

Analysis of Census Results

Overview

OTA's census identified over 200 State and local level economic development initiatives with at least some features directed toward high-technology development. The appendix contains detailed descriptions of 150 of these initiatives that were launched by State governments; table 2 shows the distribution of these programs by type and State. Using the narrower definition of a "dedicated" high-technology development (HTD) program—chartered and at least partially funded by the State government, and specifically targeted on the creation, attraction, or retention of high-technology firms—OTA identified a total of 38 programs in 22 States.

Most of these HTD initiatives have been launched within the last 3 years (see table 3). Few of them have been in existence long enough to produce measurable results, and in most cases there has been no systematic evaluation of their effectiveness. In fact, their effectiveness will be difficult to measure—many of these States had experienced a considerable amount of high-technology development prior to any intervention by the State government, and the impact of the dedicated program on further development has yet to be demonstrated. In other cases, furthermore, relatively mature State programs have been very slow to produce any appreciable results,

Table 2.—State High-Technology Programs by Type^a

State	HTD	TF	HTE	LTA	CPA	GID	State	HTD	TF	HTE	LTA	CPA	GID
Alabama	—	—	—	—	—	1	Nevada	—	—	—	—	—	1
Alaska	—	—	—	—	—	2	New Hampshire	—	—	—	—	—	1
Arizona	—	—	—	1	1	1	New Jersey	—	—	1	—	—	—
Arkansas	—	—	—	—	2	1	New Mexico	—	—	2	—	1	—
California	1	—	—	1	1	—	New York	—	—	2	—	—	1
Colorado	—	—	1	1	—	1	North Carolina	—	—	1	—	2	—
Connecticut	—	—	3	—	—	1	North Dakota	—	—	—	—	—	—
Delaware	—	—	—	—	—	1	Ohio	—	—	1	—	—	—
Florida	—	—	3	—	—	1	Oklahoma	—	—	—	—	—	—
Georgia	—	—	1	—	2	—	Oregon	—	—	—	—	—	—
Hawaii	—	—	1	—	—	—	Pennsylvania	—	—	2	—	1	1
Idaho	—	—	—	—	—	2	Puerto Rico	—	—	—	—	—	2
Illinois	—	—	2	1	—	2	Rhode Island	—	—	1	—	—	1
Indiana	—	—	1	—	—	1	South Carolina	—	—	—	1	—	—
Iowa	—	—	—	—	—	—	South Dakota	—	—	—	—	—	—
Kansas	—	—	—	—	—	1	Tennessee	—	—	2	—	1	—
Kentucky	—	—	—	—	—	1	Texas	—	—	—	—	—	1
Louisiana	—	—	—	1	—	1	Utah	—	—	—	—	—	—
Maine	—	—	—	—	—	2	Vermont	—	—	—	—	—	—
Maryland	—	—	—	1	—	2	Virginia	—	—	1	1	—	—
Massachusetts	—	—	1	—	1	1	Washington	—	—	1	—	1	—
Michigan	—	—	8	—	—	1	West Virginia	—	—	—	—	—	1
Minnesota	—	—	—	—	1	—	Wisconsin	—	—	—	—	—	—
Mississippi	—	—	1	—	—	1	Wyoming	—	—	—	—	—	—
Missouri	—	—	—	1	—	2	Totals	38	9	15	27	27	37
Montana	—	—	—	—	—	1							
Nebraska	—	—	—	—	—	1							

^aHTD = High-technology development.
TF = Task force.
HTE = High-technology education.

LTA = Labor/technical assistance.
CPA = Capital provision assistance.
GID = General Industrial development

SOURCE: Off Ice of Technology Assessment

Table 3.—Establishment of State High-Technology Programs by Year

1959	North Carolina Research Triangle Park
1984	Mississippi Research and Development Center
1988	New York Science and Technology Foundation
1975	Connecticut Product Development Corp.
1978	Florida Research and Development Commission Massachusetts Technology Development Corp.
1979	Hawaii Venture Development Fund North Carolina Board of Science and Technology
1980	Georgia Advanced Technology Development Center
1981	California Innovation Development Loan Program Florida Technical Entrepreneurship Program Indiana Corp. for Science & Technology Missouri Office of Science and Technology New York Corp. for Innovation Development Pennsylvania Industrial Development Authority Tennessee Department of High-Technology, Finance, and Service Sales Washington Research Foundation
1982	Connecticut Innovation Development Loan Fund Connecticut Science Park Illinois Biomedical Research Parks Illinois Research Assistance to the State Michigan High-Technology Development Corp. Michigan High-Technology Resource Center Michigan Industrial Technology Institute Michigan Innovation Center Michigan Molecular Biology Institute Rhode Island Strategic Development Corp. Tennessee Technology Corridor Foundation Texas Institute for Ventures in New Technology Virginia Science, Engineering, and Technology Advisory Service
1983	Florida Interagency High-Technology Committee Michigan High-Technology Equity Loans New Mexico Economic Development Division Ohio Industrial Technology and Enterprise Board Pennsylvania Ben Franklin Partnership Fund

SOURCE: Office of Technology Assessment.

while more recent programs in other States are already considered successful. Admittedly, some programs are designed to achieve long-range objectives, while others are intended to show short-term results; but there has yet to be any systematic comparison

of the effectiveness and benefits of different program types. Finally, some States report that, even without a dedicated effort, they have nevertheless experienced a great deal of high-technology industrial development.

It was also found, however, that different States define “high-technology development” in different ways, and that in most cases their high-technology initiatives are an extension of their overall economic development strategies. States with HTD initiatives, for example, tend to be those that had a sophisticated research base and considerable high-technology industry even before these programs were established; their objective is in part to strengthen and retain what was already there. In States where the economic base consists primarily of “sunset” industries, on the other hand, the “high-technology” strategy tends to emphasize economic diversification and the application of new production technologies to traditional manufacturing processes. Still other States, notably those that are not yet highly industrialized, base their strategies on the aggressive pursuit of the production facilities of expanding high-technology firms as part of a broader effort to bolster their industrial base and build the foundation for future development.

These patterns suggest that, for most States, attention to high-technology industrial development is not distinct from economic development in general. They also suggest, however, that in launching their initiatives, the States have given attention both to the special needs of technology-based enterprises and to their own comparative advantage vis-a-vis the basic stages of technological innovation and commercialization. This attention, in turn, results in part from the ways in which these programs have been created.

Creation of State High-Technology Programs

Initiatives to promote high-technology industrial development usually come about in one of two ways: 1) as a natural, evolutionary outgrowth of the State’s ongoing economic development efforts; or 2) as the result of a special effort to identify and mobilize the appropriate State resources. Both routes lead to pro-

grams that are based on the needs of technology-based enterprises, whether perceived or projected, and on strategies to mobilize the resources or provide the services that will encourage or attract their growth within the State. In many cases the programs are based on models elsewhere: several States cited

the National Research Development Corp. (created by the British Government in 1949 to commercialize new products), and many other strategies are described in terms of “making Silicon Valley happen here.”

General Industrial Development Programs

In the first instance, the dedicated high-technology program results from a need perceived by the State’s department of economic development. This office already provides a wide range of assistance to industry in general, such as locating plant sites or identifying an appropriate labor pool. Many but not all these services are also helpful to technology-based businesses. As more and more special requests are received from high-technology firms, or as this sector becomes more important to the State’s industrial base, individuals or offices within the existing State agency are designated to concentrate on meeting this increasing demand.

OTA found that almost all States have “general industrial development” programs that can also assist or influence the creation and growth of high-technology businesses. The same can be said for programs in the “capital assistance” and “labor and technical assistance” categories. These programs rarely exclude any specific type of business that needs their services, and the services they offer to new, expanding, or relocating high-technology industry are often not much different from services offered to more traditional industry.

For this reason many States that do not have dedicated HTD programs can and do encourage this kind of development through the services offered by their general, capital, and technical assistance programs. In the States where dedicated programs

do exist, they usually work closely with these general programs to help their high-technology clients. In addition, in several States, an existing State agency or representative assumed the job of encouraging high-technology industrial growth in the State.

As a result, however, it was difficult in most States—even those with dedicated programs—to determine precisely where to make the cutoff between “high-technology” programs, on the one hand, and those whose mission is more general but who nevertheless provide the special services demanded by a growing high-technology sector.

High-Technology Task Forces

The second method of creating a high-technology program is more of a “supply-side” tactic. The Governor or legislature appoints an ad hoc task force to examine the State’s resources and recommends initiatives that will encourage the development of high-technology industries. These task forces usually represent all sectors of the State’s economy, and they address such issues as the proper definition of “high technology,” the special needs of high-technology firms, and the question of loyalty to traditional industry versus the appeal of emerging technologies.

OTA’s census identified nine existing task forces, and similar task forces in a number of other States have already disbanded after reporting to the Governor or legislature. In many cases the task forces, after presenting their recommendations, are succeeded by permanent advisory committees that coordinate subsequent efforts. In other cases they are transformed into nonprofit, semiprivate corporations or foundations that administer or provide funding for the mechanisms created to implement task force recommendations. These organizations often provide the basis for the State’s HTD programs.

High-Technology Development Programs and Services

OTA’s census identified only 38 State initiatives that met the criteria for the “high-technology development” category—that is, a dedicated State government program or agency whose specific mission is the promotion of high-technology industrial development in the State, whether by attracting branch

plants of expanding firms elsewhere or by encouraging the creation and retention of indigenous high-technology businesses. In addition, OTA identified 15 “high-technology education” programs—initiatives undertaken by States in conjunction with their universities, and dedicated to equipping inventors

or entrepreneurs with the skills needed to create firms that will develop or commercialize emerging technologies. In many cases, however, it is difficult to draw the line between these two categories, particularly where the school involved was a State university and thus funded by the State. (In addition, the 15 education programs included here are only a fraction of the HTD programs that have been launched by colleges and universities, both public and private, throughout the Nation.)

The services most frequently offered by these 53 programs involve information dissemination—ii' programs link industry and university resources, and 8 others involve promotional activities aimed at advertising the State's resources and opportunities

for high-technology firms. Almost half of the programs also offer some form of financial assistance—nine programs assist entrepreneurs in locating venture capital, another nine deal with industrial revenue bonds, eight provide grants for research and development, and four provide loans to high-technology firms. Other services commonly offered include: market development assistance (seven programs); product development assistance (four programs); and incentives or assistance in training technical personnel (five programs). More unique services include helping inventors to acquire patents; providing laboratory or office space for new and growing businesses; and investing public pension funds in high-technology business.

Unsuccessful High-Technology Programs

In the course of its census, OTA also identified several high-technology industrial development programs that have not succeeded. It is unclear whether the reasons for failure are unique to each program or State, or the result of program design flaws that other States should avoid. Several examples follow:

- The Maine Capital Corp. (MCC) was established by the legislature in 1978, with capitalization encouraged through a 50-percent credit against State income tax for investments in MCC. Since that time, MCC has funded only one project—a manufacturer of electronic parts—and that project was unsuccessful. Although MCC has advertised its services, the fact that it could invest only in Maine corporations, and the fact that it is so close to Boston (a center of competing private venture capital activity), may have rendered the program ineffective.
- The Michigan Business Development Corp. (MBDC) was authorized by the legislature in 1979 to promote the growth of small high-technology businesses in Michigan by channeling private venture capital to existing firms. However, the legislature did not reach final agreement with the financial community about stock

and royalty rights before the legislation was passed. As a result, the private sector was unwilling or unable to provide funding to businesses through this program, and MBDC never got off the ground. It was replaced in 1981 by the Michigan Economic Development Authority, which has established several programs for financial assistance to high-technology industry. The New Jersey Office for Promoting Technical Innovation (OPTI) was set up in 1979 to encourage economic development through technical, business, and financial assistance to technology-based enterprises. OPTI had a broad mandate but little flexibility or funding. It attempted to encourage everything from "base-ment inventors" to sophisticated licensing arrangements, but its greatest success may have been in involving the private sector in screening and financing promising projects. The program lost its funding on September 31, 1982, but a source close to the program characterized it as a useful experiment whose errors were taken at a low cost. A proposal to create a similar mechanism, with these errors corrected, has been introduced in the New Jersey Legislature.

High Technology in Overall State Strategies

Most States report that “high-technology development” is part of their overall strategies to increase economic growth, create new jobs, and enhance the standard of living of their people. (These strategies are described in the appendix.) As part of this effort, most States seem to be assessing their strengths and capitalizing on them in order to develop, attract, or retain high-technology industry. The resulting programs therefore appear to target different phases in the development and commercialization of new technologies, according to each State’s comparative advantage. These phases correspond roughly to basic stages of industrial innovation: 1) initial research and product/process development; 2) commercialization and firm creation; and 3) expanding production or application by established firms. These patterns are illustrated below with examples identified by the OTA census.

Strategies Focused on Research and Development

States whose high-technology strategies emphasize basic and applied research in emerging technologies tend to focus on the resources and facilities of their university systems, and on the importance of cooperation between industry and university activities. Several States are working to improve or expand the university faculty, curriculum, and research in relevant disciplines. To encourage these efforts they often provide R&D tax credits, offer challenge grants for university research, seek out Federal R&D contracts, and even support the creation of independent centers of research and development.

- Michigan has set up several research institutes with State funding to conduct research and development in biotechnology and robotics.
- Illinois and Utah both have a biomedical research park connected with the State university.

Strategies Focused on Commercialization and Firm Creation

Some States encourage the development and commercialization of new technologies by providing their

inventors and entrepreneurs with the services they need to create new firms and bring new products to market. These services include providing product and market development assistance, finding capital assistance for new products and young companies, and in some cases establishing “incubator facilities” for high-technology business starts.

- Georgia’s Advanced Technology Development Center provides technical and business assistance, helps firms to find venture capital, and provides incubator space for new businesses.
- The Massachusetts Technology Development Corp. provides venture capital for firms and products that would usually be overlooked by traditional sources of capital, and it also provides assistance with business plans, management, and marketing.
- The Hawaii Venture Development Fund has a special “Inventor’s Fund” for the development of new product ideas.
- The Connecticut Product Development Corp., which makes equity investments in existing firms, has recently set up an Innovation Development Loan Fund to fund the development of innovative projects.

Strategies Focused on Expanding Production and Mature Industries

Instead of targeting the early stages of the innovation and firm creation processes, some States concentrate on attracting the assembly facilities of expanding or relocating high-technology firms, or on transferring and applying new production technologies to help firms in mature industries.

Attracting Production Facilities.—Some States, aware of their limited R&D capability or skilled labor pool, are instead trying to attract the production of more standardized high-technology goods in the State. These States pursue expanding and relocating high-technology firms in much the same way that they recruit more mature industries, through promotional programs and through location assistance and tax incentives. Alabama’s New and Expanding Industry Program is an example of such an initiative; similar strategies to attract high-

technology expansion and relocation are being used in Delaware, Idaho, and Puerto Rico.

Process Development and Application.—The “high-technology” strategy in many States emphasizes technology transfer—the application of new production technologies to the manufacturing processes in mature industries already located in the State. By increasing the efficiency and productivity of the existing industrial base, these programs may strengthen and retain facilities and jobs that might otherwise leave the State or the country. Maine’s New Enterprise Institute, for instance, helped to introduce technologies like computer-assisted design and manufacturing to the shoe industry, and Michigan has established an Industrial Technology Institute to promote the development and application of robotics in the automotive and other mature industries. Similar programs are underway at the Mississippi Research and Development Center, the Arkansas University-Industry Experimental Center for Small Manufacturers, and the Texas Engineering Experimental Stations.

Other Approaches

Some State strategies have aimed at developing integrated markets within the State, thereby provid-

ing the opportunity for new high-technology industry to produce for and obtain inputs from existing industry. Examples of this approach are Michigan’s emphasis on robotics, both as a new manufacturing sector and as an input to the automotive industry, and Arizona’s attempts to encourage the growth of high-technology support industries.

A few States have placed their general industrial development emphasis on technology appropriate to unique State needs, and are not making a concerted effort at this time to attractor develop high-technology industry. Alaska, for example, has a limited manufacturing base and special application needs in most technologies.

Finally, several States have attracted “spillover” high-technology industry without a concerted effort by their governments. These States include Colorado, Oregon, Arizona, Washington, and New Hampshire. Each of them maybe a desirable place to live and do business, but in each case they also have-the advantage of proximity to a growing center of high-technology development—apparently a great advantage in attracting branch plants.