, needs, problems, and opportunities distressed areas present. EDA also can collect and disseminate information on “best practices,” such as outlined in this report, to state and local science and technology and economic development policymakers. Lastly, EDA can focus resources on organizations, mechanisms, and programs involving science and technology.

Summary and Recommendations



Introduction

Technology is a driving force in today's economy. Technology impacts the ways in which we live our lives and do business. Over the next decade, technology will become even more pervasive. As a result, state efforts to promote economic growth are focusing on bringing technology to both businesses and communities and seeking to create new technology-based firms and industries. At the same time that states are actively promoting technology development and deployment, they are beginning to recognize the need to ensure that all regions and populations within their states are able to participate in this new technology-based economy. This issue will become even more critical as states implement welfare reform and seek to place former welfare recipients in jobs.

The Economic Development Administration (EDA) of the U.S. Department of Commerce provides assistance to distressed communities to overcome problems that inhibit economic development. EDA's mission is to act as a catalyst to assist distressed communities in achieving their long-term competitive economic potential through strategic investment of resources. EDA assistance builds local capacity to understand and tackle economic development challenges and provides resources to help fund those innovative projects that will push a community forward. A key component of EDA's program is the support it provides for economic development planning.

In FY 1996, EDA solicited a proposal to conduct a study of state science and technology strategic planning. The project had three objectives: 1) to identify best practices in science and technology strategic planning; 2) to determine how states were addressing the needs of distressed areas in their strategic planning initiatives; and, 3) to make recommendations for promoting economic growth in distressed communities by leveraging science and technology investments. EDA selected the State Science and Technology Institute (SSTI) to conduct the study.

This report presents the project's findings. They are based on a review of state strategic plans developed between 1991 and 1995 (Appendix A); interviews with senior policymakers in the states that developed a science and technology plan during this time period; site visits to five states that have adopted and implemented strategic plans, with an emphasis on those strategies which include a focus on distressed areas; and a one-day roundtable on "Leveraging Science and Technology Resources to Benefit Distressed Areas", which included senior state and federal technology and economic development practitioners. A list of the Roundtable participants is provided in Appendix B.



Why Develop A Science And Technology Strategic Plan

States often undertake strategic planning efforts in response to a downturn in the economy. Economic re-structuring, a recession, or downsizing within a key industry such as defense, can cause a state to examine its economy and develop policies to promote future economic growth. Equally important for states is to periodically assess their development priorities. Today's economy is knowledge and idea-based, driven by the ability of firms to innovate and develop new products and processes. In the past, state development policies focused primarily on providing capital for physical plant and equipment, and using taxing and regulatory powers to encourage companies to locate facilities within the state. Given the major transformation occurring in the national economy, it is an opportune time for states to reassess their science and technology policies and to evaluate their appropriateness and effectiveness.

Strategic planning provides an opportunity to examine the health of the economy, to identify strengths and weaknesses, and to determine the role government should play in facilitating a healthy business environment. The strategic planning process can:

- bring key stakeholders, both public and private, together to develop consensus;
- provide an opportunity for business, academic, and community representatives to share their input with state decision-makers;
- be used to forge partnerships within and between the public and private sectors;
- increase public understanding of the economy and how it is changing;
- ensure that the state is achieving a maximum return on its investments;
- sharpen the focus of the states' development efforts; and
- set goals against which to measure success.

The development of a science and technology strategic plan, or the science and technology component of an economic development strategy, allows a state to assess its existing technical resources, determine whether they can be leveraged better to generate economic activity, and identify needs that must be addressed to support a technology-intensive and technology-driven economy. The strategic planning process can be used to enlarge the base of support for the state's science and technology initiatives by involving businesses and communities which may not have been aware of the potential

benefits of the state's technology investments. Maryland, Pennsylvania, and Rhode Island have undertaken strategic planning efforts in the last several years, but the impetus for each was different:

- √ Maryland saw a need in 1992 to create a strategy for overall science and technology policy. The state had significant technology resources, such as the National Institutes of Health and Johns Hopkins University, upon which it wanted to build. The Maryland Department of Business and Economic Development (then called the Department of Economic and Employment Development) developed a Strategic Statement to “sharpen our vision for technology development in Maryland, offer the principles to guide future actions and help us judge our overall success.”¹ In addition to providing a blueprint for operations, the strategic planning process resulted in focusing greater attention on commercialization and modernization.
- √ Pennsylvania initiated its science and technology strategic planning effort, Technology 21, in 1996 because a benchmarking study, prepared for the Commonwealth by PHH Fantus, showed that the state was not viewed as a leader in technology, in spite of having a strong technology base and being recognized as being at the forefront of state cooperative technology programs.² Also, given that Pennsylvania's major technology development programs — the Ben Franklin Partnership Program and the Industrial Resource Centers program — have been in place for more than ten years, the strategic planning process provided the opportunity to determine if any modifications in existing programs were needed.
- √ The poor performance of Rhode Island's economy in recent years led the Governor to create the Rhode Island Economic Policy Council in 1995 charged with 1) analyzing the strengths, weaknesses, opportunities, and threats facing the state's economy, and 2) developing strategies and policies to address them. The Council spent a year analyzing economic data and listening to Rhode Islanders provide input on the condition of the economy. “The Council brought together labor, business, and government to develop a consensus on the condition of our economy, and more important, what we all must do to boost economic opportunity for Rhode Islanders.”³ As a result of the strategic planning process, the Council gained a stronger understanding of the changes taking place in the economy and why these changes are occurring.

The data analysis uncovered new insights and problems and challenged some commonly accepted views. The process led to a greater understanding of the challenges of “the new economy,” an economy “where the key to wealth and job creation is largely dependent on the extent to which ideas, innovation, and technology are embedded into services and manufactured products.”⁴

Best Practices in Science and Technology Strategic Planning

The project team reviewed the twenty-nine economic development and thirteen science and technology strategic plans that states developed between 1991 and 1995. An overview of these plans can be found in Appendix A. SSTI conducted follow-up interviews, by phone and on site, with policymakers in the states that had developed science and technology strategic plans, or in states whose economic development strategy included a focus on science and technology.

Although the processes used to develop the strategic plans and the policies and initiatives proposed differed from state to state, the project team and the practitioners interviewed identified a number of key factors that contributed to the successful development and implementation of a state science and technology strategic plan.

Key Factors in Successful State Science and Technology Strategic Planning

The strategic planning process:

- had a champion, and
- was structured to obtain a wide range of viewpoints.

The strategy:

- articulated a vision for the state's future;
- sought to benefit all areas of the state including distressed areas;
- was based on a thorough understanding of the state's industry and technology resources;
- was built on existing delivery systems;
- addressed the key elements needed to support technology-based development; and
- included performance measures.

The implementation plan:

- identified specific actions, assigned responsibilities and established timelines;
- was tied to the state budgeting process; and
- had strong leadership committed to implementation of the strategy over the long-term.

These key factors — the best practices for science and technology strategic planning — provide the greatest assurance that a state's strategic planning efforts will be successful. The next section discusses each of these practices in detail, and provides examples of their use among the states whose plans were reviewed.

Structuring the Planning Process

The strategic planning process must have a champion. A strategic plan is used to coordinate and integrate the activities of a variety of organizations in pursuit of common goals and objectives. For a strategic planning activity to be successful, it must have a champion with the ability to bring all of the relevant players to the table and the means to see that recommendations are implemented. Such leadership can come from the public or private sector and preferably will include both government and business support. The Governor, and/or state legislative leaders, often plays a key role in initiating the process and assigning responsibility for developing the strategy. A committee or task force of public and private leaders can be used to catalyze and oversee the development of the strategy. The entity responsible for developing the strategy, while it may be an existing organization or a committee or council established specifically to develop the strategy, should be broad-based and include representatives of both the public and private sectors. California created a new public-private organization to lead its strategic planning initiative.

- √ In October 1993, Governor Pete Wilson signed legislation establishing a statewide biennial economic development strategic planning process. The bi-partisan California Economic Strategy Panel was created to develop the strategy. The 15 member panel is chaired by the Secretary of the California Trade and Commerce Agency and includes legislators, business leaders, and a labor representative. The Panel oversaw the development of *Collaborating to Compete in the New Economy: An Economic Strategy for California*, and continues to monitor implementation of the plan.

The planning process should be structured to obtain a wide range of viewpoints. A key to developing an effective strategy is to listen to the marketplace. It is critical that all stakeholders — businesses, workers, academic institutions, and communities — have the opportunity to provide input to the strategic planning process. Successful planning processes use a variety of mechanisms to obtain input, including focus groups, regional conferences, workshops, and surveys. Such activities are needed to gather information, develop consensus, and build support for the plan. Regional hearings or workshops can help to ensure that the views of all areas of the state are reflected in the strategy. Arizona, for example, used multiple techniques to reach a broad cross-section of citizens.

- √ In 1992, Arizona adopted *Creating a 21st Century Economy: Arizona's Strategic Plan for Economic Development*. The initiative was overseen by the Arizona Strategic Planning for Economic Development (ASPED) Coalition, which included a broad representation of Arizona's communities. From the very beginning of the strategic planning activity, a special effort was made to "involve the entire state actively in this strategic planning process in order to build a broad consensus for economic development."⁵

Nearly 1,000 Arizonans participated in twenty advisory groups, fifteen regional town halls, six public forums, three special project teams, and a statewide leadership town hall, providing input to the ASPED planning process. Advisory groups focused on the following: industry clusters; external factors affecting the Arizona economy such as defense restructuring, and globalization; and the underlying support systems or foundations of the economy, including human resources, capital, technology, and infrastructure. The process included both experts and the general public. The plan is being implemented by the Governor's Strategic Partnership for Economic Development (GSPED).

The strategic plan should articulate a vision for the state's future. Achieving consensus on a vision for the state's economy in the future is the first step in developing an effective strategic plan. The vision provides the framework for developing strategies and establishing measures that can be used to determine if progress is being made toward achieving the vision. The vision can be broadly-based, such as North Carolina's, or more narrowly focused on technology, such as Maryland's.

- √ North Carolina's strategic planning process identified the following vision: "a North Carolina in the year 2005 that is the worldwide leader in the development and use of technology...recognized for its high quality jobs and high caliber workforce...a model of public-private partnership that generates continued economic development... renowned for its ability to commercialize new technology...recognized for its strategic investments in education and infrastructure...and envied for its high quality of life."⁶
- √ Maryland's technology vision is stated as follows. "Maryland, a world class giant of academic and government-supported basic research must seize its

Developing an Effective Strategy

potential and become an industrial technology leader — one that commercializes new technological discoveries made by research institutions in the state and that modernizes its existing manufacturing industry by applying current technologies.”⁷

The strategic plan should seek to benefit all areas of the state, including distressed areas. All economic development takes place at the local level. State economies, by and large, are composed of a number of regional economies. An effective statewide strategy must take into account the needs of all its regions. Access to technology resources, such as research universities and federal laboratories, will vary by region, as will the technology infrastructure, the industrial mix, and the skills of the workforce. There are a variety of approaches that can be taken to ensure that the strategy reflects state, regional, and local needs. Regional conferences and workshops can be held to gather input for the planning process or planning can occur at the regional level with the state plan integrating local and regional approaches. Strategies can also be developed to address the needs of specific types of communities within the state, for example, urban or rural areas. Massachusetts’ and Virginia’s strategies address regional as well as statewide needs.

- √ The Commonwealth of Massachusetts’ strategic plans calls for the state to partner with local and regional interests to promote competitiveness. In addition to analyzing state economic trends, economic profiles of each region were prepared and major economic development conferences were held in each region. The proposed strategies include state actions that can help to strengthen the regional economies as well as actions expected to affect the economy statewide.

- √ Virginia created eighteen Regional Economic Development Advisory Councils to provide input on the development of the Commonwealth’s strategic plan for economic development. The regional councils are broad-based coalitions of business leaders, local and regional economic development professionals, educators, and private citizens. Each regional council provided an assessment of its region and participated on the steering committee responsible for developing *Opportunity Virginia: A Strategic Plan for Jobs and Prosperity*.

The strategic plan should be based on a thorough understanding of the state's industry and technology resources. Developing an effective science and technology and/or economic development strategy requires an understanding of the key factors affecting the state's economic performance. Data on population and employment change, income and wage levels, and skill levels of the work force are needed to assess the health of the economy and to compare the performance of the state's economy to its surrounding region and to the nation as a whole. Data on employment are used to determine 1) key sectors of the economy, 2) the extent to which particular firms are growing more or less rapidly than firms within their industry nationally, 3) the degree employment is concentrated in high or low growth sectors, and 4) the potential for future growth.

Data Resources. Much of the data needed to assess the performance of a state's economy is readily available. The U.S. Bureau of the Census publishes data on population and employment; and in its *County Business Patterns*, reports county-level detail on employment level, payroll, the number of establishments, and the distribution of establishments by employment size. The Bureau of Labor Statistics (BLS) provides data on productivity growth for selected industries and develops long-term projections of industry and occupational employment, data useful in understanding industry trends in terms of both size and types of skills required. BLS is also the official source of statistics on employment and unemployment. The National Science Foundation collects data on privately and federally funded research expenditures in the U.S. by industry and size of company, and data on the number of R&D scientists and engineers by industry. In addition, federal law requires each state to maintain an ES202 unemployment compensation database. Individual employers are required to submit information on the firm's employment, payroll, location, and four-digit SIC code. These data are usually maintained by the state employment commission and can be a valuable source of information.⁸

Economic Clusters.⁹ In recent years, an increasing number of states have begun to focus on key sectors or clusters of firms. A cluster of economic activity is:

...a geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communication and dialogue, that share specialized infrastructure, labor

markets and services, and that are faced with common opportunities and threats.¹⁰

Some states are focusing on supporting and strengthening economic clusters because the concentration of industrial activity and supporting institutions generally leads to:

- industry access to a deeper pool of specialized labor;
- greater ease in interacting and collaborating with other industry members;
- more up-to-date information about industry events and trends;
- products tailored to specific industry characteristics;
- more rapid diffusion of new technologies and techniques;
- greater support for publicly funded efforts to serve the cluster;
- a greater propensity to generate “spin-off” firms within the region and draw in additional suppliers from outside the region;
- better industry expertise within local financial institutions, thereby improving industry access to financing; and
- greater visibility of local firms vis-à-vis prospective customers.¹¹

States depend on both quantitative and qualitative data to identify and understand the needs of industry clusters.

Statistics on industry trends and practices can be obtained from trade associations and sector studies. Qualitative data often are collected by means of surveys, focus groups, and interviews, as demonstrated by the variety of approaches implemented by California, North Carolina, and Rhode Island.

√ California’s Economic Strategy Panel undertook an extensive analysis of California’s economy using both detailed economic data and data collected by means of direct interviews with industrial representatives.¹² The Panel examined regional patterns of employment and business at the local level by three and four digit SIC codes between 1991 and 1994. In addition, the Panel studied the organization of industry clusters and the factors that facilitate their growth and expansion. A new economic information system was established incorporating data from the Trade and Commerce Agency, the Labor Market Information Division of the Employment Development Department and the Stephen P. Teale Data Center. These data were used to provide

an overview of the performance of California's economy. Working in partnership with local organizations and government, the Panel examined nine industry clusters in five regions. Industry clusters included ones that were:

- established and expanding;
- established and in transition; and
- emerging.

The Panel used both quantitative and qualitative (direct interviews) methods to understand each cluster with regard to:

- the components, including key producer/exporters, suppliers, human resources, investors, institutions such as government, education, research laboratories and associations and infrastructure that make up the cluster;
- size and growth of the cluster;
- evolution of the cluster;
- relationships and networks;
- markets;
- opportunities; and
- requirements for future growth.

Key industry cluster leaders told the Panel where they thought their industry would be in five years and what challenges they faced in reaching their business goals. They identified common themes and learned how the state's economic foundations — its workforce, capital markets, infrastructure, tax and regulatory policies, and quality of life — could facilitate the growth and expansion of the clusters, in particular, and the California economy in general.

- √ By analyzing its industrial clusters, North Carolina discovered that next to knitting, vehicle manufacturing was the state's largest cluster. Yet, because North Carolina does not have any final assembly car operations, it is not generally thought of as a major auto manufacturing center. Analysis at the regional level helped identify comparative advantages, even in the more rural and distressed areas of the state, and identified gaps in supplier chains ripe for entrepreneurial ventures or industrial recruitment. The North Carolina Alliance for Competitiveness (NC ACTs) co-funded the development of competitiveness strategies for its rural-based industry clusters, manufactured housing and hosiery, as well as for its high technology industry clusters in biosciences and communications.

- √ Rhode Island conducted a comprehensive assessment of the state's economic performance and structure, and analyzed nine industry sectors and four economic foundations — firm and worker learning, business financing, technology, and business climate. Industry sectors studied included: jewelry, precision metalworking, boat building and marinas, seafood products, electronics and instruments, financial services, software, biomedical, and travel and tourism. A working group was appointed for each industry cluster. The studies included an assessment of industry trends and prospects, an analysis of the competitive position of Rhode Island's industry, identification of areas for improvement, discussion of requirements for building the cluster, and recommendations for what actions firms and the public sector should take to grow the cluster. The industry studies were based on interviews of CEOs, review of material written on the industry, analysis of data, and the results of industry working groups.

The strategy should build on existing delivery systems. One of the key reasons for developing a strategic plan is to ensure that the state will achieve a maximum return on its investment. Prior to developing recommendations for implementing new policies or undertaking new actions, an inventory should be made to identify what services are being provided, to whom and by whom. Both Colorado and North Carolina examined their technology delivery systems as part of their strategic planning process.

- √ Colorado surveyed 2,379 companies to determine their understanding of, and need for, technology transfer services. The respondents indicated little knowledge of the technology resources and services available to them through the state's universities and laboratories. Companies indicated that both the universities and laboratories could better serve their needs by improving the marketing of their services and providing a clear point of contact. Over 300 local, state and federal economic development and technology transfer organizations were also surveyed to assess the availability of statewide services. The service providers also identified a need for greater marketing of the state's technology related assistance organizations. To respond to these needs, a symposium was held with workshops on how to identify when a company can benefit from applied technology and how to access technology resources for client firms.

- √ Over the years, North Carolina has invested heavily in technology development. In 1995, the North Carolina Alliance for Competitive Technology (NC ACTs) conducted a technology resource and capacity review study to analyze the state's technology delivery system. "What we found is that there are 36 distinct technology and manufacturing delivery organizations in the state, with a total budget of \$85 million - \$37 million of which comes from state funds. Of these service providers, 67 percent are affiliated with a university or a community college and the most frequent services provided, not surprisingly, are education and training (34 percent) and information services (19 percent). Sixty-seven percent of the organizations are located in the Raleigh/Durham area, with only 27 percent having any field offices."¹³

While it is clear that North Carolina provides a comprehensive array of services and supports numerous non-profit service delivery organizations, the strategy recommends actions to improve the delivery system. These include: establishing a policy guidance and review system that uses policy and budgetary review to assess whether state funded agencies are attempting to implement the strategy, and creating regional alliances to coordinate technology services at the local level.

The strategy should address the key elements needed to support technology-based development. In addition to identifying actions to support specific technology-based industries or industry clusters, effective science and technology strategies include policies that affect the general competitiveness of the state as a place to do business. Key areas of importance to technology-based businesses are human resources, technology resources, capital, information infrastructure, and tax and regulatory policy. Although the categorization of these key areas may differ from state to state, the elements are consistent. Arizona and Montana developed recommendations based on different policy considerations.

- √ Arizona's strategic plan is based on the premise that the state wants to compete globally on the basis of quality rather than cost. The plan addresses strategies for building strong economic foundations for:
- skilled, adaptable, and innovative human resources;
 - widely available and flexible investment capital;
 - accessible technology, i.e., strong research and development base, commercialization and transfer processes;

- competitive tax and regulatory climate; and
 - information infrastructure, i.e., telecommunications, access to global networks.¹⁴
- √ The Montana Science and Technology Action Agenda identified key actions in the following areas:
- material resources, i.e., the state's natural resources and the industries that exploit these resources;
 - human resources, including K-12 education, higher education, and training;
 - capital resources, focused on seed capital financing and research funding; and,
 - institutional resources, such as the state's research infrastructure, university-industry linkages, and mechanisms for technology transfer and manufacturing extension.

The strategy should include performance measures. One of the benefits in developing a strategic plan is that it provides a context for measuring performance. Ongoing monitoring and assessment is needed to track the progress that is being made in achieving the state's technology development goals. Evaluation provides solid information on which to make decisions and helps to identify necessary modifications or revisions.

Developing specific measurable outcomes, while a critical element of the strategic planning process, can also be extremely difficult. The first step is to identify indicators of performance and to establish baseline data. Wherever possible, performance measures should relate to outcomes, not inputs. For example, an increase in the level of private investment in new and used machinery and equipment as a percentage of manufacturing value added is an outcome measure; whereas, the number of firms receiving manufacturing extension services is an input measure. Performance measures should be ambitious, yet achievable. They should also include a timeframe, i.e., the period of time in which the goal is expected to be achieved. The importance of delineating performance expectations was clearly recognized in the strategic plans prepared by Maine and North Carolina.

- √ In 1994, the Maine Economic Growth Council adopted a vision for Maine's economic future. Using the vision statement as a guide, the Growth Council adopted 14 priority goals and 52 performance measures in seven major areas. In selecting its performance measures, the Council considered the following criteria:

- **Data availability:**
the Council considered the extent to which the data have been gathered in the same manner over time, the extent to which they are likely to be collected and available in the same manner in the future, and the frequency with which the data are available.
- **Outcome-based:**
wherever possible, the performance measures relate to outcomes, not inputs.
- **Accuracy/validity:**
every effort was made to ensure that the measures accurately track progress toward goals.
- **Comparability:**
the measures seek to compare Maine's performance with other states, the nation as a whole, or Maine's past performance.
- **Simplicity:**
the measures chosen are relatively simple and easy to understand.

For example, one of Maine's strategies is "to encourage and nurture businesses that will set the pace of innovation in serving new markets, making new products, and exploring new lines of business and new services."¹⁵ Performance targets that will be used to evaluate progress toward this goal include:

- Maine's international exports will grow faster than U.S. international exports annually between 1996 and 2005.
- Maine's annual change in number of new business starts will exceed New England's annual change in number of new business starts for each year from 1996 until 2005.
- Maine's national rank on the Corporation for Enterprise Development (CED) Technology Resources Index will improve to at least 35th by the year 2005.¹⁶

√ North Carolina's strategy identified three overall outcomes, as well as outcomes associated with each strategy element. The overall outcomes are:

- Increase the per capita income in North Carolina from 89 percent of the U.S. average in 1992 to 92 percent in the year 2005.
- Increase the ratio of average pay per worker in North Carolina manufacturing industries to the national average — from 78 percent in 1992 to 83 percent in 2005.

- Increase North Carolina's gross state product per capita from 97 percent of the U.S. average in 1992 to the U.S. average in 2005.

The following are examples of specific targets that will be used to track progress in achieving the goals of each strategy:

- Increase level of private investment in new and used machinery and equipment as a percentage of manufacturing value added from 4.7 percent in 1991 to 7.5 percent annually in the year 2005.
- Increase the percentage of high technology firms in North Carolina by 50 percent from 2,005 to 3,007 and employment in these industries by 30 percent from 211,535 to 274,995.
- Increase the venture capital investments made in North Carolina from \$27 million in 1994 to \$209.5 million in the year 2005 in constant dollars.
- Increase the number of patents issued to North Carolina residents from .268 patents per thousand workers in 1992 to .560 patents per thousand workers in the year 2005.
- Increase share of research and development funded by industry from \$25 million or 6.5 percent of total R&D to 10 percent of total R&D by the year 2005 through balanced involvement of small and medium, as well as larger, firms.
- Increase federal grant and contract awards to North Carolina universities from 7 percent per year (1984-95) to 10 percent annually through the year 2005.
- Increase the percentage of firms served by advanced networks to 100 percent by the year 2005.
- Increase the percentage of the population with access to digital broadband system to 95 percent by the year 2005.
- Increase the number of engineers and engineering technicians in private industry by 7 percent annually over the next 10 years.
- Maintain a customer satisfaction level of at least 75 percent for the state's technology deployment organizations.
- Increase access and availability of technology deployment services to reach 60 percent of all the state's manufacturing and technology firms, directly or indirectly, by the year 2005.¹⁷

The strategy should include a detailed implementation plan. It is critical that the strategy include an action plan assigning responsibilities and timelines for implementing the recommendations. The implementation plan can be part of the strategy itself or may be developed subsequent to the strategy. In the event that an implementation plan is not agreed to as part of the strategy, it is imperative that an organization or entity, with the power to coordinate the activities of all the players necessary to implement the plan, including both the public and private sectors, take responsibility for assuring that the recommendations are implemented. Massachusetts assigned responsibility for implementing their strategic plan to the Governors' Office of Economic Affairs. In Rhode Island, the Economic Policy Council, a public-private board that reports to the Governor and the legislature, is overseeing implementation. Indiana and North Carolina included detailed implementation plans in their strategies.

✓ *Investing in Indiana* (1994) is the third strategic plan developed by the Indiana Economic Development Council (IEDC) since the early 1980s. IEDC was created by the Indiana General Assembly in 1985 and is governed by a broad-based partnership of 70 leaders representing business, labor, education and government. A primary responsibility of IEDC was preparing a strategic economic development plan for the state. The plan identified five goals and included a discussion of tactics for each goal. For each sub-goal the report included a discussion of the problem, objectives, proposed solutions, first steps, possible convener, potential partners, potential financial resources, measures of impact, and identification of a possible evaluator. The first steps were specific action items and included dates for completion.

For example, the strategy called for the establishment of INBusiness Hubs, a type of one-stop business assistance center at the regional level. Action steps included: offering seed funds for three pilot projects and subsequently expanding the concept to all 14 regions of the state. Possible conveners included the Lieutenant Governor's office and the IEDC. Potential partners were Ball State Economic Development Academy, regional program directors, state level program providers, existing independent entrepreneurship programs, and university programs. Potential sources of funding were state and local programs, private foundation grants, and user fees for certain services. The strategy suggested that measures of

impact included: reduction in the duplication of services and marketing, productivity data (businesses served, etc.), and effectiveness data (impact on businesses services, performance of those served versus those not assisted.) Ball State's Entrepreneurship Program was suggested as a possible evaluator.

- √ North Carolina's science and technology strategic plan included action steps for its seven strategies and identified those organizations, both public and private, responsible for taking the lead on implementation. The strategy included a timeframe for implementing each action. The table below shows the action steps, implementing organizations and timeframe for implementing North Carolina's strategy to support the modernization of its existing manufacturing firms.

Table 1: North Carolina's Implementation Plan

Strategy 1: Support the modernization of our existing manufacturing firms		
Action	Responsibility	Time Frame
Expand level of assistance available to small and medium firms	NCSU IES/MEP, NC ACTs, Department of Labor, SBTDC, SBC, and other service providers	Mid-1996*
Develop business networks in North Carolina	Industry associations, NC ACTs and Department of Commerce (DOC)	Begin 1996-1997**
Promote development of industry and professional trade associations	DOC, NC ACTs, NCSU IES/MEP	Ongoing**
Form regional alliances within NC among manufacturers, educational institutions and government	Regional Economic Development Commissions, Regional Consortia, NC ACTs, IES and other service providers	1996 to develop at least one pilot alliance**
Establish pilot vendor partnership programs to encourage manufacturers to develop their supplier chains and increase ISO 9000 certification across the state	DOC, IES/MEP	1996-1997***
Examine tax policies to assess how to increase manufacturers' willingness to modernize	Economic Development Board, Department of Revenue, Governor's Budget Office	1996-1997**

* This action step has been completed.

** This action step is underway.

*** This action step has not been initiated.

NCSU IES/MEP - North Carolina State University Industrial Extension Service/Manufacturing Extension Partnership

SBTDC - Small Business Technology Development Centers
SBC - Small Business Centers, Community College System

To implement the proposed actions, NC ACTs established a Work Group which included 25 groups and organizations receiving varying degrees of state support and providing some form of assistance to the state's manufacturing and technology firms. Bimonthly meetings were used to monitor implementation of the strategy, overcome barriers to success, and identify and solve problems.

The strategy should be tied to the state budgeting process.

Strategic planning provides a long-term context for making budget decisions. One way to ensure that the strategy is implemented is to review requests for funding to assess whether or not proposed activities are in keeping with the strategic plan. Maryland, Louisiana, and North Carolina have addressed this issue using three different approaches.

- √ In Maryland, for example, only programs that are addressed in the strategic plan are eligible for inclusion in the Governor's executive budget.
- √ In Louisiana, state agencies, including the Department of Economic Development, are legislatively required to develop strategic plans which include a one year operating plan tied directly to the state budget.
- √ The North Carolina Economic Development Board, working through NC ACTs, has responsibility for reviewing requests for state funding for technology and manufacturing competitiveness to determine whether the requests are consistent with the state's science and technology strategy. The state's "technology budget will enable us to assess how effectively the state's investments are assisting industry in achieving strategic objectives."¹⁸

Strong leadership is needed to oversee implementation of the strategy over the long-term. In cases where the strategy is strongly supported by the Governor or private sector leaders, there is a much greater chance that the strategy will be implemented. Two primary reasons why strategies fail to be implemented are a change in administration and/or the lack of a supporting organization with the ability to carry out the strategy. In Arizona, the Governor created a special organization to oversee implementation.

- √ Arizona's strategic plan was developed by Arizona Strategic Planning for Economic Development (ASPED), a coalition that included the Arizona Department of

Commerce, the Arizona Economic Council, the Greater Phoenix Economic Council, the Greater Tucson Economic Council and the Enterprise Network. Once the plan was completed, a new entity — the Governor’s Strategic Partnership for Economic Development (GSPED) — was established to oversee implementation of the plan. GSPED’s efforts focus on developing the ten economic clusters identified in the strategic plan. Each cluster, composed of member companies, serves as a focal point for its particular industry, fostering relationships among the companies and helping to promote job growth. Each cluster has an executive director who is a full-time employee of GSPED. The Director of Arizona’s Office of High Technology in the Department of Commerce serves as the Executive Director of GSPED, and another Department of Commerce employee serves as the GSPED Coordinator.

Leveraging Science and Technology Resources to Benefit Distressed Areas

Another major objective of this project was to determine the ways state science and technology strategies are addressing the needs of distressed communities and disadvantaged populations. The review of strategic planning documents indicated that the state plans, with a few exceptions, do not explicitly target distressed areas. Therefore, it was impossible to determine, based solely on a review of the written documents, the extent to which state technology policies are benefitting distressed areas. To gain additional perspective, the project team augmented its review of state plans by convening a Roundtable and conducting telephone and on-site interviews.

The Roundtable of senior state and federal, technology and economic development practitioners and policymakers was held on April 17, 1997. The Roundtable participants discussed barriers to promoting technology-based development in distressed areas, identified technology initiatives that have been used successfully to support development in distressed communities, and recommended approaches that states and the federal government can implement to leverage their science and technology investments to benefit distressed areas. The following recommendations are based on the discussion at the Roundtable, as well as interviews with officials in Colorado, Maryland, Massachusetts, New Jersey, North Carolina, North Dakota, and Pennsylvania.

While not every community can be home to a cluster of technology-based companies, states can use their technology programs and initiatives to support economic growth in distressed areas. The major recommendations to states that were developed by Roundtable participants were to:

- consider the needs of distressed areas in developing science and technology strategic plans by identifying components of the strategy that can most effectively meet the needs of distressed areas;
- help develop the foundations needed to support a technology driven economy, including a skilled technical work force, research and development base, and available investment capital;
- support the creation and growth of businesses in distressed areas; and,
- forge alliances with local development organizations to support economic growth in distressed areas.

The following section provides specific recommendations for ways in which states can leverage their science and technology investments to benefit distressed areas. It also includes

Developing Science and Technology Strategies to Benefit Distressed Areas

examples of the types of activities being undertaken in disadvantaged urban and rural areas.

Incorporate consideration of the needs of distressed areas in the state's technology strategy. States should consider how their science and technology investments can be used to shrink economic disparities within the state, and should identify the components of their science and technology policies and programs with the greatest potential to benefit distressed areas. For example, technology-based incubators can be an effective tool for revitalizing urban areas when low cost space is plentiful and university expertise is available. Manufacturing extension services can be used effectively to improve the competitiveness of small and medium sized manufacturers located in both urban and rural areas. Strategies that support the development of technology infrastructure can be critically important in promoting economic growth in isolated rural communities or in linking residents of urban areas with sources of information and expertise. Both Maryland and Massachusetts have undertaken initiatives to promote technology-based development in urban and rural distressed areas.

- √ Baltimore has sought to grow technology-based businesses in an incubator environment by building on the city's strong research and development base that includes Johns Hopkins University and the University of Maryland. The state has supported the city's efforts by providing financial and technical assistance and by locating major facilities, including the Maryland Bioprocessing Facility, in the city.
- √ In analyzing economic trends, Massachusetts noted certain geographic areas that required special attention. The analysis showed that these areas did not benefit from the economic growth experienced by the rest of the state in the 1970s and 1980s, and continued to experience very high unemployment and chronic nonparticipation in the labor force. Areas of severe economic distress included small cities outside major metropolitan areas, mid-sized industrial cities, and the inner city neighborhoods of Massachusetts' major cities. The strategy included specific recommendations, such as creating Economic Opportunity Areas that provide state and local tax relief and other incentives to businesses locating within designated sections of distressed communities.

Building Key Foundations Needed to Support Technology-Based Development

Integrate employment and training programs into the state's science and technology strategy. Building the technical skills of the existing and future workforce is a key element of a state science and technology strategic plan. The availability of an educated, highly skilled workforce is a prerequisite for a technology-based economy; yet today, many areas with a high concentration of technology-based industries are experiencing shortages of skilled workers. Initiatives should be considered to prepare residents of distressed areas for technical careers. Tech Prep, JobLink and Focus Hope prepare residents in distressed areas for technology-based jobs.

- √ The Suburban Maryland Technology Council, in concert with Montgomery County College and Public Schools, surveyed local firms to identify adult worker education and training needs. The firms indicated that there was a shortage of information and life sciences technicians. To respond to demand for workers in these areas, new curricula were established within the county's tech prep program for 11th and 12th grade students in systems engineering and biotechnology. Tech prep is a four year program where students complete two years in high school, followed by two years at the community college, earning an Associate Degree. The creation of the systems engineering and biotechnology programs enabled minority and other students to pursue careers with good growth prospects while at the same time meeting the needs of local employers for skilled technicians.
- √ Pennsylvania's Job Link is a state and federally funded job training and employment program that focuses on welfare recipients. Job Link is designed to develop a workforce to meet the entry-level needs of the business community while simultaneously helping people to gain independence from welfare. Job Link can work with any employer that has entry-level positions. It is not specifically targeted to technology-based companies or to technical positions. Placements have ranged from office support to medical record technicians to machine tool mechanics. The program is administered by each of the four Ben Franklin Technology Centers. From 1990 to 1996, Philadelphia Job Link placed 218 welfare recipients in jobs. Job Link is funding seven projects, totaling \$1.1 million and involving 285 trainees in FY 1997.
- √ Focus Hope is a Detroit-based human resource organization funded to "resolve the effects of discrimination and injustice and to build integration into society."¹⁹

The Center for Advanced Technology (CAT) is Focus Hope's latest project toward this goal. The CAT is a unique education and production facility that teaches candidates, disadvantaged individuals from distressed neighborhoods of Detroit, world-class manufacturing skills while at the same time providing state-of-the-art products to commercial customers. The CAT candidates learn manufacturing engineering in a real world environment with production pressures.

Invest in technology infrastructure in distressed areas. One way in which states have traditionally tried to improve and maintain their competitive position is by investing in infrastructure. In the past, this meant building roads, highways, and water and sewer systems. Today, it includes "information highways, fiber optics, satellites and digital switches, R&D test beds, research parks, incubators and laboratories."²⁰ Many distressed areas, especially rural areas, lack the infrastructure necessary to support technology-based businesses. One participant in the Roundtable described his state's rural areas as an information "dirt road" rather than the information highway needed to support today's industries. Some rural areas have no Internet point of presence (POP) and therefore any connection to the Internet is a long distance call. Such regions are clearly at a disadvantage in terms of accessing information on markets and business opportunities. States can support the development of distressed areas by investing in technology infrastructure as demonstrated by Colorado's Rural Telecommunications Project and Philadelphia's LibertyNet.

√ Colorado's Rural Telecommunications Project (CRTP) was created in 1991. At that time, the General Assembly charged the Colorado Advanced Technology Institute (CATI) with "the development of advanced technology industries in locations severely depressed as a result of the decline in traditional agricultural and natural resource industries."²¹ Through CRTP grants, ranging in amounts from \$14,000 to \$47,000, CATI has seeded the creation of Internet providers, kiosks, video conferencing, development of home pages, training, and marketing services. For example, CATI provided a grant of \$26,000 to Lamer Community College to create a Rural Internet Marketing Center through which "local business can be marketed and conduct sales with area agricultural consumers."²² CATI also sponsored a rural communications conference in 1997 to provide a "forum for collaboration, learning, and sowing the seeds for action regarding applications of telecommunications technology for rural community and economic development."²³

Philadelphia's LibertyNet was formed as a non-profit corporation in 1993 by a group of business and civic leaders with the support of the University City Science Center, Bell Atlantic-Pennsylvania, Radio Station WHYI, the University of Pennsylvania, and the Ben Franklin Technology Center of Southeastern Pennsylvania (BFTC/SEP). Its mission is to:

- empower community-based organizations and small businesses through access to telecommunications resources;
- be a leading source of Philadelphia regional information for citizens, community organizations, and educational institutions; and,
- provide access to these resources for citizens and organizations located in economically-disadvantaged neighborhoods.

LibertyNet is Philadelphia's largest on-line provider of regional information with over 44 non-profit and commercial web sites and more than 1,000 non-profit members with e-mail and browsing access. LibertyNet services include: low-cost Internet access, technical support, Internet training, and community access. LibertyNet operates a mobile unit equipped with four laptop computers and cellular modems which travels throughout Philadelphia's Empowerment Zone to provide businesses and residents with the opportunity to access and learn about the Internet. The BFTC was involved in establishing LibertyNet and remains an active supporter.

Build on existing institutions, resources and industries. The presence of research universities, federal laboratories, and private industry provides a base for launching new technology-based companies and assisting existing companies in using new processes and developing new products. In addition to focusing on a high technology industry such as biotechnology or pharmaceuticals, policymakers can also support clusters that are already in existence in distressed areas. Some distressed areas have resources, such as research universities, that can be tapped to support technology-based development. Other areas, particularly distressed rural areas, will find it difficult to support technology-based companies or to build new technology industries without making additional investments to improve the region's research and development capacity. Regional universities, community colleges, and vocational-technical centers, however, can play an important role in helping existing companies use technology. They often have technical business expertise and access to state resources that can be used to build local capacity. A public-private

partnership in New Jersey is attempting to revitalize a distressed neighborhood in Newark by developing a science park. North Carolina is working to improve the competitiveness of the hosiery industry in order to help its distressed rural areas.

- √ University Heights Science Park, Inc., a non-profit corporation, has been formed to develop a Science Park adjacent to the Central Business District in Newark, NJ. The Science Park initiative is a joint undertaking of the City of Newark, the State of New Jersey, community businesses and four public institutions of higher education located in Newark's University Heights neighborhood — Essex County College, New Jersey Institute of Technology, Rutgers University, and the University of Medicine and Dentistry of New Jersey. The Park is designed to encourage the location of technology-based firms wanting to draw on the expertise and resources of the higher education institutions while at the same time providing community amenities that incorporate the surrounding neighborhoods. In addition to providing office and lab space, small business incubators, and services for researchers and entrepreneurs, the Park will include a science park high school, housing development, a day care center, and recreational and retail space. Initial development of the Park began in 1993. Today two buildings have been renovated and are currently occupied. One is an incubator facility that also houses a day care center. The second building contains 5,000 square feet of wet lab space to be used by the New Jersey Center for Biomaterials and Medical Devices.

- √ North Carolina's experience with its hosiery industry, a predominantly rural industry in which 92 percent of its employees are women or minorities, demonstrates new roles for educational institutions, working with research universities, to improve the competitiveness of small and medium sized traditional manufacturers. The hosiery industry established a training program in 1990 by contributing \$300,000 in equipment and other assistance to create a Hosiery Technology Center at Catawba Valley Community College. In 1995, the National Association of Hosiery Manufacturers, with the assistance of NC ACTs, developed a competitiveness strategy to help the industry modernize and become more cost competitive. Since the strategy was developed, the following actions have been implemented: 1) a certification laboratory was created to establish standards for quality and color; 2) a dyeing and

bleaching specialist was hired to assist small and medium size firms in meeting such standards; 3) a prototype marketing network of six small hosiery manufacturers was formed to develop products and direct marketing channels for niche, high value added markets, not now being served; and 4) a consortium of over twenty small and medium-size hosiery manufacturers was organized to undertake projects of common interest. Two projects, a research and development project to develop technology to automate the boarding operations in their plants and a project to collect benchmarking data for their manufacturing operations, have been completed in cooperation with North Carolina State University

Help existing firms access and use technology. While it may be unrealistic to expect to encourage advanced technology firms to locate in distressed areas, states can help existing industry access technology and incorporate advanced technologies into processes and products. Distressed areas are more likely than other regions to be home for traditional companies that could be significant users of technological innovation. The Manufacturing Extension Partnership (MEP) program, jointly funded by the Department of Commerce's National Institute of Standards and Technology and individual states, now operates in all fifty states. The goal of MEP is to improve the competitiveness of the nation's small and medium-size manufacturers. While MEP has a presence in every state, services may or may not be available in every region of each state. State technology programs can team with manufacturing extension centers to help manufacturers use technology to improve their competitive position. In addition, states, as have Maryland and New Jersey, can take steps to see that industrial extension services are available to manufacturers in all regions including distressed areas.

- √ Maryland's Lower Shore Manufacturing Network (LSMN), operating from Salisbury State University, offers a forum through which private businesses in Somerset, Wicomico and Worcester counties can focus on technological issues that could impact productivity and profits. The primary objectives of LSMN are to:
 - stimulate growth and development of technological businesses throughout the region;
 - optimize the application of technology to all businesses from productivity improvements; and,
 - foster linkages among the private sector, economic development, local government and education officials.

Supporting the Creation and Growth of Businesses in Distressed Areas

- √ Several states are promoting technology to strengthen agricultural and other resource-based industries in distressed rural areas. New Jersey, for example, is supporting the development of technology-intensive aquaculture. New Jersey's Fisheries and Aquaculture Technology Extension Center develops new technologies and transfers them to New Jersey's fisheries and aquaculture industries. After a national aerospace company's plant closed on Maryland's Eastern Shore, the county in which it was located purchased the plant and developed plans for converting it to an industrial park. One firm is now located at the site and five industries, including advanced hydroponics, have been targeted for future development. A hydroponics greenhouse is being established at the University of Maryland Eastern Shore campus to develop a network of growers.

Support entrepreneurial development. Entrepreneurs often need help in developing business plans, obtaining financing, identifying markets and obtaining specialized services. Experience in areas such as Silicon Valley and Route 128 in Boston show that personal contacts between technology companies and entrepreneurs facilitate the flow of information and rapid diffusion of innovations that give the companies an advantage when competing in global markets. Specialized services grow to meet the needs of these companies, and at the same time, companies improve the region's economic foundations by recruiting and training workers or by developing special facilities. Distressed areas, both rural and urban, often lack a network of people with the knowledge and skills needed to support entrepreneurs and technology-based companies. State technology programs have demonstrated that they can fill that gap by providing technical and financial assistance for entrepreneurs and small businesses in distressed areas.

- √ To fulfill the information needs of early stage, small and other disadvantaged businesses, the Ben Franklin Business Information Center (BIC) was established in 1991. The mission of BIC is to provide professional on-line information services to small and medium sized companies who do not have access to on-line business data. BIC is staffed by five professional librarians who have access to 4,000 data bases which they use to provide information on marketing, competitors, and industry trends.

Between 1991 and 1993, BIC operated the Minority Telecommunications Expansion Program (MTEP). The program, funded in part by a grant from Bell Atlantic, provided on-line information to minority-owned businesses and minority community organizations in the Philadelphia area free of charge. The grant covered on-line costs, and BIC contributed staff time. During its two years of operation, the program completed 121 information search projects for 69 minority-owned businesses and minority community organizations. Although the program succeeded in reaching this underserved population, the BIC was required to restructure after the grant expired. BIC now makes services available free of charge to all Ben Franklin clients and to businesses that pay the cost of the on-line search. BIC services also are made available through community and business organizations, such as the Chamber of Commerce and the Wharton Small Business Development Center.

- √ In an effort to promote economic growth and job opportunities for low-income residents, Rebuild LA established a program to support flexible manufacturing networks in Los Angeles County. The initiative initially targeted the apparel and household furniture industries. An Apparel Technology Resource Center was created at the Los Angeles Trade Technical College to provide training in state-of-the-art computer-aided design and production and a series of workshops were held to help companies modernize their manufacturing. Similar activities are underway to train workers in furniture design and manufacturing and to help furniture manufacturers to reach new markets.²⁴

Provide access to investment capital. Access to capital is a problem for many small businesses. The problem is compounded in distressed areas and for technology-based companies. Banks may not be comfortable with making loans to technology companies because they lack the knowledge and tools to assess the risks of financing deals for these types of companies. Residents of distressed areas often have few private resources on which to draw. Early-stage risk financing is usually not available.

States can and do make seed capital available to firms in distressed communities although funds generally are not targeted to specific geographic areas. North Dakota took the additional step of establishing a fund targeted to rural areas.

The Ben Franklin Technology Center of Southeastern Pennsylvania, in addition to aggressively marketing its early-stage financing programs within its entire region including distressed areas of Philadelphia, also has taken a long-term approach aimed at building community businesses that are not technology-based. Over the long-term, as businesses grow, the Center hopes to introduce technology into these firms and increase the number of technology-based companies.

√ One of the major challenges facing rural North Dakota is the lack of available financing and capital for science and technology. In 1991, the state created the Regional Rural Development Revolving Loan Fund. Applicants must be “primary sector” businesses and must be located more than five miles outside the city limits of cities with populations of eight thousand or more. Academic/ business partnerships, corporations, university researchers, and individuals are eligible to apply. The funds, which must be matched, can be used for developing business plans, conducting market research, test marketing, product design, prototyping, and university technical assistance.

√ The Ben Franklin Technology Center of Southeastern Pennsylvania’s (BFTC/SEP) Enterprise Growth Fund is a micro-loan program that provides small amounts of capital, up to \$25,000, to start-up and emerging businesses. The program is targeted to low and moderate income women and minority business owners in the Greater Philadelphia region. The fund was established in 1993 with support from the U.S. Small Business Administration. The program was specifically designed to reach groups not being served by Ben Franklin’s other financing programs. The majority of the businesses assisted are in retail trade and typically not technology-based companies. BFTC/SEP is interested in targeting Enterprise Growth Fund investments to distressed areas that offer support and other resources to entrepreneurs such as Philadelphia’s empowerment zones. The Enterprise Growth Fund has made 54 loans totaling \$644,395 since its inception.

Creating Alliances with Local Economic and Community Development Organizations

Enter into partnerships with local economic and community development organizations. The needs of distressed areas are complex and often require a comprehensive set of solutions. Urban areas are often characterized by deteriorating housing, aging public facilities, and inadequate services. Some rural areas are experiencing serious population losses, as younger workers leave to look for job opportunities elsewhere. Technology can be used to help distressed areas compete economically, but

technology alone is not the answer to urban and rural revitalization. Real change in distressed areas will require a partnership among business, community-based organizations, educational institutions, and all levels of government. State technology agencies should participate in such partnerships. In Chicago, a federal laboratory is exploring ways to work with a community development organization and in Philadelphia, the Ben Franklin Center is part of a consortium to promote economic growth.

- √ Argonne National Laboratory, a Department of Energy laboratory operated by the University of Chicago, has formed a partnership with Bethel New Life, a community development corporation that serves a distressed neighborhood in Chicago. The partnership is designed to ascertain whether science and technology can be used to address the needs of an inner city community. While the partnership is still in an early stage, it has established a job training initiative focused on environmental training, made computers and the Internet available and more friendly to neighborhood residents, and surveyed abandoned industrial properties in order to clean up contaminated sites and prepare them for development.²⁵
- √ The Ben Franklin Technology Center of Southeastern Pennsylvania (BFTC/SEP) has very close ties with its sister Industrial Resource Center and with economic development agencies throughout the Greater Philadelphia area. BFTC/SEP, the Delaware Valley Industrial Resource Center (DVIRC), and the Philadelphia Industrial Development Corporation (PIDC), for example, joined together eight years ago to form Strategy 21. Strategy 21 brought together economic development organizations, corporations, and educational institutions in the Philadelphia region to work jointly on regional issues. Strategy 21 is not a formal organization. When initiatives are identified, one organization will take the lead and others will contribute resources. Strategy 21 recently put together a Workforce Development Consortium that has received a planning grant from the state's Business Quality Partnership. Strategy 21 has been so successful that its sponsors have agreed to pool their resources to jointly fund a full time staff person dedicated to Strategy 21 initiatives.

Build technology development capacity at the local level.

Distressed areas frequently lack local leadership and organizational capacity to pursue technology-based development. Public and private resources are often limited.

Local economic development organizations are more familiar with traditional economic development activities focused on industrial recruitment and marketing. States can provide both financial and technical assistance to support planning and program development at the local level, as has been demonstrated by Maryland, North Carolina, and South Carolina.

- √ The Rural Development Center (RDC) located at the University of Maryland Eastern Shore (UMES) is one of the major economic development organizations in the region. The center began as a defense conversion initiative and has developed into a regional institution that also focuses on diversifying the local economy from its dependence on the poultry industry. The RDC assists community groups, non-profit organizations, local elected and appointed officials and private firms. Types of assistance include strategic planning, loans, grants, projects, and programs for the nine-county Eastern Shore of Maryland.
- √ In 1994, recognizing the wide variances between the state's regions, North Carolina provided funding to seven regional partnerships to develop regional strategies. Some of the partnerships were new 501(c)(6) organizations, while others were existing organizations. The state has provided continued funding for the partnerships, ranging from \$200,000 to \$1,000,000. The success of the partnerships has been mixed, with some moving forward quickly and others taking more time to get up and running.
- √ A stated goal of South Carolina's strategy was to "ensure that the benefits of increased wealth generation are realized across all regions of the state."²⁶ To accomplish this, the state is facilitating planning and providing leadership training in each region and providing support for business development.

Summary and Recommendations

Between 1991 and 1995, twenty-nine states adopted economic development strategic plans. Thirteen states developed statewide strategies specifically to guide their science and technology investments. Eight additional states — Maine, Nevada, New Mexico, Ohio, Pennsylvania, Virginia, West Virginia, and Wyoming — have either completed science and technology strategic plans or will complete them in 1997. Strategic plans can sharpen the focus of the state's development efforts, ensure that the state is achieving a maximum return on its investments, and set goals against which to measure progress.

A review of the strategic plans developed between 1991 and 1995 showed that the most effective strategies:

- demonstrate a thorough understanding of the state's economy;
- address the key elements needed to support technology-based development;
- include measurable outcomes;
- provide a detailed implementation plan which clearly assigns responsibilities and sets milestones and timelines; and
- are supported by strong public and private sector leaders who are able to assure that the strategy is implemented.

It is also clear from this review of state science and technology strategic planning that, in general, states do not view science and technology policies and programs as a tool to revitalize distressed areas. One reason may be that state technology policies originally were focused on attracting, creating, and supporting "high technology" industries rather than promoting the use of technology to improve competitiveness. The state practitioners interviewed expressed the belief that technology companies are not likely to be found in or attracted to distressed areas. Also, the entity responsible for implementing the state's technology policy — be it a state agency, quasi-public organization, or private for-profit or not-for-profit corporation — usually does not have close ties to economic and community development organizations with responsibility for developing and administering traditional programs to revitalize distressed areas.

Yet, technology clearly plays a role in improving the competitiveness of firms. Technology also provides opportunities for residents of distressed communities to increase their skills and to access sources of information. States are just beginning to recognize that investments in science and

technology can have broad impacts across all sectors of the state's economy. This report describes a number of innovative programs that are using science and technology resources to benefit distressed areas. It should be recognized, however, that the impacts of these efforts are thus far relatively small. In addition, barriers which can include the absence of a critical mass of technology entrepreneurs, lack of a highly skilled workforce, and poorly developed telecommunications infrastructure, add to the difficulty of promoting development in distressed areas.

This project demonstrates that the approaches suggested by the National Academy of Public Administration (NAPA) in its report on the federal role in economic development would be most appropriate for EDA to undertake in encouraging more state attention, focus and concern about distressed areas.²⁷ The NAPA study emphasized a federal role of learning, linking, and leveraging. These three roles apply very appropriately to EDA's efforts in supporting state and local investments in technology-based economic development:

Learning

- EDA can encourage states in their strategic planning efforts to emphasize using state science and technology investments to revitalize distressed communities. EDA can also fund pilot programs and demonstrations, the results of which can be shared with state and local economic development practitioners to identify the science and technology programs which are most likely to positively impact distressed areas. These may include technology incubators, product development laboratories and testbeds, service centers, and innovation centers.

Linking

- State and local science and technology programs tend to be operated through strategic alliances or coalitions of higher education, government, and industry. EDA should work with these coalitions to encourage them to consider the needs of distressed areas. Such partnerships can bring additional resources to distressed areas.

Leveraging

- Another characteristic of state and local technology-based economic development is generally strong requirements to leverage public funds with industry, foundation, federal government, and university funds. EDA might use its funds to encourage science and technology investments in distressed places and to benefit disadvantaged people that otherwise might not receive attention and priority.

Concrete steps EDA can undertake to carry out this federal role in technology-based economic development include:

- dedicating funds specifically for state and local science and technology planning that addresses the needs of distressed areas;
- providing technical assistance to states and regions seeking to develop science and technology strategic plans;
- increasing the amount of technical assistance available to state and local technology and science policymakers on the issues, needs, problems, and opportunities distressed areas present;
- funding additional demonstrations of technology-based economic development in distressed areas with careful evaluation of the results;
- collecting and disseminating information on “best practices”, such as outlined in this report, to state and local technology and science as well as economic development policy makers;
- increasing EDA’s focus on organizations, mechanisms, and programs involving science and technology; and
- encouraging greater use of EDA resources to link technology-based economic development with traditional economic development.

Endnotes

¹ Maryland Department of Economic and Employment Development, *A Strategic Statement for Technology Development: Strengthening Maryland's Economy Through Commercialization and Modernization* (Baltimore, MD: Maryland Department of Economic and Employment Development, 1993) 2.

² PHH Fantus, *Benchmarking Assessment for the Commonwealth of Pennsylvania* (Harrisburg, PA: Pennsylvania Department of Commerce 1996).

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⁶ North Carolina Alliance for Competitive Technologies, *Making Manufacturing and Technology Work for North Carolina* (Research Triangle Park: North Carolina Alliance for Competitive Technologies, 1995) 18.

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⁹ For additional information on economic clusters, see *America's Clusters: Experiences and Lessons Learned* and *America's Clusters: Building Industry Clusters* prepared for the Economic Development Administration by DRI/McGraw Hill and Information Design Associates (IDeA), 1996 and *Cluster-Based Economic Development: A Key to Regional Competitiveness*, prepared for the Economic Development Administration by Information Design Associates (IdeA), 1997.

¹⁰ Stuart Rosenfeld, *Overachievers, Business Clusters that Work: Prospects for Regional Development* (Chapel Hill, NC: Regional Technology Strategies, Inc., 1996) 5.

¹¹ Redman, 42.

¹² California Economic Strategy Panel, *Collaborating to Compete in the New Economy: An Economic Strategy for California* (Sacramento, CA: State of California, 1996), online, U.S. Department of Commerce under "New Economy", Internet, 1 June 1997.

- ¹³ North Carolina Alliance for Competitive Technologies, 50.
- ¹⁴ Arizona Strategic Planning for Economic Development, V-1.
- ¹⁵ Maine Economic Growth Council, *Measures of Growth: Setting Performance Measures To Achieve Maine's Long Term Economic Goals* (Augusta, ME: Maine Development Foundation, 1996) 19.
- ¹⁶ Maine Economic Growth Council, 20, 23, 25.
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- ¹⁸ North Carolina Alliance for Competitive Technologies, 58.
- ¹⁹ Focus Hope Homepage, online, Internet, 6 June 1997.
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- ²⁴ "Turning Small Companies Into Big Job Factories," *Los Angeles Times* 22 June 1997: online, *Los Angeles Times Online*, Internet, 24 June 1997.
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- ²⁶ South Carolina Department of Commerce and Department of Parks, Recreation and Tourism, *Approaching 2000: An Economic Development Vision for South Carolina* (Columbia, SC: South Carolina Department of Commerce and Department of Parks, Recreation and Tourism 1995) 32.
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Appendix A: An Overview of State Science and Technology Strategic Planning

This Appendix presents:

- An overview of state science and technology strategic planning based on a review of state science and technology and economic development plans completed between 1991-1995;
- A review of the status of state science and technology strategic planning as a mechanism for addressing the needs of distressed areas;
- Findings regarding the content of state science and technology strategic plans and the process by which they were developed; and
- Examples of selected state science and technology strategies.

States undertake strategic planning processes for a number of reasons. State development policies often are initiated in response to a crisis. Economic restructuring, a recession, or downsizing within a key industry such as defense, can cause a state to examine its economy and develop policies to promote future economic growth. The election of a new Governor or new legislative leadership can provide an opportunity to examine and evaluate existing state policies and programs. In a handful of states, strategic planning is an ongoing process with plans updated every five years or so.

Twenty-nine states adopted economic development strategies between 1991 and 1995 (Table A1). Thirteen states adopted dedicated science and technology strategic plans during this same time (Table A2). Seven of these thirteen states prepared both a general economic development strategy and a science and technology strategic plan. Two states — Alaska and Connecticut — conducted an analysis of the state's technology base as a first step in developing a technology strategy, and Kansas conducted such an analysis as a first step in revising its technology strategy. New Jersey developed Vision 2020 to initiate the state's science and technology strategic planning effort. (See Table A3).

Economic Development Strategic Plans. Some of the economic development strategic plans addressed the science and technology base in the state or the needs of particular technology-based industries, but the recommendations were usually general. This is not surprising, given the broad range of public investments and policy that must be taken into account in developing an economic development strategy. In addition to technology, the plans addressed tax and regulatory policy, transportation, infrastructure, education, natural resources, and environmental issues. Several of the strategies, including Arizona's, South Carolina's, Vermont's, and Virginia's, called for the development of state science and technology strategic plans. Both Arizona's and North Dakota's economic development plans addressed technology issues.

- √ Arizona's *Strategic Plan for Economic Development* included recommendations for initiatives in seven "foundation" areas with technology being one of the areas. Specific initiatives included improving K-12 math and science education, encouraging university research with economic development impact, strengthening the Governor's Council on Science and Technology, developing a statewide university-industry technology transfer strategy, and attracting and growing technology-based companies.

- √ The North Dakota *Vision 2000 Report* proposed eight major initiatives, including establishing a Commission on Science and Technology. North Dakota's Technology Transfer, Inc., was created to carry out the plan's technology recommendations.

Table A1: State Economic Development Strategic Plans¹

State	Strategy	Year Adopted	Developed By
Alaska	Marketing Alaska: The Governor's Economic Development Initiative	1996	Marketing Alaska Executive Committee
Arizona	Creating a 21st Century: Arizona's Strategic Plan for Economic Development	1992	Arizona Strategic Planning for Economic Development (ASPED)
California	Collaborating to Compete in the New Economy: An Economic Strategy for California	1996	California Economic Strategy Panel
Colorado	The Challenge to Become World Class	1996	Colorado Advanced Technology Institute
Connecticut	The Connecticut Connection: Implementation Strategy for The Connecticut Competitiveness Initiative	1994	Connecticut Economic Conference Board
Hawaii	Restoring Hawaii's Economic Momentum	1996	Hawaii Department of Business, Economic Development and Tourism
Idaho	Idaho Department of Commerce Strategic Plan	1995	Idaho Department of Commerce
Illinois	Economic Leadership in Illinois	1992	Illinois Department of Commerce and Community Affairs
Indiana	Investing in Indiana	1994	Indiana Economic Development Council
Iowa	Five-Year Economic Development Plan	1992	Iowa Department of Economic Development
Kansas	A Kansas Vision	1993	Kansas, Inc.
Kentucky	Kentucky Strategic Plan for Economic Development	1994	Kentucky Economic Development Partnership Board
Louisiana	Department of Economic Development Strategic Plan	Annually	Louisiana Department of Economic Development
Maryland	Strategic Directions for Increasing Maryland's Competitiveness	1995	Maryland Economic Development Commission
Massachusetts	Choosing to Compete: A Statewide Strategy for Job Creation and Economic Growth	1993	Executive Office of Economic Affairs ² and the University of Massachusetts
Michigan	1995 Business Climate Agenda	1995	Michigan Jobs Commission
Minnesota	Economic Blueprint for Minnesota	1992	Minnesota Department of Trade and Economic Development
Missouri	Missouri Department of Economic Development Strategic Plan	1996	Missouri Department of Economic Development
New Jersey	New Jersey Economic Master Plan Commission Report	1994	New Jersey Economic Master Plan Commission
New Mexico	New Mexico Economic Development Dept. '98 Strategic Plan	1996	New Mexico Economic Development Department
New York	New York State Economic Strategies and Initiatives for 1993 - 1996	1992	New York State Department of Economic Development

State	Strategy	Year Adopted	Developed By
North Carolina	Making North Carolina A High-Performance State	1994	North Carolina Economic Development Board
North Dakota	Vision 2000 Study and Growing North Dakota	1991	Vision 2000 Committee
Oklahoma	Building a Better Oklahoma	1993	Oklahoma Futures
Oregon	Oregon Shines, Oregon Shines II	1989 ³	Oregon Economic Development Department
South Carolina	Approaching 2000: An Economic Development Vision for South Carolina	1995	South Carolina Department of Commerce and Department of Parks, Recreation, and Tourism
Virginia	Opportunity Virginia: A Strategic Plan for Jobs and Prosperity	1994	Opportunity Virginia Steering Committee
West Virginia	Strategic Plan for Economic Development	1993	Council for Community and Economic Development & West Virginia Development Office
Wyoming	State Economic Development Plan	1994	Wyoming Department of Commerce

¹ Some of the plans are dated 1996 since they were published in early 1996 although the planning process occurred in 1995.

² Now the Department of Economic Development.

³ Originally adopted in 1989, updated every two years, latest revision in 1997.

Science and Technology Strategic Plans. The overriding goal of the thirteen science and technology strategic plans developed by the states between 1991 and 1995 was to create high-wage jobs in technology-based businesses in order to increase per capita income and improve citizens' standard of living. Strategies used to achieve this broad-based goal of state-wide economic growth included:

Improving or capitalizing on the state's research base. The strategies recognized the importance of maintaining and strengthening the research and development capacity of the states' colleges and universities. The specific activities proposed depended on the current capacity of the research system within the state. In Tennessee, a state with fewer industrial research and development resources, the plan proposed activities designed to build a nationally competitive science and technology base. In North Carolina, known for its wealth of research institutions in Research Triangle Park, the strategy focused on ways to capitalize on the technology developed, while continuing to maintain and strengthen research and development capacity.

Building the technical skills of the existing and future workforce. The states' plans acknowledged the availability of an educated, highly skilled workforce as a prerequisite for a technology-based economy. The strategies addressed the need for improved math and science education at the K-12 level and emphasized the importance of technical training. While the strategies articulated the need for skilled workers, they did not propose programs or activities to prepare disadvantaged, lesser skilled workers for technical jobs.

Creating a climate supportive of entrepreneurs and technology-based businesses. State science and technology strategies typically focused on encouraging "home-grown" businesses by providing support to entrepreneurs and small technology-based firms rather than seeking to recruit technology firms to locate within the state. The strategies included recommendations on tax and regulatory policies and proposals for programs to provide financial and nonfinancial assistance to entrepreneurs and technology-based companies.

Louisiana's strategy, for example, recommended that the state establish a financial stimulus package for technology-based businesses in Louisiana to establish, expand, and/or stabilize operations.

Accelerating the commercialization and deployment of technology. States are increasingly trying to facilitate the incorporation of new technology into processes and products. Maryland's strategy, for example, included recommendations for exploiting the commercialization potential of technology developed by universities and federal laboratories located in the state.

Investing in technology infrastructure. States have a long history of investing in physical infrastructure to support economic development. The states' science and technology strategic plans recognized that the infrastructure needed to support technology-based enterprises is changing rapidly. Most of the strategies addressed the need for an expanded and upgraded telecommunications infrastructure. The Maine Science and Technology Action Plan, for example, called for continued investment in the next generation of Internet through the University of Maine system and challenged every Maine community and every Maine business to establish its own World Wide Web page.

Table A2: State Science And Technology Strategic Plans

State	Strategy	Year Adopted	Developed by
Colorado	Colorado Technology Transfer Plan for Economic Development	1994	Colorado Advanced Technology Institute
Georgia	Georgia: Focusing on the 21st Century Through Science and Technology	1993	Governor's Advisory Council on Science and Technology Development
Illinois	Technology and Jobs Agenda	1994	Illinois Coalition
Iowa	Technology Investment Strategy for Iowa	1992	Wallace Technology Transfer Foundation
Kansas	KTEC: Touching the 21st Century	1992	Kansas Technology Enterprise Corporation
Louisiana	Science and Technology Program Strategic Plan	Annually	Louisiana Department of Economic Development
Maine	Maine's Science & Technology Plan, A First Step Toward a Productive Future	1992	Maine Science and Technology Foundation
Maryland	A Strategic Statement for Technology Development	1993	Maryland Department of Economic and Employment Development
Montana	Montana Science & Technology Policy and Plan	1992	Montana Science and Technology Alliance
New Mexico	High-Tech Jobs for New Mexico	1992	Governor's Technical Excellence Committee
North Carolina	North Carolina: Strategies for Competitive Future	1995	North Carolina Alliance for Competitive Technologies
Tennessee	Science and Technology Strategies for Tennessee	1995	Science and Technology Advisory Council
Vermont	Vermont Science and Technology Plan	1994	Vermont Technology Council

Table A3: Additional Science and Technology Strategic Planning Activities

State	Additional Planning Documents	Date	Developed by
Alaska	Strategic Plan and Sector Analysis	1996	Alaska Science and Technology Foundation
Connecticut	Connecticut Critical Technologies	1992	Connecticut Economic Conference Board
Kansas	A Strategic Technology Assessment for the State of Kansas	1995	Kansas Technology Enterprise Corporation
New Jersey	Vision 2020	1995	New Jersey Commission on Science and Technology

Addressing the Needs of Distressed Areas

The strategic plans SSTI reviewed did not explicitly address the needs of distressed communities or areas, with a few exceptions. This was true of both the science and technology strategies and the overall economic development strategies. Even in economic development strategies that included a goal of promoting development of distressed areas, it often was not clear which initiatives would be dedicated to those areas in particular. Furthermore, to the extent that actions were identified, they seldom focused on technology. Maine, Massachusetts, New Jersey, and South Carolina's strategies included a focus on distressed areas.

- √ A goal of Maine's economic development strategy was to shrink economic disparities within the state. While this goal was reflected in the state's science and technology plan, proposed activities to achieve the goal have not yet been developed.
- √ Massachusetts' *Choosing to Compete: A Statewide Strategy for Job Creation and Economic Growth* was premised on a commitment to maximize employment opportunities for citizens and areas in greatest need. The strategy called for targeting job creation incentives to economically distressed areas of the state; targeting technical and job training assistance; improving infrastructure and physical assets through targeted state capital spending; providing special assistance to minority-owned enterprises; and improving basic education at the preschool, primary, and secondary levels. The strategy also addressed the needs of distressed urban areas, rural and small city development, defense restructuring, and small business development.
- √ Revitalizing the state's urban areas is one of four objectives identified in New Jersey's Economic Master Plan. Strategies to achieve this objective include establishing a state-level Urban Council to facilitate public/private partnerships; working with local and neighborhood development organizations to attract private and public funding for revitalization activities

and planning; establishing an enterprise loan marketing program; capitalizing the Urban Development Corporation and expanding its scope; and promoting workforce training and development.

- √ A stated goal of South Carolina's strategy was to "ensure that the benefits of increased wealth generation are realized across all regions of the state." Specific actions proposed included facilitating planning in each region, providing support for business development, and providing leadership training.

Like the general economic development strategies, the science and technology plans did not discuss whether the state's science and technology activities would benefit distressed areas of the state. The strategies, by and large, were not targeted geographically or by population although several included recommendations for supporting technology-based development in rural areas. Most of these initiatives focused on linking rural areas to sources of technology and technical expertise by the use of advanced telecommunications.

In some instances, while the strategy did not specifically mention distressed areas, it is expected to positively impact such areas. Vermont, for example, is predominantly rural and lacks many of the resources needed to support economic development. Successful implementation of the state's science and technology policy is expected to increase the number of high-skill, high-wage jobs in the state. While initial activities focused on the University of Vermont, the state's only research institution, it is expected that spin-off companies will be located throughout the state.

To the extent that the science and technology strategies were targeted, they were usually targeted by industry or technology area. Arizona, California, Connecticut, Kansas, and South Carolina, among others, identified proposed activities to meet the needs of industry clusters.

Science and Technology Strategic Planning Processes

States varied in who initiated the strategic planning process, how the process was carried out, the amount of data collected and subsequent analysis performed, who was responsible for developing and implementing the strategy, and the extent to which the strategy contained outcome measures. In some states, the planning process took as long as two years. In others, a strategy was completed in a matter of months.

Initiating the Process. The strategic planning process has been initiated by state government as well as the private sector. In seven states, the science and technology strategic planning process was initiated at the request of the Governor. For example, the Vermont Science and Technology Plan was prepared by the Vermont Technology Council in accordance with a Governor's Executive Order. In two states, Iowa and Maine, the strategic planning process was developed at the request of the legislature.

Strategies also were initiated by the agencies responsible for administering the state's science and technology programs. Colorado's technology transfer plan was initiated by the Colorado Advanced Technology Institute (CATI), Maryland's strategy was initiated by the Department of Economic and Employment Development, and Kansas' plan was developed by the Kansas Technology Enterprise Corporation. The Louisiana Department of Economic Development is required by legislation to produce a five-year strategic plan and annual operating plans. The Science and Technology Program Strategic Plan is a distinct part of the overall departmental plan.

In some cases, private sector organizations or business leaders spearheaded the strategic planning process. *Connecticut Connects: An Assessment of the Economic Challenges for the State's Future* was prepared by the Connecticut Economic Conference Board. The Board was established by statute in 1991 to provide economic advice to the Governor and state legislature and to hold regular conferences on the state's economy. The members of the Board are appointed by the Governor and legislature.

Organizing for Action. Strategies can be developed by an existing organization, or state agency or a strategic planning committee can be appointed. In eight states the strategy was developed by the state's science and technology agency. In five states, the strategy was developed by a public-private

council set up for the explicit purpose of developing a strategy. For example:

- √ Georgia's strategy was developed by the Governor's Advisory Council on Science and Technology Development. The Council, established in 1992, includes representatives of the business community, academic community, research and development community, and producers and consumers of technological resources.
- √ Illinois' *Technology and Jobs Agenda* was developed by the Illinois Coalition, a not-for-profit organization established in 1989 to strengthen Illinois' economy through science and technology. Its members include representatives from business, higher education, labor, and government.
- √ New Mexico's strategic plan was developed by the Governor's Science and Technology Advisory Council. Represented on the Council are the Governor's Science Advisor, Economic Development Department, Los Alamos and Sandia National Laboratories, Lovelace Institute, the state's three research universities, and private businesses involved with technology commercialization.

Analyzing the Economy. The first step in developing a strategic plan usually is to conduct a baseline assessment of the strengths and weaknesses of the state's economy and of the state's research infrastructure. Most strategies included some analysis of key economic, demographic, labor, and industrial issues, although the extent of the analysis varied greatly. Some states also included a review of major global issues likely to impact future growth of the state's economy. California's strategy, while it is an overall economic development strategy rather than a science and technology strategy, provides a good example of the type of analysis needed to support the planning process.

√ California's Economic Strategy Panel was created by the Governor to "develop an overall economic vision and strategy to guide public policy toward a prosperous 21st Century." The Panel undertook an extensive analysis of California's economy using both detailed economic data and data collected by means of direct interviews with industrial representatives. The Panel examined regional patterns of employment and business at the local level by three- and four-digit Standard Industrial Classification (SIC) codes between 1991 and 1994. In addition, the Panel examined the organization of selected industry clusters and the factors which had facilitated their growth and expansion. The clusters were examined in regard to the:

- Components that made up the cluster, including key producers/exporters, suppliers, human resources, investors, institutions, such as government, education, research laboratories and associations, and infrastructure
- Size and growth of the cluster
- Evolution of the cluster
- Relationships and networks
- Markets
- Opportunities
- Requirements for future growth.

Based on its analysis, the Panel concluded that California was growing a new economic base which was substantially different from the economic base of its past. The strategy proposed public policies designed to meet the competitive requirements of the knowledge-based industries which were emerging.

Getting Input. In addition to analyzing trends in the economy, states used a variety of mechanisms to obtain input for the strategic plan, including surveys, focus groups, interviews, and public hearings. Both Colorado and North Carolina used multiple techniques to reach a broad cross-section of citizens.

- √ In preparing Colorado's plan, the Colorado Advanced Technology Institute (CATI) commissioned eight background studies and conducted surveys of Colorado businesses and economic development and technology transfer organizations. A planning forum was held to present and discuss the results of the studies and surveys and to develop recommendations.
- √ The North Carolina Alliance for Competitive Technologies (NC ACTs), organized six task forces on particular issues of concern, held nine focus groups across the state to assess industry attitudes and practices, and conducted in-depth surveys of the state's manufacturing sector and technology delivery systems. NC ACTs also worked with the private sector to conduct industry specific studies.

Implementation

The strategies varied greatly in the level of detail on implementation. Some of the plans included recommendations for action but did not identify a party responsible for acting on the recommendations, a timeline for implementation, or any measures to plot progress on achieving the goals and objectives of the strategy. In some cases, an action plan was developed after the strategy had been adopted. For example, The Montana Science and Technology Policy Plan was released by the Montana Science and Technology Advisory Council in 1991. A year later, the Council completed *The Montana Science and Technology Action Agenda* which included key actions, identified responsible parties, and established an implementation timeline.

Of the thirteen strategies examined, eight included an implementation plan, although they varied greatly in level of detail and specificity. Only three plans (Maine, Maryland, and North Carolina) included specific outcome measures. The outcome measures varied in level of specificity. Some plans identified data to be tracked (e.g., growth rate of technology-related businesses, new companies started, or industry support for universities' research and development). Others set quantitative goals, such as increasing the percentage of high-technology firms in the state by 50 percent and increasing employment in technology industries by 30 percent. Louisiana's strategy contained measurable objectives, such as

executing at least 125 technology transfer agreements between the federal government and Louisiana private sector companies annually.

Determining the extent to which the recommendations in strategies developed several years ago have been implemented is difficult because many states established no mechanism for tracking implementation, and staff turnover has resulted in little institutional memory. For example, in three of the states that adopted strategies in 1992 and 1993 (Iowa, Maryland, and Montana), changes in administrations and the state's science and technology leadership made it difficult to determine how effectively the strategy was implemented, if at all. While the strategies may have influenced the state's investment in science and technology, those most involved in developing and implementing the strategy are no longer with state government.

- √ Iowa, which adopted a *Technology Investment Strategy for Iowa* in 1992, completely reorganized its science and technology effort in 1996. The Wallace Technology Transfer Foundation, established by the legislature in 1989 with responsibility for "formulating a long-range strategic plan to guide state investment in applied research, development, and commercial transfer of selected scientific and technological innovation and in the development of Iowa science infrastructure," no longer exists, and the state is reevaluating its science and technology initiatives.
- √ Maryland experienced a change in Governors, which has led the state to refocus and refine its development priorities. However, many of the implemented recommendations have survived, albeit at modest resource levels.
- √ The Montana Science and Technology Alliance, which was established by the legislature in 1985 and oversaw the development of the *Science and Technology Policy and Plan* and the *Montana Science and Technology Action Agenda*, was disbanded in June of this year. Efforts to fully implement the plan failed when the Governor, who was a key supporter of the initiative, left office and the state's fiscal condition made it difficult to provide sufficient funding.

For the strategies adopted in 1995, it is still too early to assess implementation even though the strategy may assign responsibility for monitoring implementation.

Thirteen states adopted statewide science and technology strategic plans between 1991 and 1995. During this same time, twenty-nine states adopted overall economic development strategies, some of which addressed the science and technology base in the state or the needs of particular technology-based industries.

The strategies, with a few exceptions, did not explicitly address the needs of distressed areas or consider the way implementation of the strategy would benefit these areas. If the strategy was targeted, it was targeted to specific technologies or industries rather than to geographic areas or population groups.

The states varied greatly in their approach to strategic planning. Several states have established strategic planning organizations that prepare, update, and monitor implementation of the state's strategic plan over time. In others, a strategic plan was developed to respond to an economic crisis or the election of a new administration and may or may not have led to an ongoing planning effort.

A number of plans reviewed did not include an implementation plan or assign responsibility for action. However, a number of recently developed plans assigned responsibility for action items and established timelines and outcome measures. Many plans included recommendations that must be carried out by entities over which the organization that developed the plan has no authority.

Public outreach — through focus groups, regional conferences, and workshops — was critical to the states in developing their strategic plans. Outreach activities were used to gather information, to develop consensus, and to build support for the plans. Regional hearings or workshops were used to ensure that the views of all areas of the state were reflected in the strategies.

Findings

Business and industry representatives played a key role in developing states' strategic plans. Many states appointed industry task forces to identify key issues and suggest ways in which the state might encourage further growth of a particular industry segment. It was also a common practice to appoint an advisory council with representatives from both the public and private sectors to oversee development of the plan.

Examples of State Science & Technology Strategies

Maryland

After completing an assessment of the competitive position of its biotechnology industry in 1992, Maryland saw a need to create a strategy for overall science and technology policy. The state had significant existing technology resources — especially as the home of the National Institutes of Health and Johns Hopkins University — upon which it wanted to build. The Maryland Department of Economic and Employment Development developed a Strategic Statement to “sharpen our vision for technology development in Maryland, offer the principles to guide future actions, and help us judge our overall success.”

The Maryland Department of Economic and Employment Development spent several months assessing the state’s technology industries because “it is critical that we begin with a shared understanding of how these different elements need to come together to promote growing and prosperous technology-driven industries in Maryland.” In that assessment, the state determined that information technologies stood out as the dominant technology industry; the state had competitive niches in the aerospace industry; biotechnology was a leading technology prospect; and environmental technology offered key opportunities.

Based on the assessment of Maryland’s overall competitive position in technology development, the strategic plan identified strategic priorities, future actions, and measures of success. The seven strategic priorities were:

Enhancing product focus and entrepreneurial support

- Assisting in deployment of technology
- Exploiting commercialization potential of Maryland research institutions
- Accessing new markets
- Supporting workforce development and training
- Ensuring availability of business financing
- Improving the climate for technology development

State officials reported that the strategic planning process became a blueprint for operations. Most importantly, it focused state attention on two specific areas: commercialization and modernization. The process created a new model for understanding the innovation process. The view of the innovation process changed from a concept of a linear progression (going on a predictable path from basic

research to commercial development) to a concept of an interactive process where research and business development are closely linked to market needs and opportunities. Additionally, the process resulted in targeting of state efforts toward small and medium-sized companies.

North Carolina

Recognizing that the state was “in the middle of profound economic restructuring, similar to the earlier shift from an agrarian to an industrial base” the North Carolina Alliance for Competitive Technologies (NC ACTs) developed a plan to consider how the state should invest in technology and assist industry to make North Carolina a better place to live, with high-quality jobs, high-performance enterprises, and widely shared prosperity. Its plan was based on the thesis that the states that make the best investment in technology will be those that prosper in the 21st century.

NC ACTs’ charge is to:

- Create a statewide strategy to make the best use of the state’s technological resources
- Measure current activities against the strategy and make corrections where necessary
- Identify ways to leverage North Carolina’s investments with nonstate dollars
- Make sure the state’s investments are helping the state’s industries and people to the highest possible extent.

While most states envy North Carolina’s Research Triangle Park, the strategic planning process indicated that more work needed to be done. NC ACTs found that the state “has put in place many of the resources necessary to compete in a global economy,” but the state needed “a clear vision and strategies to harness these resources and direct them where they will do the most good for our manufacturing and technology industries and our people.”

NC ACTs undertook a year-long process that included investigating the needs of North Carolina industries, the resources offered by the state, and the correlation between the two. Six task forces were created, nine focus groups were held, and in-depth surveys of the state’s manufacturing sector were conducted. As a result, NC ACTs concluded that

“although North Carolina makes a significant investment in technology, there is a disconnect between that technology and the needs of the state’s manufacturing and technology firms.” It identified seven strategies and 39 actions that should be undertaken, including:

- Support the modernization of existing manufacturers
- Improve the entrepreneurial culture and support for new and existing firms
- Increase deployment of technology research and development
- Maintain and strengthen the R&D and instructional capacity of the state’s higher education system
- Ensure that all educational institutions prepare youth and adults with necessary workplace skills
- Redesign the technology and manufacturing delivery system to better meet customers’ needs.

NC ACTs reported that progress has been made on 33 of the 39 action items called for in the plan. For example, more partnerships between industries and universities are occurring, the community college system is examining new ways to work with small and medium-sized manufacturers, and more activity is occurring in making companies aware of the federal Small Business Innovation Research (SBIR) program.

North Dakota

Like some other states, North Dakota's strategic planning process was undertaken at a time of economic uncertainty. The sense of crisis was stronger in North Dakota in 1990 than in other states. During the planning process, the North Dakota 2000 Committee “went out and asked if North Dakota was dying. The people of North Dakota said yes, it would, unless we change the way we look at things.” Among the state's problems, North Dakota was the only state to have fewer residents in 1990 than it did in 1930, the state's two basic economic generators were agriculture and energy, and in three years, 17,000 people between the ages of 22-55 had left the state.

The planning process was undertaken because “North Dakota is at risk and cannot stand still. It must take bold actions now to prepare for the future. The Vision 2000 project is an effort led by North Dakotans to look ahead and develop strategies to begin building for the 21st century today.”

The North Dakota 2000 Committee worked for over a year to determine the state's problems, identify opportunities, and make recommendations for future actions. In addition to background research, the process included 40 meetings across the state, involving more than 6,700 people.

The Committee concluded that the economy needed to be diversified and that “careful, selective, planned investments in such things as applied research at our universities and infrastructure improvements to support the expansion of existing activities and the creation of new firms, jobs, and wealth” should be made. Four economic sectors were targeted for support: advanced agriculture and food processing; energy by-product development; export services and tourism; and advanced manufacturing. The Committee's recommendations included steps to:

- Establish a Commission on Science and Technology
- Create the North Dakota Entrepreneurial Challenge
- Create a Compact for Education Excellence
- Establish the Development Bank of North Dakota.

Seven years later, state officials report that the plan has had a significant impact on the state's operations. Prior to the plan, the state did little to encourage economic development beyond tourism promotion. The state has since created Technology Transfer, Inc., a program designed to expand the state's science and technology base, and established a Manufacturing Extension Partnership center. Additionally, the four industry sectors have received special attention from the Office of Economic Development and Finance.

Vermont

In November 1993, Vermont Governor Howard Dean signed an executive order directing the Vermont Technology Council to propose a vision and plan for science and technology within Vermont. He instructed the Council to ensure that the plan addressed broad goals of economic prosperity, a new industrial base, and academic preeminence for the state's institutions of higher learning, while balancing that with preservation of the state's environment and heritage.

The executive order was signed at a time when, in Governor Dean's words, “the long-term economic vitality of Vermont is in jeopardy, facing the mounting effects of global competition

and economic restructuring throughout New England. Vermont's manufacturing employment base is eroding and external forces are playing a progressively increasing role in our economy." State leaders believed that the successful commercialization of science and technology would be vital to addressing those difficulties and would lead the way to a stronger state economy. They felt that there was a need and opportunity to bring together the "high-quality research of our colleges and universities with the entrepreneurial capacity of our business sector and the support and collaboration of state government in new ways that would benefit the Vermont economy and all Vermonters."

The Governor called for a plan to determine science and technology policy priorities and a vision for science and technology that would, among other things:

- Build on the state's research infrastructure
- Seek out centers of technical competence
- Use the full capability of the state's higher education resources
- Address the relevance of educational initiatives at all levels
- Promote entrepreneurship
- Provide for the development of high-quality, challenging, and fulfilling jobs for Vermonters.

In a year-long process, the Vermont Technology Council examined the activities of other states that use science and technology for economic development, identified areas of science and technology on which to focus, held public hearings to seek input, and produced a report with several recommendations.

As a result of the process, the Vermont Technology Council recommended that four industries be targeted (food processing, environmental technologies, biotechnology, and advanced materials technologies) and centers of excellence be established in each of those areas. The plan also called for support for five "infrastructure improvement programs" (Vermont EPSCoR, a manufacturing extension center, enhancing telecommunications, a state SBIR program, and technology transfer programs).

In an update, two years after the plan was issued, the Vermont Technology Council reported that three centers of excellence

had been established and a fourth was in the planning stages. Progress was reported on three of the infrastructure improvement programs, while no mention was made of the other two.

The Vermont plan helped raise awareness in the state on the need for focused investment in science and technology. It helped serve as a blueprint for action and was followed closely in determining which centers of excellence should be funded.

APPENDIX B: List of Roundtable Participants

Rob Atkinson
Executive Director
Rhode Island Economic Policy Council

Gary Bachula
Deputy Under Secretary
Technology Administration
U.S. Department of Commerce

Rich Bendis
President
Kansas Technology Enterprise Corporation

Dan Berglund
Executive Director
State Science & Technology Institute

Joe Bordogna
Acting Deputy Director
National Science Foundation

Luis Bueso
Director of Planning
Economic Development Administration
U.S. Department of Commerce

Marianne Clarke
Research Director
State Science & Technology Institute

Chris Coburn
President
State Science and Technology Institute

Bob Coy
Director
Delaware Economic Development Office

Greg Diamond
Special Aide to the Governor
Governor's Office of Business
Development, Colorado

David Driver
Science Research Park
New Haven, Connecticut

Darryl Gorman
Program Manager, SBIR Program
National Science Foundation

Steve Jarvis
Director
Office of Competitive Technology
California Department of Trade and
Commerce

Eleanor Josaitis
Acting Executive Director
Focus Hope
Detroit, Michigan

Jay Kayne
Economic Development and
Commerce Policy Studies Director
National Governors' Association

Alan Klein
Region 9 Economic Development District,
Colorado

Kjell Knudsen
Minnesota Technology, Inc.

Margot Leydic-Boyd
Economic Development Administration

Maxine Moul
Director
Nebraska Department of Economic
Development

Walt Plosila
Executive Director
North Carolina Alliance for Competitive
Technologies

Ken Poole
Director, Domestic Business Development
National Association of State Development
Agencies

Harry L. Roesch
States' Washington Representative
Appalachian Regional Commission

Rose Ann Rosenthal
President and CEO
Ben Franklin Technology Center of
Southeastern Pennsylvania

Marsha Schachtel
Director, Technology Development
Maryland Dept. of Business and Economic
Development

Rohit Shukla
Executive Director
Los Angeles Regional Technology Alliance

Phillip Singerman
Assistant Secretary for Economic
Development
U.S. Department of Commerce

Pat Valente
Assistant Deputy Director
Ohio Department of Development