CHAPTER 2

State Government Initiatives

CHAPTER 2

State Government Initiatives

Summary

State governments are becoming increasingly active in promoting technological innovation and high-technology development (HTD). OTA's census (published as a background paper in May 1983) identified 153 State government programs with at least some features directed toward HTD. Of these, 38 programs in 22 States were "dedicated" initiatives specifically targeted on the creation, attraction, or retention of high-technology firms. Some of these initiatives date from the 1950's, but most are too recent to evaluate systematically. A survey was conducted in 16 States to gather further information on the design, operation, and effectiveness of these initiatives.

In general, the survey States appear to be implementing the programs they judge to be most effective in meeting their needs, often based on an analysis of the State's existing industrial base, rather than merely copying the activities of other States. In most cases State officials consider their high-technology initiatives to be a natural (and even unavoidable) extension of their various economic development strategies. A high-technology task force was the most common mechanism for identifying needs and formulating policy recommendations, and the Governor's Office was identified as the primary initiator of 58 percent of the programs investigated. The role of the private sector was generally that of advice and consultation, the same role commonly played by university officials. Respondents reported that local governments had no involvement in the establishment of over half of the State programs investigated.

About one-third of the programs in the survey States were classified as "labor and technical assistance" (primarily training programs). States with older initiatives had a slightly higher percentage of "high-technology education" programs, which may reflect their greater university resources. States with more recent initiatives had a slightly higher percentage of "general industrial development" programs with special provisions for high-technology firms, as well as programs involving capital assistance. The latter may reflect their perception that capital availability is an area of great importance if they are to compete with traditional high-technology leaders, such as Massachusetts and California. However, while many State programs help firms to locate seed or venture capital, very few actually provide risk capital themselves.

Most of these initiatives have been launched in the last 3 years, and the vast majority (85 percent) have undergone no formal evaluation. Preliminary analysis of their effectiveness and impact is inconclusive and often contradictory. OTA's investigation suggests that dedicated programs have served relatively few businesses directly, and that high-technology location decisions by existing firms are more likely to be influenced by general economic development programs than by high-technology initiatives. Nevertheless, dedicated initiatives provide a wide range of technical and financial services that are particularly useful to high-technology startups and expansions. Their principal achievement to date may be in terms of institutional rather than technical innovation—i.e., policy development, consensus-building, and the encouragement of cooperative linkages among governments, universities, and industry. Most respondents–State officials and high-technology executives alike—would favor additional initiatives by both State and Federal governments.

Analysis reveals that during the 1975-78 period, high-technology employment grew faster than overall manufacturing employment in all 16 of the survey States. During the 1978-80 period, which includes part of the recent recessionary cycle, survey States that had high-technology programs in place experienced a continued expansion in high-technology employment sufficient to offset what would otherwise have been a decline in overall manufacturing employment. By contrast, survey States that had not launched their programs experienced a decline in high-technology employment that contributed to

their general decline in manufacturing employment. These comparisons do not provide a statistically sound proof of the effectiveness of State HTD programs, but the more favorable experience of these States may have encouraged the other survey States (and many other States not included in the survey) to initiate their own high-technology programs.

Introduction

High-growth, technology-based firms and the industries they compose are becoming the targets of numerous State economic development strategies. In some cases, these strategies involve organizational innovations designed to identify, integrate, and mobilize existing State resources for technological innovation. In many cases the strategies also include the development of government programs specifically designed to stimulate, attract, or retain high-technology industrial development. The impetus for these dedicated programs comes from an increasing awareness of the impact of State and local initiatives on the creation of new businesses. In addition, recent changes in Federal policy have put increasing emphasis on the role and responsibility of the States in controlling the distribution of public funds and in promoting their own economic development and well-being.

The Task Force on Technological Innovation of the National Governors' Association (NGA), with finding from the U.S. Economic Development Administration (EDA), has analyzed many of these new State policies and programs.[1] The NGA study found that most States are actively pursuing short-term efforts to compete for technology-based research and manufacturing firms, and that they are also developing medium- and long-term strategies based on encouraging modernization in traditional industries and creating a favorable environment for entrepreneurship and technological innovation.[2] As a result of these activities, according to the NGA report, both the center of gravity for technological innovation and "the real and effective initiative for economic development and for the provision of jobs is shifting from the Federal Government to the States."[3] The report acknowledges that most of these State initiatives are too new to evaluate, and that "no State has yet devised a fully integrated, comprehensive policy" for promoting HTD; but it asserts that these efforts "already show great promise for meeting pressing national economic needs. "[4]

Researchers at the Urban Institute have testified that these initiatives provide a potential alternative to a Federal industrial policy: State economic development programs, if "reoriented" to serve national interests and integrated into a " 'federalist' industrial policy," might "increase overall economic activity in the Nation rather than simply rearranging the location of a fixed amount of activity." They also noted, however, that "total development expenditures by States maybe smaller than optimal" because they are unable to capture all the benefits of their outlays, and that "less than 1 percent of the allocated resources in 1981 were targeted to specific industries, high-technology firms, R&D activities, small firms, minority firms, or distressed geographic areas. "[5]

OTA conducted a preliminary census of State government initiatives in December 1982 and January 1983.[6] This census identified 153 State programs

[1] Task Force on Technological Innovation, *Technology and Growth: State Initiatives in Technological Innovation* (Washington, D. C.: National Governors' Association, October 1983); see also *State Initiatives in Technological Innovation: Preliminary Report of Survey Findings,* February 1983.

[2] Task Force on Technological Innovation, NGA, **op. cit., pp. 9-10.**

[3] Task Force on Technological Innovation, NGA, **op. cit.,** p. 8.

[4] Task Force on Technological Innovation, NGA, **op. cit., pp. 102,** *104,* and 8.

[5] Larry C. Ledebur and David W. Rasmussen, "Toward a Federalist Industrial Policy: The Role of State Industrial Development Programs," testimony before the Joint Economic Committee of Congress, July 14, 1983; see also "The Role of State Economic Development Programs in National Industry Policy," *Po/icy Studies Journal, vol. 2, No. 4,* May 1983, pp. 750-761. Further discussion of this topic, as well as a comprehensive listing of State economic development programs, can be found in *Directory of Incentives for Business Investment and Development in the United States: A State-by-State Guide* (Washington, D. C.: Urban Institute Press, 1983).

[6] **Census of State Government** *Initiatives for High-Technology Industrial Development* (Washington, D. C.: U.S. Congress, Office of Technology Assessment, OTA-BP-STI-21, May 1983).

with at least some features directed toward HTD (table 1). Only a few of these programs, however, focused specifically on the needs and problems of technology-based businesses. Using the narrower definition of a "dedicated" HTD initiative–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. In addition, OTA identified 15 high-technology education (HTE) initiatives, undertaken in conjunction with State universities, designed to equip entrepreneurs with the skills needed to create firms or to help existing firms commercialize emerging technologies. (These 15 programs are only a fraction of the high-technology initiatives that have been launched by U.S. colleges and universities–see ch. 3.)

In order to gather more detailed information on State government initiatives, OTA contracted with the Research Triangle Institute (RTI) to conduct a survey and comparative analysis of high-technology initiatives in 16 States—8 that had implemented dedicated programs before 1981, and 8 that initiated dedicated programs in 1981-82. The sample States selected for the survey were:

Pre-1981 States	*1981-82 States*
California	Indiana
Connecticut	Illinois
Georgia	Michigan
Massachusetts	Minnesota
New York	Missouri
North Carolina	New Mexico
Tennessee	Ohio
Pennsylvania	Rhode Island

A total of 321 interviews were completed during February and March 1983. The distribution of these respondents among the 16 survey States is presented in table 2. RTI gathered information on a total of 68 HTD-related programs in the survey States, but it investigated their impacts and effectiveness only in the pre-1981 States, on the assumption that these initiatives might be old enough to have produced measurable results. The findings of this survey are presented below.

Table I.—State High.Technology Programs by Type[a]

State	HTD	TF	HTE	LTA	CPA	GID
Alabama	—	—	—	—	—	1
Alaska	—	—	—	—	2	—
Arkansas	—	—	—	2	1	—
Arizona	—	—	1	1	1	1
California	1	—	1	1	—	—
Colorado	1	1	—	1	—	1
Connecticut	3	—	—	1	1	1
Delaware	—	—	—	—	—	1
Florida	3	—	1	—	—	3
Georgia	1	—	2	—	—	—
Hawaii	1	—	—	—	—	—
Idaho	—	—	—	2	—	1
Illinois	2	1	—	2	1	—
Indiana	1	—	1	—	—	—
Iowa	—	1	—	—	—	—
Kansas	—	1	—	—	—	1
Kentucky	—	—	—	1	1	1
Louisiana	—	1	—	—		
Maine	—	—	—	—	2	2
Maryland	—	1	—	2	3	—
Massachusetts	1	—	1	1	1	1
Michigan	8	—	—	1	1	—
Minnesota	—	—	1	—	—	1
Mississippi	1	—	—	1	1	1
Missouri	1	—	1	2	2	2
Montana	—	—	—	—	—	1
Nebraska	—	—	—	1	—	1
Nevada	—	—	—	—	—	1
New Hampshire	—	—	—	—	—	1
New Jersey	—	1	—	—	—	—
New Mexico	2	—	1	—	—	—
New York	2	—	—	1	2	—
North Carolina	1	—	2	—	—	1
North Dakota	—	—	—	—		1
Ohio	1	–	–	–	2	1
Oklahoma	—	—	—	—	—	1
Oregon	—	—	—	—	—	1
Pennsylvania	2	—	1	1	1	—
Puerto Rico	—	—	—	2	1	—
Rhode Island	1	—	—	1	1	—
South Carolina	—	1	—	1	—	—
South Dakota	—	—	—	—	—	1
Tennessee	2	—	1	—	—	—
Texas	1	—	—	1	—	2
Utah	—	—	—	—	—	1
Vermont	—	—	—	—	1	—
Virginia	1	1	—	—	—	1
Washington	1	—	1	—	—	—
West Virginia	—	—	—	1	—	1
Wisconsin	—	—	—	—	—	3
Wyoming	—	—	—	—	—	1
Totals	38	9	14	28	27	37

[a]HTD = high-technology development; TF - task force; HTE = high-technology education; LTA = labor/technical assistance; CPA = capital provision/assistance; GID - general industrial development.

SOURCE: Office of Technology Assessment.

Table 2.–Distribution of Survey Respondents by State

States	State policymakers	Program managers	Other participants	High-technology firms	Total
Pre-1981 States:					
California	1	7	2	17	27
Connecticut	1	6	2	27	36
Georgia	2	3	3	22	30
Massachusetts	2	5	4	24	35
New York	1	3	7	18	29
North Carolina	2	3	4	31	40
Pennsylvania	2	4	4	15	25
Tennessee	1	4	5	23	33
Subtotal	12	35	31	177	255
1981-82 States:					
Illinois	1	3	4	0	7
Indiana	1	3	4	0	8
Michigan	1	9	2	0	12
Minnesota	1	2	6	0	9
Missouri	2	6	0	0	8
New Mexico	1	3	2	0	6
Ohio	1	6	4	0	11
Rhode Island	1	2	1	0	**4**
Subtotal	9	34	23	0	66
Total all survey States	21	69	54	177	321

SOURCE: Research Triangle Institute.

Program Design and Operation

State Goals and Strategies

States appear to define HTD in many different ways.[7] States with dedicated 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 in part is to strengthen and retain what was already there. However, in States where the economic base consists primarily of ''sunset'' industries, the ''high-technology" strategy tends to emphasize economic diversification and the application of new production technologies untraditional manufacturing sectors. Still other States, notably those that are less 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 ingeneral. They also suggest 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-à-vis the basic stages of technological innovation and commercialization. In most cases, State officials consider their high-technology initiatives to be a natural (and even unavoidable) extension of their different economic development strategies.

The overall goals the 16 survey States hope to achieve through their high-technology initiatives fall into three general categories: jobs and income; business development; and economic diversification. State policymakers in 13 of the 16 States were able to identify specific policy goals in each of these categories that guide their high-technology strategies.

- Job and *income goals* focus primarily on creating new jobs and increasing per capita income. States in the industrial Northeast and North

[7] The balance of this chapter is based on the contractor report, *State Initiatives Survey,* prepared for OTA by the Research Triangle Institute, Alvin M. Cruze, principal investigator, May 1983.

Central regions reported a greater emphasis on creating new jobs; Pennsylvania and Michigan, both of which have been hard hit by structural changes in their industrial base, indicated that reducing job losses and unemployment were also major goals. Emphasis on increasing per capita incomes was more common in Sunbelt States.

- *Business development goals* focus on the creation of new ventures and the expansion of existing firms. States in both groups also strive to attract new businesses, but retaining existing business is a more common goal in the pre-1981 States. Pennsylvania and Ohio, on the other hand, report that modernizing existing industry is a major goal.
- *Industrial development goals* in almost every survey State focus on diversifying the industrial base, but several States are also trying to increase the geographical distribution of their industry. Respondents in almost all of the survey States indicated that they had targeted manufacturing or R&D as the key business activity to be encouraged. On the other hand, only three States, all with fairly recent initiatives—Michigan, Missouri, and Ohio–specified the services as business activities of interest. In addition, every survey State except Ohio has targeted specific high-technology industries for encouragement (table 3).

Program Design

High-technology economic development programs appear to be initiated in one of four different ways, each of which may affect the design and operations of the program:

- *To alleviate specific needs identified by State task forces or commissions.* Examples include the Connecticut Product Development Corp. (created in 1972 by legislation growing out of the State's Full Employment Task Force); Georgia's Advanced Technology Development Center (created as a result of a study commissioned by the Governor in 1979 to determine how to promote the growth of high-technology industry); the Bay State Skills Corp. (evolved from a gubernatorial plan to meet Massachusetts' need for more skilled and trained workers); and Tennessee's Technology Corridor Foundation (created as a result of recommendations of the Governor's Technology Corridor Task Force).
- *Through the evolution of traditional economic development organizations,* which have been redirected or strengthened to form the basis of

Table 3.—Targeted High.Technology industries and Business Activities in the Survey States

	Pre-1981 States								1981-82 States								
	CA	CT	GA	MA	NY	NC	PA[a]	TN	IL	IN	MI	MN	MO	NM	OH	RI	Total
Targeted high-technology industries:																	
Space/Avionics	X	—	x	–	–	–	–	–	–	–	–	–	–.x	–	–	–	3
Transportation	—	—	–	–	–	–	–	–	–	–	x	—	—	—	—	—	1
Communications	X	—	x	–	–	x	–	x	–	–	x	–	–	–	–	–	5
Electronics	X	X	–	–	–	–	–	–	–	X	–	–	X	X	–	–	5
Microelectronics	—	X	–	X	–	X	–	–	X	–	–	–	–	–	–	–	4
Robotics	—	—	–	–	–	–	–	–	–	–	X	–	–	–	–	–	
Computer hardware	X	—	X	X	X	X	–	–	X	–	–	–	–	–	–	–	1
Computer software	—	—	x	–	x	–	–	–	x	–	–	–	–	–	–	–	3
Lasers	—	—	x	—	—	—	—	—	—	—	–	—	—	X	—	—	2
Energy	—	—	x	—	—	—	—	x	—	—	–	—	—	—	—	—	2
Biotechnology	—	—	X	X	X	X	–	X	X	–	X	–	–	–	–	–	7
Biomedical	—	X	–	–	X	–	–	–	–	–	X	X	X	X	–	X	
Pharmaceutical	—	X	–	–	X	X	–	–	X	–	–	–	–	–	–	–	1
None targeted	—	—	–	–	–	–	–	–	–	–	–	–	–	–	x	–	I
Targeted business activities:																	
Manufacturing	x		X	—	X	—	X	—	X	—	X	x	—	X	X		10
R&D							X	X	–	X	—	X	—	X	—	—	X	—	X	X	X	8
Services							—	—	—	—	—	—	—	—	X	—	x	—	x	—	3

[a]Pennsylvania has targeted 27 specific industries.

SOURCE: Research Triangle Institute,

a new program. An example of this type of evolutionary design is the Pennsylvania Industrial Development Authority, which has provided low-interest loans to businesses for over 20 years but has recently been directed to set aside 25 percent of its funds for advanced-technology businesses.

- *To alleviate localized problems or needs,* and later expanding to include additional locales. Programs designed for localized impact include Science Park in New Haven, Corm. (designed to attract companies engaged in developing and producing new products, in order to increase the economic vitality of the surrounding area) and the Center for Industrial Cooperation at University of New York at Stony Brook (formed in 1978 to link the resources of the University with the needs of local industry).
- *To take advantage of Federal initiatives and finding.* Examples include the Innovation Development Loan Funds in both California and Connecticut (created to obtain EDA grants, which are then used to provide financial, managerial, and technical assistance to inventors and small high-technology businesses) and the Massachusetts Small Business Development Center (created to obtain U.S. Small Business Administration finding to develop five centers to assist small businesses).

Public/Private Participation

Since economic well-being has been an overriding political issue at the State level in recent years, and since many present Governors campaigned on platforms that included economic revitalization, it is not surprising that they have played an extensive role in initiating and designing high-technology programs. The Governor's Office was identified as the primary initiator of 58 percent of the programs investigated. A high-technology task force or commission appointed by the Governor was the primary mechanism for identifying needs and formulating policy recommendations in each of the survey States except Indiana and Missouri. Programs created in this way bring with them whatever political clout or liability the Governor and his commission possess. This can be relatively advantageous until a change of administration: programs designed to address problems identified by a previous Governor's "special commission" may be viewed more critically by his successor than programs that have evolved more naturally; this appears to be happening at present in California.

The legislature's role is also important, since 75 percent of the programs required enabling legislation, and this body is also the key provider of funding (see below). However, the role of the legislature varied widely among the survey States, from little or no involvement in Indiana and New Mexico to the driving force in Ohio. The State economic development office takes a lead policy role in Connecticut, Massachusetts, North Carolina, Indiana, and Missouri, but a less direct role elsewhere.

Another major factor is the participation and support of local officials and business leaders, but respondents reported that local governments had no direct involvement in the establishment of over half of the programs investigated; local governments generally participated indirectly, through their legislative representatives. The role of the private sector was generally that of advice and consultation (64 percent of the programs), but the private sector also was cited as the primary initiator of 10 percent of the programs and as an important contributor to most programs. University officials also provided extensive advice and consultation (48 percent of the programs), and they were identified as the primary initiator of 16 percent of the programs.

Program Types

Table 4 shows the distribution of programs implemented by the survey States to accomplish the goals outlined above. Analyzing the 68 initiatives by program type reveals little significant difference between the two groups. States with older initiatives had a slightly higher percentage of HTD and HTE programs, perhaps a reflection of their existing high-technology base and greater university resources. States in the 1981-82 States, on the other hand, have a slightly higher percentage of GID programs with special provisions for high-technology firms, a possible reflection of the relative youth of their strategies. They also have a slightly higher percentage of "capital assistance" programs, which may indicate they are designing their initiatives to compete with the traditional high-technology leaders, such as Massachusetts and California, where capital is much

Table 4.–High-Technology Development Programs in the Survey States, by Type

Type[a]	All programs		Programs in pre-1981 States		Programs in 1981-82 States	
	Number	Percent[b]	Number	Percent	Number	Percent
HTD	30	44	16	48	14	40
HTE	14	21	8	24	6	16
LTA	23	34	11	33	12	40
CPA	19	28	8	24	11	31
GID	15	22	6	18	9	26

[a]H T D = high-technology development; HTE = high-technologyeducation; LTA = labor/technical assistance; CPA = capital provision assistance; GID = general industrial development.
[b]Percentages do not sum to 100 because some programs are categorized in more than one program type.

SOURCE' Research Triangle Institute,

easier to obtain from the private sector. Capital provision is also one of the areas in which survey respondents desired more State and Federal Government involvement (see below).

- *High-technology development initiatives* are generally key elements in State strategies because they focus specifically on the creation and expansion of high-technology firms. Six of these 30 programs are task forces, but the others provide financial services, perform research, or disseminate information.
- *Financial assistance programs* represent exactly half of the 68 programs investigated. While only 6 of these 34 programs are specifically targeted on innovation and high-technology industries, several others have specific assistance for high-technology firms. The financial service provided by the highest proportion of these programs is assistance in finding venture capital (12 programs), but many others offer long-term loans or loan guarantees. The majority of financial assistance programs are relatively new, and 7 have not begun to provide services to businesses.
- *Training programs,* one-third of those surveyed, operate either directly or through grants to other organizations. Most of these programs have linkages with Federal programs and 12 have obtained funding from Federal sources. Some States are analyzing the use of customized job training (i.e., specifically tailored to the needs of potential employers) in connection with new Federal efforts under the Job Training Partnership Act of 1982.
- *High-technology education programs* operating from a university and involved in fostering the creation of new high-technology businesses represent 14 of the 68 initiatives in the survey States. One impetus for such programs appears to be the role played by universities in encouraging new business starts, an important factor in California's high-technology development. California has attempted to institutionalize this role through the Microelectronics Innovation and Computer Research Opportunities (MICRO) program, which provides funding for graduate fellowships and faculty research projects, and is supported by matching grants from private industry. The relatively low percentage of HTE programs results in part from the universe of programs that were investigated: strictly university initiatives were not included, despite their number and importance. (These initiatives are described in greater detail in ch. 3.)

Services Provided

The frequency and distribution of the services provided by high-technology programs provides an indication of which actions the States believe to be most necessary, or most effective, in achieving their high-technology goals. If a State's programs provide a large number of financial or training services, for example, it can be assumed that it has identified the availability of risk capital or the skills of its work force as areas for priority attention.

The OTA census found that the services most frequently offered by dedicated HTD or HTE programs involve *information dissemination*— 17 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—9* programs assist

entrepreneurs in locating venture capital, another 9 deal with industrial revenue bonds, 8 provide grants for R&D, and 4 provide loans to high-technology firms. Other services commonly offered include: *market development assistance (7* programs); *product development assistance (4* programs); and *assistance in training technical personnel (5* 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.

Table 5 shows the frequency and distribution of services provided by the 68 programs investigated in the RTI survey, using the service codes developed for the OTA census. Because these 68 programs include many that were not considered to be "dedicated" for the purposes of the OTA census, the number and types of services they provide show a different pattern than that outlined above. The most commonly provided services involve *labor training,* either linked with a university (26 programs), provided by the State (14 programs), or with technical support from the State (11 programs). Other fre-

Table 5.—Number of Programs Providing Specific Services in Survey States

Service category	All programs	Pre-1981 programs	1981-82 programs
Enterprise zones	3		2
Industrial revenue bonds	6	2	4
Information dissemination	16	10	6
Investment capital	4		1
Investment in survival	0	0	0
Grants	10	7	3
Research	10	6	4
Startup		1	
Development	2	5	3
Training	8	5	3
Labor	7	5	2
Grant for jobs created	1	0	1
Training vouchers	2	0	
Training by State	14	6	8
Technical support by State		7	4
Links with university	11	15	11
Licensing assistance	1	1	0
Loans	5	2	3
Debt	2	2	0
Equity	5	2	3
Subordinated	2	1	1
Stock or royalty rights	3	2	1
Guarantees	2	0	2
Long-term, low-interest	5	2	3
Market development assistance	7	7	0
Office or equipment provision	4	4	0
Physical plant assistance	7	7	0
Patent searches		1	0
Product development assistance	1	7	2
State resources promotion	9	5	4
Task forces and commissions	10	6	4
Tax incentives	5	1	4
Reduction in corporate tax	0	0	0
Abatement of property tax	4	2	2
Freeze on assessed value	2	1	1
Exemption from sales tax	2	1	1
Venture capital	2	1	1
Direct (startup)	3	1	1
Direct (product development)	2	2	0
Bond issue to raise funds	1	0	0
Royalty or stock rights	1	0	1
Assistance in finding	14	9	5

SOURCE: Research Triangle Institute.

frequently offered services are *information dissemination (16* programs) and assistance in finding *venture capital* (14 programs). However, while many programs help firms to locate venture capital, only three State programs are actually designed to provide venture capital. On the other hand, many programs offer other *financial services:* 10 provide some form of grants, 6 help to arrange for industrial revenue bonds, 5 provide loans or loan guarantees, and 5 provide abatements or other tax incentives for high-technology firms.

With few exceptions, specific services were offered by programs in both groups of States. However, all seven of the programs offering market development assistance or incubator space were implemented by pre-1981 States. Further analysis of the distribution of services between the two groups of States reveals interesting but inconclusive patterns. For example, 7 of 9 product development programs and 10 of 16 information dissemination programs are in pre-1981 States, as are 15 of 26 programs that link business with university resources, the latter corresponding to the higher frequency of HTE programs in these States. In the area of financial services, 1981-82 States more frequently offer industrial revenue bonds and tax incentives, while pre-1981 States make greater use of grants and venture capital assistance.

Eligibility

State high-technology initiatives maintain varying eligibility requirements, usually designed to focus their service on the specific needs of a targeted industry group. More recent initiatives are somewhat more targeted or restrictive, but in general there is little difference between the two groups of States with regard to eligibility. Six categories of eligibility emerge from the survey responses and subsequent analysis:

- *General (15* percent). –No provisions in the program design for limiting program services to any group or subgroup industries. For example, the Pennsylvania Technical Assistance Program offers technical information and assistance to all State businesses, particularly in the area of technology transfer.
- *Specific/high-technology* (17 percent).–Provisions in the program design for limiting program services to a set of industries or businesses, generally defined as “high-technology industries. ” An example of this is the High-Technology Equity Loans Program in Michigan.
- *Specific/technological innovation (9* percent).–Provisions in the program design for limiting services to a set of industries or businesses involved in technological innovation. The Illinois Biomedical Research Park, for example, is set up to assist biomedical firms with innovation and development.
- *Specific/targeted industries (25* percent) .–Provisions in the program design limiting services to a subgroup of industries, but not restricted to only high-technology industries. These include programs for small business, such as the Maine New Enterprise Institute, and programs like the Maryland Technology Extension Service, which provides services to any business that meets certain criteria of need.
- *Specific/geographic* (10 percent) .–Provisions in the program design for limiting services to businesses within a specific region of a State. The Metropolitan Center for High-Technology, for example, is targeted on Michigan’s urban areas.

Funding

Program operations are funded from a variety of sources, including direct State appropriations for program operations, bond issues, State educational appropriations, Federal funding, multistate regional finding, private sources, and various combinations of these sources. Approximately 64 percent of the surveyed programs receive 100 percent of their funding from State appropriations, while only 11 percent of the programs receive less than half of their financial support from the State. The remaining funds come from Federal sources (20 percent of the programs) and/or private funding (18 percent). Only one program, Connecticut’s Science Park, reported that it received any finding from the local government.

The amount of funding is, of course, a key element of the operation of any program. For active

programs in which current funding amounts have been established, 9 percent are below $100,000; 21 percent fall in the $100,000 to $500,000 range; and 23 percent are between $500,000 and $1 million. The largest segment (33 percent) fall in the $1 million to $10 million range. Approximately 14 percent of these programs have financial resources greater than $10 million, but many of these larger budget figures represent loan programs, bond issues, or capital projects, rather than strictly operating budgets.

Program Effectiveness and Impacts

Obstacles and Problems

State policymakers identified the recent economic downturn and its effects on the State's revenues and employment as the most significant obstacle to the implementation of their high-technology strategies. Another obstacle identified by State policymakers is one of information: State legislatures find it difficult to get needed information about business activity in their State and in other States, a problem that may sometimes lead to confused State policies. In addition, 8 of the 16 survey States had new Governors in 1983. While most of them have announced no plan to change their States' programs, this may create problems with continuity and momentum. Other obstacles included the State's image or business climate and the lack of consensus and cooperation on HTD, particularly among local groups, labor unions, and the existing business community.

Program managers, however, identified the program's coordinating function (and the cooperative activities it has fostered) as its major strength (46 percent of respondents). Another major strength was the funding level and general resource base available to the program (34 percent). At the same time, the major weakness identified most often by program personnel was *inadequate* funding and other resources (22 percent). However, the majority of program managers reported no problems. Other participants involved in program design and operation, on the other hand, identified numerous problems—52 of 54 respondents cited the coordination of program activities and the difficulty of obtaining the cooperation of the participants as problems.

Program Evaluations

Only 9 of the 68 programs had been evaluated at the time of the survey, 3 (all pre-1981) through external evaluation and 6 programs (4 pre-1981 and 2 1981-82) through internal evaluation. The vast majority of programs (85 percent) had undergone no formal evaluation of their effectiveness, and many respondents stated that it was too early to assess program impact adequately. In fact, less than three-fourths of the 68 programs were currently in operation: 21 percent were in the planning stages and have obtained first finding, but approximately 7 percent of the programs either were waiting for funding or passage of enabling legislation, or had their operations suspended due to loss of funding, changes in administration, or changes in overall high-technology strategy.

Several program managers, however, were able to furnish baseline data on the number of businesses that had been provided with program services. These data suggest that training programs tend to serve more firms in the 1981-82 States, while financial assistance programs provide services to a greater number of businesses in the pre-1981 States. In general, the available data suggest that the programs for which data were available had provided services to relatively few businesses: over 80 percent had served fewer than 100 firms, and 60 percent had served fewer than 50 clients. The responses of high-technology firms (see below) also suggest that these programs generally have not had a direct impact on a large percentage of the businesses in the pre-1981 States. This may be understandable, however, given the indirect nature of the services provided by many programs and the short history of the majority of them.

Impact on High-Technology Businesses

High-technology firms were surveyed only in the 8 survey States whose initiatives were in operation before 1981, on the assumption that these programs were more likely to have had a measurable impact

on the high-technology business community. Of the 177 businesses contacted, 99 were potential clients for program services—29 were startups, 46 had expanded, and 24 had relocated since 1980. Of these 99 firms, 56 had received services from the State government, most frequently financial assistance, educational and training assistance, and locational and business information. Thirty-four of these 54 firms said that this assistance influenced their location decisions, and 18 said that it was a critical or important factor. When they were asked to name the State program involved, the overwhelming majority of firms named traditional economic development mechanisms such as industrial revenue bonds, business recruitment, and general training programs, rather than the dedicated high-technology programs identified by the OTA census.

In response to an open-ended question about the factors that influenced their decision to locate in a particular State, many of the 99 high-technology firms said they had done so because their founders lived there (22 firms) or because it was close to their existing operations (22). Other important factors included the availability of trained manpower (17), access to the firm's markets (12), local transportation resources (12), and quality of life or climate (10). However, many firms cited general State support (13), along with tax rates (4), financial incentives (4), and training programs (3). Other important locational factors included proximity to university facilities (8) and general high-technology climate (8), as well as the overall business climate (5) and the availability of suitable sites (5) and venture capital (3). It is in these latter areas where the indirect influence of State high-technology initiatives may have their greatest long-term impact, by making more resources available to high-technology firms and improving the general climate for HTD.

Additional Initiatives Desired

Survey respondents were also asked whether the State government should undertake any additional initiatives for HTD. The desire for additional initiatives provides some measure of the effectiveness of existing programs, although an inconclusive measure. That is, respondents might desire additional programs either because current programs are ineffective, or because they have been effective and additional initiatives would increase their impacts. While 51 percent of program managers rated their programs excellent or very good, for example, 77 percent of them would nonetheless desire additional initiatives by their State government.

Table 6 presents the responses of program managers, other participants, and high-technology firms. Two-thirds of all survey respondents desire some additional State initiative, as do a majority of each respondent group: 87 percent of other participants, 77 percent of program managers, and 59 percent of high-technology firms. Regarding the type of additional State initiatives desired, education and training programs and financial assistance programs were mentioned most often (each by 30 percent of respondents), followed by general high-technology assistance programs (26 percent) and additional R&D

Table 6.—Additional High-Technology Initiatives Desired

Response	Program personnel		Other participants		High-technology[a] businesses		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Additional State government initiatives desired?								
Yes	36	77	41	87	98	59	175	67
No	6	13	6	13	47	28	59	23
Don't know	5	10	0	0	21	13	26	10
Totals	47	100	47	100	166	100	260	100
Additional Federal Government initiatives desired?								
Yes	***36***	***62***	***28***	***58***	***85***	51	149	
No	15	26	18	38	59	35	92	34
Don't know	7	12	2	4	23	14	32	11
Totals	58	100	48	100	167	100	273	100

[a]Businesses were contacted only in the eight pre-1981 States

SOURCE: Research Triangle Institute.

programs (10 percent). However, business respondents rated training slightly higher, and financial assistance somewhat lower, than did program managers. On the other hand, startups and expansions since 1980 cited financial assistance (general support, industrial revenue bonds, venture capital assistance, and R&D or expansion funding) more often than training or education programs.

When respondents were asked if they would also desire additional high-technology initiatives by the Federal Government, more than half responded that they would, including a majority of each respondent group (table 6). Support was universally weaker for Federal initiatives than for additional State programs, but analysis reveals a greater desire for additional Federal initiatives in States with more recent programs. Support for additional Federal initiatives among high-technology business respondents ranged from 89 percent in California (16 of 17 firms) to only 14 percent in North Carolina (4 of 31 firms).

When respondents who felt additional Federal initiatives were desirable were asked to identify them, they again mentioned education and training programs most frequently, followed by R&D programs and financial assistance. Many respondents suggested that Federal finding for training and education programs, passed directly to the States, would be the most effective means of Federal involvement. Others wanted an increase in direct research funding by the Federal Government or funding to States for R&D initiatives at the State level. Some respondents also mentioned the need for general assistance to high-technology firms or for changes in Federal industrial and trade policies. Thirteen business respondents felt that the Federal Government should increase high-technology defense spending.

Employment Impacts in the Survey States

Given the inconclusive nature of these subjective evaluations, RTI also gathered secondary data on high-technology employment patterns in the survey States (table 7). Collectively, these 16 States account for over half of the manufacturing employment and two-thirds of the high-technology jobs in the United States. They added approximately 352,000 jobs in the high-technology sector over the 1975-80 period, and their overall manufacturing employment increased by approximately 1.3 million in the same period. These figures, however, should be placed in context: total nonagricultural employment was approximately 51 million in these 16 States in 1980. While employment in high-technology industries may not constitute a significant fraction of total employment, it is clearly an important component of manufacturing employment and has accounted for approximately one-fourth of the employment growth (and a higher fraction of job creation) in the manufacturing sector in the 1975-80 period. The employment statistics in table 7 show several patterns that may be useful in evaluating the effects of their high-technology strategies and programs.

First, the survey States demonstrate a wide range of employment size and mix, ranging in size from California, with over 10 million persons employed outside agriculture, to Rhode Island, with fewer than 400,000. On average, however, the total work force in the pre-1981 States is 70 percent larger than that of the 1981-82 States. Similarly, there is a wide range of employment in the manufacturing sector, from over 2 million in California to less than 35,000 in New Mexico; manufacturing ranges from 35.3 percent of total nonagricultural employment in North Carolina to only 7.4 percent in New Mexico. However, while the average number of manufacturing employees is higher in the pre-1981 States, they represent a slightly higher percentage of the work force in the 1981-82 States.

High-technology employment shows a similar diversity, ranging from 3,500 in New Mexico to over 600,000 in California. As a share of the manufacturing work force, it ranges from 34.8 percent in Massachusetts to only 5.5 percent in Georgia, both pre-1981 States. On average, the pre-1981 States have a substantially higher proportion of high-technology employment than the 1981-82 States—21.8 percent and 15.5 percent, respectively. However, much of this difference is accounted for by California and Massachusetts; excluding these recognized leaders reduces high-technology employment to 16.8 percent of overall manufacturing in the pre-1981 States, much closer to the level in the 1981-82 States. In addition, Minnesota's level of high-technology employment is higher than the average for the pre-1981 States, while three pre-1981 States-North Carolina, Tennessee, and Georgia—have high-technology employment levels lower than the average for the 1981-82 States.

Table 7.-Employment in the Survey States, 1980

State	Total nonagricultural employment (thousands)	Manufacturing employment		High-technology employment		
		Number (thousands)	Percent of total	Number (thousands)	Percent of manufacturing	Percent of total
United States	90,657.0	20,381.0	22.5	3,676.4	18.1	4.1
16 Survey States	50,821.4	12,879.4	25.3	2,481.0	19.3	4.9
Pre-1981 States	32,037.4	7,757.1	24.2	1,666.5	21.8	5.3
California	10,104.3	2,008.9	19.9	801.2	29.9	5.9
Connecticut	1,413.8	440.0	31.1	98,6	22.4	7.0
Georgia	2,115.1	519.1	24.5	28.7	5.5	
Massachusetts	2,595.7	674.5	28.0	235.0	34.8	9.1
New York	7,113.6	1,46.7	20.5	374.5	25.7	5.3
North Carolina	2,328.5	82.0	35.3	87.1	10.6	3.7
Pennsylvania	4,621.2	1,333.2	28.8	213.8	16.0	4.6
Tennessee	1,747.2	502.7	28.8	47.6[a]	9.5	2.7
1981-62 States	18,784.0	5,122.3	27.3	794.5	15.5	4.2
Illinois	4,692.9	1,239.2	28.4	237,0	19.1	5.1
Indiana	2,137.1	658.0	30.8	134.5[b]	20.4	6.3
Michigan	3,291.6	968.5	30.0	80.9	8.2	2.5
Minnesota	1,710.3	371.1	21.7	108.7	28.8	6.2
Missouri	1,989.8	437.0	22.2	60.3[a]	13.8	3.1
New Mexico	485.4	34.4	7.4	3.5[c]	13.8	3.1
Ohio	4,119.2	1,265.0	30.7	151.4	12.0	3.7
Rhode Island	397.7	129.1	32.5	20.2	15.6	5.1

[a] Total employment in high-technology industries not available due to lack of detailed Information at the 3-digit SIC level Number indicated is total employment in 2-digit sectors 36 (electronic and electric equipment) and 38 (instruments and related products). These figures represent downwardly biased estimates of total high-technolgy employment in the state, asemploymant in selected 3-digit SIC high-technology sectors is omitted.
[b] Employment in SIC sectors 36, 38, and 372 only.
[c] Employment in SIC sector 36 only.

SOURCE: Massachusetts Divsion of Employment Security, *High-Technology Employment: Massachusetts and Selected States* 1975-81 *July 1981;* and U.S. Department of Labor, Bureau of Labor Statistics, *Supplement to Employment and Earnings, State and* Areas, Bulletins 1370-13 and 370-16.

These comparisons show little consistent difference between the two groups of survey States, but they fail to reflect variations in industrial base and other regional differences that may influence employment trends. While the precise effect of these factors is unclear, analysis reveals that States with high-technology programs in place before 1981 have experienced a higher rate of growth in both manufacturing and high-technology employment in recent years. Table 8 presents employment growth rates for the 1975-80 period and for two subperiods, 1975-78 and 1978-80.

During the 1975-80 period as a whole, high-technology employment grew faster than overall manufacturing employment for the Nation as a whole, in both groups of survey States, and in every individual survey State. However, both manufacturing employment and high-technology employment expanded far more rapidly in the pre-1981 States, and high-technology employment outperformed overall manufacturing by a greater margin. An explanation for this emerges from the far different patterns that result when the 1975-80 period is broken into subperiods.

Between 1975 and 1978, manufacturing employment in the 1981-82 States expanded more rapidly than in the pre-1981 States or the Nation as a whole. Surprisingly, high-technology employment growth for both groups of survey States was lower than the U.S. average. But during the 1978-80 period, which includes part of the recent recessionary cycle, a strikingly different pattern of employment growth became evident. Manufacturing employment grew more slowly in the pre-1981 States (1.3 percent) but actually declined in the 1981-82 States (–7.6 percent). The pre-1981 States, which by then had many of their high-technology programs in place, experienced a continued expansion in high-technology employment (9.5 percent); in fact, their high-technology employment growth was sufficient to offset what would otherwise have been a decline in overall manufacturing employment. By contrast, the 1981-

Table 8.—Employment Change in Survey States, 1975-80

State	Percent change, 1975-60		Percent change, 1975-78		Percent change, 1978-80	
	Manufacturing	High-technology	Manufacturing	High-technology	Manufacturing	High-technology
United **States**	11.1	26.1	11.9	17.3	– 0.7	7.5
16 **Survey States**	8.6	21.6	11.3	16.1	–2.5	4.7
Pre-1981 States ., ... , . . .	122	28.0	10.7	16.9	1.3	9.5
California	26.8	42.9	18.5	24.6	7.0	14.7
Connecticut	12.8	23.2	7.6	14.6	4.9	7.5
Georgia	18.5	51.0	17.9	36.3	0.6	10.8
Massachusetts	16.8	40.2	13.0	23.2	3.3	13.9
New York	2.1	9.4	4.3	5.4	–2,2	3.8
North Carolina	17.6	58.4	15.2	35.8	2.0	16.6
Pennsylvania	–0.6	8.7	2.2	6.3	–2.7	2.3
Tennessee	9.5	30.4[a]	14,6	31.0[a]	–4.4	– 0 . 1[a]
1981-82 States	3.6	9.9	12.2	14.5	–7.6	–4.1
Illinois	2.4	3.1	4.5	5.0	–2.1	–1.8
Indiana	1.7	4.6[b]	14.6	14.8[b]	–11.3	–8.9[b]
Michigan	3.3	10.4	22.7	24.7	–15.9	–11.5
Minnesota	19.1	40.8	15.5	28.2	3.1	9.8
Missouri	7.8	26.2[a]	12.7	21.6[a]	–4.3	3.8[a]
New Mexico	20.3	20.7[c]	16.8	27.6[c]	3.0	–5.4[b]
Ohio	–0.1	1.7	8.8	12.8	–8.2	–9.9
Rhode Island	12.3	26.2	18.5	31.2	–5.3	–3.8

[a] Total employment in high.technology industries not available due to lack of detailed information at the 3-digit SIC level. Number indicated is total employment in 2-digit sectors 36 (electronic and electric equipment) and 38 (instruments and related products). These figures represent downwardly biased estimates of total high-technology employment in the state, as employment in selected 3-digit SIC high-technology sectors Is omitted.
[b] Employment in SIC sectors 36, 38, and 372 only.
[c] Employment in SIC sector 36 only.

SOURCE: Massachusetts Divsion of Employment Security, *High-Technology Employment: Massachusetts and Selected States 1975-81 July 1981;* and U.S. Department of Labor, Bureau of Labor Statistics, *Supplement to Employment and Earnings, State and Areas,* Bulletins 1370-13 and 370-16.

82 States, which had not yet implemented their programs, experienced a decline in high-technology employment (-4. 1 percent) that contributed to their general decline in manufacturing employment. High-technology employment continued to outperform manufacturing employment generally, and in each individual State except Ohio and New Mexico; but six of the 1981-82 States nevertheless experienced a real decline in high-technology jobs, compared to only one of the States with HTD programs in place.

These comparisons do not provide a statistically sound basis for inferences concerning the effectiveness of HTD initiatives or the effects of other differences between the two groups of survey States. Comparable data for the 1980-82 period are not yet available, for example, and high-technology's countercyclical performance maybe more strongly related to the industrial mix or general economic health of a given region. Far more sophisticated econometric analysis will be required before these differences can be attributed even in part to the presence or absence of State government HTD programs. Nevertheless, the far more favorable employment experiences of the pre-1981 States during the early stages of the recent recessionary period may have provided much of the impetus for the 1981-82 States (and many States not included in the survey) to initiate their own high-technology programs in hopes of improving the employment conditions in their own economies.