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An Assessment of the Ohio Thomas Edison Program

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An Assessment of the Ohio Thomas Edison Program

Prepared for:

**The Ohio Economic Development
Study Advisory Committee**

Prepared by:

**Dean M. Prestegaard, Adina Swirski,
Donald Iannone, and Ziona Austrian
Economic Development Program
Cleveland State University Urban Center**

December 7, 1998



The Urban University Program...
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improve the state's urban regions.

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PURPOSE AND FOCUS

This report examines the Ohio Thomas Edison Program, a longstanding component of Ohio's economic development strategy. The Edison Program is one of twelve state economic development programs assessed as a part of the Ohio Economic Development Study, being performed for the State of Ohio by Cleveland State University's Urban Center.

This analysis examines the program's history, evolution over time, and its primary program components today. Because of recent analyses of the program, the Ohio Economic Development Study Advisory Committee assigned the program a Level 2, cursory analysis priority. This level of analysis is more descriptive and qualitative in nature and concentrates less on program performance, as measured in quantitative terms.

The analysis presented in this report is based in large part on internal reports and files supplied to the researchers by the Edison Program staff within the Ohio Department of Development, and the individual centers.

The scope of this analysis includes:

1. Edison Seed Development Fund (now defunct)
2. Edison Incubators
3. Edison Technology Centers
4. Federal Technology Transfer Initiatives

Like other aspects of the Ohio Economic Development Study, this analysis focuses on the statewide initiative, and it does not attempt to evaluate the performance of individual centers and activities.

INTRODUCTION

In the early 1980s, the State of Ohio, as well as most other states, was facing serious economic problems. High rates of unemployment and the continued loss of jobs in the state's traditionally strong, manufacturing industries were of great concern to government leaders. As in other states around the nation, Ohio began to look for new and innovative ways to promote the development of new firms and to strengthen firms already operating in the State.

State government decided that it needed to play a more direct role in helping combat the long-term decline in Ohio's core manufacturing sector. These improvements were seen as essential to re-position Ohio industry for global competition. Newly developed and developing countries were seen to have several advantages including: the use of new, more efficient manufacturing processes; rapid production of newly developed products, especially advanced electronics and other technology related products; and the availability of a low cost labor force.

Ohio also faced increasing competition from other states, primarily in the South and western part of the country, which offered cheap land for building new manufacturing facilities and an abundant low cost labor force. With this increased national and international competition came a belief that the state needed to do something to promote the development of new, high-technology firms and to assist existing firms to adopt new production technologies that would increase their efficiency.

One program developed to address these issues was the Ohio Thomas Edison Program. Implemented under the Celeste administration in 1983, the goal of the Edison Program was to promote the development and implementation of new technologies for products and production, in order to increase the competitiveness of Ohio industries. The program was continued and advanced during the Voinovich Administration during the 1990s. As the Taft Administration takes office this coming January, the program must be ready to respond

to new policy ideas under Governor Taft’s leadership. From the beginning, the program was envisioned as a series of strategic partnerships between industry, government, and universities throughout the State. These partnerships were expected to bring together knowledge and experience from diverse groups interested in technological development to help create new and/or improved commercial opportunities.

Over the 15 years since the program was first enacted, it has continued to evolve and transform in an attempt to meet the changing needs of firms operating in an increasingly technologically advanced, global economy. This report reviews the origins of the program and some of the major changes that have taken place over time. While a detailed discussion of the program’s history would provide little insight into its current operations, understanding the fundamental issues that have shaped the program will help build an understanding of the program’s goals and intended impacts.

THE OHIO THOMAS EDISON PROGRAM HISTORY

Bipartisan leadership and visionary actions by both the executive and legislative branches of state government created Ohio’s Thomas Edison program – an initiative that effectively brings together technology providers and users to create commercial opportunities. Many Ohio companies have seen significant increases in sales, profits and market share due to the Edison Program. (Ohio Department of Development, 1998)

The Ohio Thomas Edison Program originally had three initiatives:¹ Edison Technology Centers, Edison Technology Incubators, and the Seed Development Fund. Since it was first implemented, one initiative, the Technology Transfer Initiative, has been added and one, the Seed Development Fund, has been abandoned.

Program	Year Implemented	Currently Operating
Thomas Edison Seed Development Fund	1984	No
Thomas Edison Technology Centers	1984	Yes
Thomas Edison Technology Incubators	1985	Yes
Thomas Edison Technology Transfer Centers	1984	Yes

¹ For clarity and consistency, program will be used to refer to the entire Ohio Edison Technology Program. Although the Edison Technology Centers are formally referred to as a ‘program’, it will be referred to here as an ‘initiative’ since it is part of the overall program.

While each of these initiatives is unique in terms of the specific activities in which they are involved, they all share a common focus and goals. That is, to *support public/private partnerships, which could strengthen and diversify the economy of Ohio through the promotion of technological innovation*. Each of the initiatives is designed to support the Program's goals, including:

- Accelerate the development and implementation of those advanced technologies most likely to benefit the economic development of the State;
- Integrate Ohio's academic community into a cooperative economic development effort;
- Maintain and create jobs through technological innovation and entrepreneurship;
- Improve the productivity and competitive posture of Ohio's established industries;
- Diversify Ohio's economy and increase Ohio's share of advanced technology firms that are among the national growth leaders.

When the program was first enacted, each of the 3 initial initiatives was operated independently. Each initiative was to work toward meeting the program's goals, however, relatively little was done to coordinate activities or reporting procedures across initiatives. Overtime, each of the initiatives has increased coordination in several ways. This coordination has occurred both in terms of each initiative's various activities and in terms of reporting procedures.

Since each initiative, most notably the incubators and technology centers, have multiple facilities, one area for increased coordination has been between the different facilities within the same initiative. For example, the Edison Technology Centers formed the Edison Center Directors' Council (ECDC) which serves to coordinate goals, multi-center activities, performance measurement & reporting, and joint purchases of supplies & services. When appropriate, activities and reporting procedures are also coordinated across initiatives.

OHIO EDISON SEED DEVELOPMENT FUND

The Seed Development Fund (SDF) was implemented in 1984 to promote research partnerships between Ohio's universities and industries. At the time, there was a perception that the funds available for research and development were declining. In order to free up funds for R&D and to reduce some of the risks to firms that engage in new product development, the SDF offered grants for research and development.

The SDF provided two types of grants. Class I grants of up to \$50,000 were given to help firms demonstrate the feasibility of commercializing a new product or production process. Class II grants of up to \$250,000 were given to help develop a new product or production process. The recipients of these grants were primarily small to medium sized enterprises. The grants for specific projects were provided through one of the State's universities, however, the role of the university and the state government was to provide support for the project and to monitor its progress. The grants were intended to allow small manufacturers to pursue their own research by providing funding that may not have been available to them from other sources.

In 1992, funding for the Seed Development Fund ended. There was no formal closing of the program, it was just allowed to run out of funding for new projects. This was a national trend at the time. Currently this trend is reversing itself and similar programs are again being funded nationally. A strategic question for the incoming Administration is whether the Seed Development Fund is worth bringing back in some revised form to meet the research and development capital needs of new technology start-ups. The venture and seed capital markets have clearly changed since the 1980s. Any attempt to re-start the fund should recognize current market realities.

THE EDISON TECHNOLOGY INCUBATORS

The Edison Technology Incubators help to promote the development of new firms by providing various types of business assistance including production facilities at below-market rental rates, business & office services, and managerial & technical assistance. The incubators allow small firms that are still in a start-up phase, to focus on producing and selling their products by reducing financial and other concerns that often stop young firms from ever fully developing. Once a firm successfully produces and sells its product, it will then expand out of the incubator into its own facilities. Such firms are said to have graduated from the program.

Table 2: Ohio Edison Techology Incubators

Name		Location
Akron Industrial Incubator	All	Akron
BioStart		Cincinnati
Center for Technology Commercialization	CTC	Toledo
Mansfield/Richland Incubator	MRI	Mansfield
Edison Technology Incubator/BioEnterprise	ETI	Cleveland
Business Technology Center	BTC	Columbus
Hamilton County Business Center	HCBC	Cincinnati
Lewis Incubator for Technology	LIFT	Cleveland
Youngstown Business Incubator	YBI	Youngstown

PERFORMANCE DATA

The following section discusses incubator data for fiscal years 1996 and 1997. While data for all operating incubators was available for FY 1996, data was incomplete for two incubators in FY 1997. In FY 1996, the incubators had a combined total of 43 tenants. This number increased to 46 tenants for FY 1997. In addition, 30 firms graduated from the incubators in FY 1996 and 20 firms graduated in FY 1997. The number of jobs created or retained was 273 in FY 1996 and 173 in FY 1997. A total of 722 businesses were

counseled in FY 1996 and 517 were counseled in FY 1997. This includes tenants, potential tenants, and non-potential tenants. Educational events, including both services initiated by incubators and outside sponsored activities, rose from 59 in FY 1996 to 65 in FY 1997.

Table 3 presents statistics for the individual centers. It is important to note that data for CTC is only through the third quarter for FY 1996. All had the most tenants in both years and accounted for almost 40 percent of all tenants. HCBC counseled the most businesses in FY 1996, while All counseled the most in FY 1997. Finally, ETI held the most educational events, 9, in FY 1996 and BTC held the most in FY 1997, with 21. Occupancy rates ranged from a low of 10 percent (CTC) to 100 percent (BTC) in FY 1996. In FY 1997, the low occupancy rates for Biostart and LIFT can be explained by the age of the incubators, as both were created in 1996.

Table 3: Incubator Statistics

FY 1996	YBI	All	BTC	ETI	HCBC	MRI	BIO	LIFT	CTC*	TOTAL
Tenants	6	16	4	4	9	3	N/A	N/A	1	43
Graduates	-	3	4	4	18	-			1	30
Jobs Created/Retained	27	22	17	144	37	14			12	273
Businesses Counseled	68	77	15	163	298	55			46	722
Educational Events	11	5	3	19	12	8			1	59
Occupancy Rate	51%	31%	100%	95%	70%	60%			10%	
FY 1997	YBI	All	BTC	ETI	HCBC	MRI	BIO	LIFT	CTC	TOTAL
Tenants	2	18	2	N/A	11	4	8	1	N/A	46
Graduates	-	4	2	N/A	11	3	-	-	N/A	20
Jobs Created/Retained	18	54	17	N/A	43	28	13	-	N/A	173
Businesses Counseled	45	173	32	N/A	129	86	26	26	N/A	517
Educational Events	5	8	21	N/A	20	3	8	-	N/A	65
Occupancy Rate	62%	55%	100%	N/A	79%	65%	48%	9%	N/A	

*Data for CTC is only through third quarter 1996

Source: Edison Technology Incubators Third and Fourth Quarter Reports, FY 1996-1997

Financial data was available for six incubators in FY 1996² and FY 1997.³ Table 4 summarizes the sources of funds for the incubators.

² No data was available for CTC in FY 1996

³ No data was available for ETI, Biostart and CTC in FY 1997

Table 4: Incubators Sources of Funds*

Source of Funds	FY 1996 (\$)	%	FY 1997 (\$)	%
Rent	655,219	30%	580,163	25%
Services	182,878	8%	142,264	6%
Federal	500	0%	244,923	11%
Local	105,000	5%	245,997	11%
Private	35,778	2%	163,204	7%
Edison	1,165,117	54%	871,000	38%
Other	30,311	1%	57,981	3%
Total	2,174,803		2,305,532	

In Kind Contributions				
	FY 1996 (\$)	%	FY 1997 (\$)	%
Space	250,264	44%	179,924	72%
Time	52,129	9%	61,929	25%
Other	265,431	47%	8,162	3%
Total	567,824		250,015	

*Data is not included for CTC in FY 1996 and for ETI, BIO, and CTC in FY 1997

Source: Edison Technology Incubators Third and Fourth Quarter Reports, FY 1996-1997

Of the incubators reporting data, the Edison Program was the largest source of funding. The Edison share of funding decreased, however, from 54 percent in FY 1996 to 38 percent in FY 1997. Rent from tenants was the second largest source of funding.

EVALUATION

In 1994, a performance assessment was done by Human Resources Investments to assess the effectiveness of the Edison Incubators. This study attempted to provide a basis to evaluate the activities, accomplishments, and value of services provided by the incubators. It used benchmarks to compare the incubators to leading mixed incubators and technology incubators in the country.

The study found that the Edison Incubator Program ranked well as compared to effective incubators in the country. The study found that funding for the program is less than in other incubators researched. The average of 2 graduates per year per incubator exceeded the mixed incubator average of 1.8, but fell below the technology average of 2.6 per year. In addition, the failure rate of 5.6 percent matched the failure rate of technology incubators and was much lower than the 9.6 percent failure rate for mixed incubators. In

addition, staffing at the Edison Incubators was found to be significantly less than the surveyed incubators.

This study had a number of general recommendations for the Edison Incubators. First, they should add to current lease agreements a stipulation requiring all tenants and graduates to provide information that is necessary to record benchmarks. The incubators should also develop and nurture ties with affiliated universities to assist in areas such as training and staffing. In addition, incubator managers should target 20 percent of their time for direct consulting with tenants. They should also utilize sales, payroll, and goods purchased data to develop both returns on investment and job quality measures. The study also recommended that the incubators strengthen employee review procedures. Each incubator should also have a documented entrance policy and each applicant should be rated against the same set of criteria to make the acceptance decisions more objective. Graduation benchmarks were also recommended. The study also suggested that the incubators should have a written exit policy of three years, with a six-month additional stay for flexibility. Finally, all incubators should administer an exit interview to tenants to obtain statistical information.

A relevant question, not answered by the reports reviewed for this study, is to what extent the recommendations from the earlier assessment study were implemented by the State of Ohio? Perhaps the Edison Program could produce a future report documenting successful and unsuccessful actions to implement the assessment study's major recommendations.

THE OHIO EDISON TECHNOLOGY CENTERS

The Mission of the Edison Technology Centers is to maximize the effectiveness of Ohio's technology-based economic development in creating greater wealth and a higher standard of living for the citizens of the State.

It will be achieved by providing an integrated array of research, development, deployment, training and commercialization services to Ohio's existing and emerging companies through the Edison Technology Centers and their linkages with statewide resources. (Edison Technology Centers, Strategic Plan, FY 1997 – FY 2001)

CENTER DESCRIPTIONS AND SERVICES

The Ohio Edison Technology Centers are all intended to help in the strengthening of Ohio's industrial competitiveness. How the centers attempt to achieve this goal is as different as the industrial base of the areas where in which the centers are located. In order to gain an appreciation for the diversity of the Technology Centers, it is necessary to understand a little about the types of services they provide.

Table 5: Ohio Edison Technology Centers

Name		Location
Cleveland Advanced Manufacturing Program	CAMP	Cleveland
Edison BioTechnology Center	EBTC	Cleveland/Cincinnati/Columbus
Edison Industrial Systems Center	EISC	Toledo/Lima/Mansfield/Sandusky
Edison Materials Technology Center	EMTEC	Kettering
Edison Polymer Innovation Corporation	EPIC	Akron
Edison Welding Institute	EWI	Columbus
Institute of Advanced Manufacturing Sciences	IAMS	Cincinnati

Cleveland Advanced Manufacturing Program (CAMP) – Cleveland

The Cleveland Advanced Manufacturing Program (CAMP) provides numerous types of services to manufacturing firms, including manufacturing modernization, engineering & technical assistance, and business management services. Many of the services offered by

CAMP involve the application of some of the most advanced technologies being used in manufacturing. These services include assistance with computer process simulation, machinery automation, CAD/CAM/CAE, microfabrication, robotics, and expert systems.

Edison BioTechnology Center (EBTC) – Cleveland/Cincinnati/Columbus

In an attempt to develop a stronger biomedical and biotechnology industry in the State of Ohio, the Edison BioTechnology Center (EBTC) provides numerous services that are focused on specific sectors within the biotechnology industry. These sectors include pharmaceutical, medical devices, and healthcare software companies. Unlike most of the other Edison Centers, a major focus of the EBTC is assisting in the formation on new biotechnology firms. EBTC helps entrepreneurs with general business assistance and strategic planning, but also offers expert advice related to FDA regulations and patent issues.

One way in which the EBTC ensures a greater success of the firms it assists is by working closely with other economic development agencies throughout the state. Most notable of these is their relationship with the two of the Edison Technology Incubators, BioEnterprise (Cleveland) and Bio/START (Cincinnati).

Edison Industrial Systems Center (EISC) – Toledo/Lima/Mansfield/Sandusky

The Edison Industrial Systems Center (EISC) describes itself as “Industry’s link to technology.” Like CAMP, EISC provides numerous types of services to manufacturing firms. Some of EISC’s services include: general business & marketing assistance; assistance and training on QS 9000 & ISO 9000; use of food manufacturing technology & advanced imaging technology; and various manufacturing engineering & human resource assistance. EISC provides services to such diverse industries as automotive, defense, and food processing.

Edison Materials Technology Center (EMTEC) – Kettering

The Edison Materials Technology Center (EMTEC) works with industry, academia, and government to develop new industrial materials and improve manufacturing processes. Firms that are involved in the development of these new materials and/or processes are

then able to take this knowledge and use it in commercial ventures. Some of EMTEC's major programs includes: the Casting Technology Application Program, which focuses on the metal casting industry; the Core Technology Program, which focuses more generally on developing new industrial materials and manufacturing processes; and the Heat Treating Network.

Other types of business and manufacturing assistance are provided through EMTEC Manufacturing Extension. EMTEC Manufacturing Extension provides services such as general business & management assistance, quality training (e.g., ISO 9000), pollution prevention, and waste reduction. This program is funded in part by the national Manufacturing Extension Partnership program.

Edison Polymer Innovation Corporation (EPIC) – Akron

As its name suggests, the Edison Polymer Innovation Corporation (EPIC) focuses exclusively on advancing polymer related industries in Ohio. The services and assistance that EPIC provides to companies are wide ranging and include activities from business assistance to research & development to design & process improvement. Working closely with industry and university researchers, EPIC provides firms with access to the latest scientific research and technologies used in the polymer industry.

Edison Welding Institute (EWI) – Columbus

Self-proclaimed as “the largest welding and materials joining engineering consulting company in North America,” the Edison Welding Institute (EWI) provides assistance with all types of material joining. EWI's services include more than just welding. It also includes brazing, soldering, and adhesive bonding of various materials. EWI also provides various degrees of assistance ranging from ‘technical inquiries’ to consulting to contracted research. In addition, EWI provides training in the form of workshops & seminars and sponsors conferences related to material joining.

Institute of Advanced Manufacturing Sciences (IAMS) – Cincinnati

Similar to CAMP and EISC, the Institute of Advance Manufacturing Sciences (IAMS) provides numerous types of services that are intended to increase the productivity of firms and increase their adoption of new technologies. The easiest way to describe the services provided by IAMS is to say that they work to improve the manufacturing processes of client firms. Services provided by IAMS include: lean production practices, such as total quality management; factory layout design; organizational design; and process mapping, which helps to identify non-value added activities so they can be eliminated. IAMS also offers special programs related to pollution prevention and machining optimization. Many of the services provided by IAMS are designed to assist firms on a one-on-one basis, however, they also offer various training workshops and seminars that are open to any interested firms.

COMMON CHARACTERISTICS OF CENTERS

Each of the Edison Technology Centers is unique in many ways and focuses on specific areas in which the demands, and often unrealized needs, of industry are not being met by the private market. While their focus may differ, how the centers operate are quite similar. In addition to each receiving funding from the State through the Ohio Edison Technology Program, the Centers also share several other characteristics.

From a funding perspective, each of the centers rely on funding from several different sources. For many of them, state funding is combined with funding from other government sources, federal, state and local. But not all of their financial support comes from public sources. Centers rely on industry involvement for both financial and operational support. Industry financial support comes from two primary sources: membership and fees.

Firms that become members in a Center receive various types of benefits ranging from newsletters and industry specific information to discounts on Center services. The revenues that are generated from membership provide additional funds to cover general operating expenses. In addition to providing financial support, member firms are also able to help Centers in planning for future activities and services.

While the Centers receive a considerable amount of funding from public sources and from industry membership, this does not mean that the services they provide are free. Most of the services that are provided involve some type of fee. Fees that are charged vary by Center and by the specific type of service that is provided. These fees help to cover the costs of individual projects and also help to ensure that only the most viable projects are conducted. While the fees are considerably less than what a firm would have to pay to conduct the project without a Center's assistance, they are high enough to ensure that there is some risk to the firms involved. This cost/risk sharing is seen as an important characteristic of the Edison Technology Center initiative.

Centers are also similar in how they provide services to firms. By working closely with each other, Centers are able to connect firms with other Centers that may already have programs in place that can meet the specific needs of a firm. Firms that seek assistance from one of the Centers may also have other needs that are unrelated to the any of the Centers' primary focus areas. By working closely with the other initiatives within the Edison Program (e.g., the Edison Technology Incubators), centers are able to help firms find additional assistance. While this type of activity has not been used to a large degree in the past, there are indications that Centers and Incubators are increasingly working together to help firms. A clear example of this is the relationship between the EBTC and the Edison Technology Incubators.

Centers also work closely with Ohio's universities. All of the Centers have some type of working relationship with local universities. Universities often play a central role in helping Centers provide scientific research and testing that firms often need. The Center-university partnerships are a vital component in meeting the Edison Program's overall goal of strengthening Ohio's industrial competitiveness.

CENTERS & PROGRAM PERFORMANCE

As with most economic development programs, attempting to accurately evaluate or assess the impacts of the Edison Technology Centers is difficult. The evaluation of any economic development program must start with developing a clear understanding of the goals and objectives of the specific program. For quantitative analyses, this also means that the goals and objectives must be formalized into a series of measurable variables.

For many programs, this process typically results in some measure of job creation being defined and used as a measure of program performance. With the general increase in knowledge about the factors that affect state and local economies and the recognition that simply creating jobs may not improve the long run performance of an economy, economic development programs have become much more than just job programs. The Edison Technology Centers initiative is a good example of this.

As mentioned earlier, the Edison Technology Centers *Strategic Plan, FY1997-2001* states that the initiatives mission is to:

“. . . maximize the effectiveness of Ohio’s technology-based economic development in creating greater wealth and a higher standard of living for the citizens of the state. It will be achieved by providing an integrated array of research, development, deployment, training and commercialization services to Ohio’s existing and emerging companies through the Edison Technology Centers and their linkages with statewide resources.”

Based on this mission statement, the Edison Center Director’s Council identified 5 strategic goals to achieve it. These goals are:

1. Help Ohio manufacturing and technology–based companies achieve and sustain global competitiveness;
2. Support the formation and attrition of new technology-based enterprises;
3. Help Ohio’s companies develop new world class technologies through R&D that leverages industrial, academic, and government investments;
4. Work with Ohio’s educational and training infrastructure to improve the capabilities and skills of Ohio’s workforce; and
5. Provide leadership and support in the formulation of Ohio’s technology-based economic development strategies.

Based on their mission and goals, two important facts need to be highlighted. First, while the term ‘competitiveness’ is not clearly defined, it is clear that it is much broader than simply ‘job creation’ and at times may seem to be exactly the opposite. In order for a firm

to be 'competitive' it must be able to produce a product that is of greater quality than other products on the market, or is less expensive, or both. Since the cost of labor continues to be one of the largest components of producing a product, helping firms to increase their employment will not necessarily help them become more 'competitive'.

This being said, it is important to recognize the importance of assisting firm's competitiveness to overall employment in the state's economy. A competitive firm is productive and profitable. As a firm becomes more productive, it will be better able to compete with other firms in the market. The major premise supporting the activities of the Technology Centers is that, as firms become better able to compete in national and international markets, the demand for a firm's product will grow. With this growth comes the need for increased employment in the firm and an increased demand for other factors of production. The increased demand for other factor inputs will help develop, support, and grow firms that are able to supply these inputs.

The second fact to point out about the mission and goals of the Technology Centers is their focus on technology and training. These are the two areas on which the Centers can focus in trying to make firms more productive and, therefore, more competitive. While the increased use of technology is traditionally seen simply as a substitute for labor in the production of goods and services, it is also vitally important for keeping firms competitive. By focusing on both technology and training, the Edison Technology Centers are not simply helping firms replace labor with technology but rather they are attempting to create and retain higher quality jobs in the State of Ohio. This focus requires helping firms adopt new technologies and helping workers to be better able to use the new technologies.

Measuring Performance

Since the success, or lack of success, of the Technology Centers activities cannot be measured directly by looking at changes in employment or other similar measures, the Centers must continually look for different ways to measure their performance. Based on the premise above, that creating competitive firms will have direct and indirect effects on the economy, the Technology Centers have looked for ways of measuring their overall impacts on the economy. While an impact analysis would provide a much better

understanding of the initiatives overall performance, the conduct of such an analysis is beyond the scope of the current study.

In light of this, there are other ways to try to measure their performance directly. The remainder of this study looks at the two main areas that reflect the Centers' performances directly: Center activities and financing.

Key Performance Measures

In 1995, the Technology Centers formed a work group to look at ways in which a common set of performance measures could be developed. By December of that year, a set of 'key performance measures' (KPMs) was defined. Since the first document identifying these measures was produced, several minor changes have been made; however, the basic information has remained the same.

These key performance measures were broken into 5 categories that reflect both the Centers' expertise and the initiatives goals.⁴ These categories are: Research, Technology Development, Technology Deployment, Training & Education, and Business Formation Assistance.

- **Research:** Includes basic and applied research activities
- **Technology Development:** Includes activities that use knowledge and research results to produce new materials, devices, systems, or methods.
- **Technology Deployment:** Includes activities that incorporate existing technologies and techniques into a firm's production process.
- **Training and Education:** Training typically refers to educating workers on a specific application while education is more general and is typically targeted at students in high schools, community colleges and universities.
- **Business Formation Assistance:** Includes activities that assist new and emerging firms to bring products to market. It includes activities ranging from financial assistance and intellectual property rights to technology strategies.

⁴ The last changes made to the KPMs combines two of the categories: Research and Development.

Within each of these categories, there are 5 subcategories: Projects, Assessments, Referred Projects, Instances of Technical Assistance (ITA), and Events⁵.

- **Projects:** These are activities that help to improve a specific aspect of a business and that involve a substantial amount of time (> eight hours) and commitment from the Center and the firm. Fees are typically charged for projects.
- **Assessments:** These are activities that involve conducting a diagnostic analysis on a firm and its operations. Based on the results of this analysis, the firm is given feedback on the performance of its operations. Fees may or may not be charged for assessments.
- **Referred Projects:** These are activities in which a Center 'brokers' a project to some other entity like a consultant or university for assistance. Fees are not typically charged for referred projects.
- **Instances of Technical Assistance:** These are activities that involve relatively little time (<eight hours) or effort on the part of the Centers. Fees are not charged for ITAs.
- **Event:** Events are activities lasting less than eight hours in which the Center provides information to a group of firms about some aspect of their business. These include seminars, demonstrations, and similar types of activities.

⁵ These 5 subcategories have subsequently been reduced to include only Projects, ITAs and Events.

PERFORMANCE DATA

In the fiscal year 1997 (July 1, 1996 – June 30, 1997), the Technology Centers engaged in nearly 42,000 assistance activities or services⁶. Table 6 shows how these services were distributed by KPM category (research, development, deployment, etc.) and by type (project, assessment, ITA, etc.).

**Table 6: Ohio Edison Technology Centers
Total Services Rendered by KPM Category, 1997**

KPM Category	Projects	% of Projects	Assess-ments	% of Assess-ments	Referred Projects	% of Ref. Projects
Research	139	6.1%	59	11.9%	5	1.6%
Development	263	11.6%	67	13.5%	36	11.5%
Deployment	1,473	64.7%	257	51.7%	142	45.5%
Training & Education	299	13.1%	1	0.2%	-	0.0%
Business Assistance	101	4.4%	113	22.7%	129	41.3%
	2,275	100%	497	100%	312	100%

KPM Category	ITAs	% of ITAs	Events	% of Events	Total Activities	% of Total
Research	2,781	7.4%	33	3.2%	3,017	7.2%
Development	2,107	5.6%	30	2.9%	2,503	6.0%
Deployment	31,922	84.7%	169	16.3%	33,963	81.3%
Training & Education	32	0.1%	708	68.5%	1,040	2.5%
Business Assistance	825	2.2%	94	9.1%	1,262	3.0%
	37,667	100%	1,034	100%	41,785	100%

Source: CAMP, EBTC, EISC, EMTEC, EPIC, EWI, and IAMS 4th Quarterly Reports, 1997

A number of findings are apparent from this table:

- The vast majority of services, nearly 38,000, are ITAs. This is not surprising since ITAs are services that take relatively little time (< eight hours) to perform. Projects, those services that take more than eight hours to perform, account for the second largest number of services.

⁶ All figures showing the number of activities exclude ITAs by WeldNet. WeldNet is listed under EWI but the ITAs attributed to it are always kept separate from EWI's ITAs. It is not clear what their relationship is (WeldNet is not mentioned in their strategic plan) but including the extremely large number of ITAs attributed to WeldNet would dominate activities from any other center. For FY 1997, WeldNet is stated to have had 135,484 ITAs, more than 3 times the total number of activities from all centers combined.

- The percentages listed in the table help to show how the centers use different types of services depending on the nature of the services being provided. Of all the different types of services or activities provided, the vast majority (81.3%) are in the KPM category of technology deployment.

Looking at the different types of services individually, it is clear that certain types of activities are more likely depending on which KPM category the service is in.

- The majority of Projects, Assessments, and ITAs are in the KPM category of Technology Deployment.
- Nearly half of the Referred Projects, those that involve using a third party for providing the service, are in the Business Assistance category.
- The majority of Events are in the KPM category for Training and Education.

There are two primary conclusions that can be drawn from this information. First, as a whole, the majority of services that Edison Technology Centers provide involve technology deployment. This suggests that centers are clearly focused on accomplishing the stated mission of getting firms to adopt existing technologies in an attempt to improve their productivity and competitiveness.

A second conclusion is that services related to the other KPM categories may be provided in many different ways. While on the face of it, this does not seem to be of great importance since it is expected that different situations (i.e., a demand for different services) may require different ways of delivering the services. The importance of recognizing this difference lies in the fact that each of the centers have a specific focus that is much more narrow than the initiatives overall goals.

The table that follows shows the types of services provided by each of the centers. Again, the percentages show the relative distribution of service types among the 7 centers.

**Table 7: Ohio Edison Technology Centers
Total Services Rendered by Center, 1997**

Center	Projects	% of Projects	Assess-ments	% of Assess-ments	Referred Projects	% of Ref. Projects
CAMP	527	23.2%	10	2.0%	37	11.9%
EBTC	32	1.4%	88	17.7%	130	41.7%
EISC	82	3.6%	6	1.2%	2	0.6%
EMTEC	294	12.9%	260	52.3%	51	16.3%
EPIC	541	23.8%	102	20.5%	55	17.6%
EWI	566	24.9%	-	0.0%	-	0.0%
IAMS	233	10.2%	31	6.2%	37	11.9%
	2,275	100.0%	497	100.0%	312	100.0%

Center	ITAs	% of ITAs	Events	% of Events	Total Activities	% of Total
CAMP	743	2.0%	497	48.1%	1,814	4.3%
EBTC	235	0.6%	16	1.5%	501	1.2%
EISC	1,335	3.5%	45	4.4%	1,470	3.5%
EMTEC	4,552	12.1%	278	26.9%	5,435	13.0%
EPIC	365	1.0%	69	6.7%	1,132	2.7%
EWI	28,611	76.0%	62	6.0%	29,239	70.0%
IAMS	1,826	4.8%	67	6.5%	2,194	5.3%
	37,667	100.0%	1,034	100.0%	41,785	100.0%

Source: CAMP, EBTC, EISC, EMTEC, EPIC, EWI, and IAMS 4th Quarterly Reports, 1997

Again, several findings can be taken from this table.

- All centers engage in providing services that take more than eight hours to perform (i.e., Projects). While two of the centers, EBTC and EISC, account for a relatively small percentage of all projects, much of this can be explained by the fact that these centers are relatively small compared to some of the others.
- EMTEC performs a relatively large number of Assessments as compared to other centers.
- The EBTC, one of the smaller centers, refers a relatively large number of projects to other, 3rd party, service providers.
- EWI, the Edison Welding Institute, disproportionately accounts for total ITAs. This is a clear indication that the types of services that EWI provides are those that can be provided in a short period of time (< eight hours). This point exists even though services provided by WeldNet, a subordinate unit to EWI, has been excluded. The inclusion of WeldNet would increase the number of ITAs provided by EWI by over 135,000.
- CAMP and EMTEC conduct the majority of Events. This is partly a reflection of the focus that these centers have on Training and Education (339 of CAMP's

Events and 163 of EMTEC's Events where in the area of Training and Education) and partly due to the fact that these are older, more mature centers.

SOURCES OF FUNDS

Major sources of funding for the Centers include direct state funding (Edison Center grants), federal funding, including MEP and other grants and contracts, and industry, including membership and fees. Table 8 presents sources of funds for the centers. The research category includes both directed and contract research and the other category includes foundation grants, fees from conferences, seminars, publications, licenses and royalties.

Table 8: Total Centers Sources of Funds

Sources of Funds	FY 1994 (\$)	%	FY 1995 (\$)	%	FY 1996 (\$)	%	FY 1997 (\$)	%
Edison Center Grant	14,874,415	43%	14,436,794	27%	17,499,235	26%	18,294,954	24%
Other State Grants	234,404	1%	2,467,327	5%	2,354,398	4%	3,778,155	5%
Federal Grants/Contracts	852,176	2%	14,987,294	29%	18,165,410	27%	29,252,325	39%
Membership (not in-kind)	5,124,877	15%	5,130,400	10%	5,005,239	8%	4,991,349	7%
Research	9,591,118	28%	12,078,333	23%	15,367,205	23%	14,606,222	19%
Other	3,519,641	10%	3,407,555	6%	7,790,316	12%	4,666,694	6%
<i>Total</i>	34,196,631		52,507,703		66,181,803		75,589,699	

Source: Fourth Quarter Reports for IAMS, EBTC, EPIC, EISC, EMTEC, CAMP, and EWI, FY 1994-1997

A number of findings are apparent from this table:

- Total funds more than doubled between FY 1994 and FY 1997, from \$35 million to \$76 million.
- While Edison Center Grants have increased from \$15 million to \$18 million, their share of total revenues have decreased from 43 percent in FY 1994 to 24 percent in FY 1997.
- The total State contribution to the Centers, including other state grants, also decreased from 44 percent to 29 percent.
- The Centers' largest source of additional funds has been federal grants and contracts, which increased from \$852 thousand in FY 1994 (2 percent) to \$29 million in FY 1997 (39 percent).
- Membership has become a less significant source of funding, with its share decreasing from 15 percent to only 7 percent.

In conclusion, while Centers' budgets have experienced significant growth, Centers have become less dependent on state support in terms of funding. Federal funding has played an important role in the growth of the Centers' funds. Edison Center Grants proposals for FY 1998 and FY 1999 requested funding of \$21.7 million and \$22 million respectively. Based on projected total funds of \$84 million in FY 1998 and \$88 million in 1999, the share of Edison funds would be about the same as prior years, at 26 percent and 25 percent.

The following section describes the sources of funding for specific Centers:

IAMS

- Between FY 1994 and FY 1997, IAMS' sources of funds increased from \$4.2 million to \$6.7 million.
- The Center's Edison Grant funding has increased slightly, from \$1.1 million to \$1.9 million, accounting for 40 percent of sources in FY 1994 and 26 percent in FY 1997.
- IAMS first received federal funding in FY 1996, with \$346 thousand. In FY 1997, this was the Center's largest funding source, with \$1.9 million (27 percent).

EBTC

It is important to note that EBTC's budget statements include EBI, the Cincinnati Incubator and the Cleveland Incubator.

- EBTC'S sources of funds increased slightly from \$3.2 million in FY 1994 to \$3.9 million in FY 1997.
- Edison Center Grant funding increased from \$2.4 million to \$2.8 million, its share declined from 75 percent to 72 percent.

EPIC

- EPIC's total sources of funds decreased between FY 1994 and FY 1997, from \$4 million to \$2.5 million.

- While the amount of Edison Center Grants funding for EPIC decreased during this period from \$2 million to \$1.6 million, its share of the total sources of funds increased from 50 percent to 64 percent. This contrasts with the trend of other Centers' decreased dependence on this funding source.

EISC

- Sources of funds tripled between FY 1994 and FY 1997, from \$2.1 mil. to \$6.4 mil.
- Edison Center Grant's portion of funding declined from 67 percent to 33 percent
- Federal funding has dramatically increased from \$80 thousand (4 percent) to \$1.9 mil. (30 percent).
- Both membership and research dollars have also increased.

EMTEC

- EMTEC's funding has almost tripled from \$3 million to \$8.1 million.
- The Edison Center Grant's share dropped from 78 percent to 35 percent.
- Federal funding has become an increasingly important source. Federal funding was first received in FY 1995 and grew to 32 percent of funding in FY 1997.

CAMP

- CAMP's sources of funds have significantly increased from \$6.4 million to \$31 million.
- Edison Center Grant funding accounted for 46 percent in FY 1994 and declined to 14 percent in FY 1997.
- Research funding attributed to a portion of funding growth, increasing from \$1.5 million to \$7.7 million. Its share increased slightly, from 20 percent to 25 percent.
- Federal funding has become the major funding source for CAMP, growing from \$773 thousand (12 percent) in FY 1994 to \$18 million (58 percent) in FY 1997.

EWI

- EWI's funding has increased from \$11.3 million to \$16.8 million.
- Edison Center Grant dollars have remained stable from \$2.4 to \$2.9 million. Its share of total funding has dropped from 29 percent to 17 percent.
- Membership is a much larger component than for most other Centers, accounting for 22 percent (\$2.5 million) in FY 1994 and 17 percent (\$3 million) in FY 1997.
- Research is also a significant source of funds, accounted for 39 percent to 29 percent.

The percentage of funding from Edison Center Grants has generally declined between FY 1994 and FY 1997, most significantly for CAMP and EMTEC. Federal funding has become an important source for five of the Centers, especially CAMP where it accounts for more than half of all sources. Research is significant for IAMS, EWI and CAMP. Table 9 shows the respective shares of sources of funds for each Center.

Table 9: Percentage Share of Sources of Funds

	Year	Membership	Research	Federal	Edison	Total State*
EPIC	FY 1994	33%	10%	0%	50%	50%
	FY 1997	26%	6%	0%	64%	64%
EBTC	FY 1994	13%	0%	0%	75%	75%
	FY 1997	13%	2%	0%	71%	71%
IAMS	FY 1994	4%	34%	0%	31%	31%
	FY 1997	3%	14%	27%	26%	28%
EWI	FY 1994	22%	53%	0%	22%	22%
	FY 1997	17%	29%	28%	17%	24%
CAMP	FY 1994	3%	24%	12%	46%	50%
	FY 1997	1%	25%	58%	14%	14%
EMTEC	FY 1994	6%	4%	0%	78%	78%
	FY 1997	2%	3%	32%	35%	61%
EISC	FY 1994	16%	8%	4%	67%	67%
	FY 1997	5%	8%	29%	33%	42%

*Total state includes Edison Center grants

Source: Fourth Quarter Reports for IAMS, EBTC, EPIC, EISC, EMTEC, CAMP, and EWI, FY 1994-1997

USES OF FUNDS

Table 10 categorizes the uses of funds for all centers by employment, center operations, marketing, project and research expenses, and other expenses. Employment includes all salaries, benefits, and contract employment. Center Operations includes facilities expenses, travel, equipment, and office expenses.

Table 10: All Centers Uses of Funds

Uses of Funds	FY 1994 (\$)	%	FY 1995 (\$)	%	FY 1996 (\$)	%	FY 1997 (\$)	%
Employment	5,085,164	15%	12,496,175	24%	28,826,166	50%	33,508,479	45%
Center Operations	1,622,528	5%	3,100,979	6%	7,826,947	13%	8,328,109	11%
Project and Research Expenses	24,206,715	73%	33,064,667	65%	18,250,022	31%	26,545,200	36%
Marketing	284,793	1%	633,382	1%	710,863	1%	1,222,343	2%
All Other Expenses	1,877,841	6%	1,916,512	4%	2,375,814	4%	4,772,615	6%
Total Uses	33,077,041		51,211,715		57,989,812		74,376,746	

Source: Fourth Quarter Reports for IAMS, EBTC, EPIC, EISC, EMTEC, CAMP, and EWI, FY 1994-1997

A number of trends between FY 1994 and FY 1997 are apparent from the Centers' uses of funds:

- Employment expenses have increased from 16 to 45 percent of the budget.
- Center Operations have also slightly increased, from 4 to 11 percent.
- In contrast, Project and Research Expenses have decreased from 75 to 36 percent.
- Marketing expenditures have remained constant, between 1 and 2 percent.

Data on the uses of funds are also collected by the Centers according to function. Both the funds expended on administrative functions and the funds expended on projects and research can be looked at. In total, the share of funds spent on administrative functions decreased from 27 percent in FY 1994 to 13 percent in FY 1997. This would appear to indicate that the Centers have become more efficient in their operations and are now able to devote more resources to projects and research.

Trends differ among specific Centers, however. IAMS employment expenditures increased dramatically from 15 percent to 65 percent. Administrative uses declined slightly, from 29 percent to 27 percent.

In contrast, EBTC decreased its employment expenditures from 73 percent to 52 percent. It should again be noted that EBTC's budget includes incubators and can thus be expected to vary from other centers. While administrative expenditures were unavailable for FY 1994, they accounted for 27 percent of uses in FY 1997.

EPIC increased its employment expenses slightly, from 17 percent to 21 percent. Its administrative expenses increased from 31 percent to 43 percent. This is significantly higher than the ratio for the other Centers. In addition, EPPIC was the only center to experience a reduction in budget, with total uses dropping by \$1.4 million.

EISC increased employment expenses from 21 percent to 43 percent. It also increased its marketing from 1 percent to 6 percent, more than any other Center. Its administrative expenditures declined, from 31 percent to 20 percent.

EMTEC, unlike most of the other Centers, did not increase its share of employment expenses, varying from 22 percent to 21 percent. It experienced the largest decline in the percentage of administrative expenditures, from 35 percent to 9 percent.

CAMP increased its employment expenses from 8 percent to 45 percent. In addition, it reduced its already comparatively low administrative share from 17 percent to 10 percent.

Finally, EWI increased employment expenditures from 7 percent to 52 percent. It also reduced its administrative expenditures from 15 percent to 6 percent.

THE FEDERAL TECHNOLOGY TRANSFER INITIATIVES

The Thomas Edison Program assists Ohio firms with the transfer of technology from federal laboratories through the Great Lakes Industrial Technology Center (GLITeC) and the Wright Technology Network (WTN).

Great Lakes Industrial Technology Center

GLITeC is one of six National Aeronautics and Space Administration (NASA) regional technology transfer centers. GLITeC is located in Cleveland and is managed by Battelle. It targets Ohio firms requiring assistance identifying, acquiring, adapting and utilizing federal technology for commercial applications. Three types of services are provided: technology based problem solving, product planning and development, and technology commercialization. GLITeC draws on NASA, federal labs, state and federal technology application centers, Battelle, and university centers for technical expertise.

GLITeC offers firms a number of partnership opportunities through Memoranda of Understanding, Space Act agreements, cooperative agreements, joint sponsored research agreements, and cost shared contracts. In addition, it facilitates access to and acquisition of NASA technology through licenses, cooperative R&D agreements, informal collaboration, formal consultation, and contract research including Space Act agreements, CRADAs, Small Business Innovation Research and Small Business Technology Transfer Program grants. In addition, GLITeC is part of NASA's program to help defense related companies diversify into commercial products and markets.

GLITeC includes a network of affiliates in each of the six Great Lakes states. The Edison Welding Institute is Ohio's affiliate. GLITeC is also further involved in the Edison Program through the partnership that forms the Lewis Incubator for Technology. GLITeC's role in this incubator is in the identification of viable technology on which fledgling firms can base their businesses.

Wright Technology Network

The Wright Technology Network (WTN), formerly the Ohio Advanced Technology Center, was established in 1989 as a not-for-profit corporation. It is located in the Miami Valley Research Park in close proximity to Wright Patterson Air Force Base, which contains the Department of Defense's largest laboratory. WTN was established to integrate the Wright Patterson Air Force Base Laboratory into Ohio's economic development strategy through the transfer of Wright Laboratory technology to Ohio industry.

WTN's primary activities include technical assistance to small Ohio firms, assisting smaller firms in negotiating Cooperative Research and Development Agreements (CRADAs) with the Laboratory to facilitate technology transfer and identifying private sector commercialization opportunities for Wright Laboratory technology. In addition, WTN has been expanding its scope of efforts to include technology transfer from other Air Force Laboratories and is expanding its territory to encompass the entire Great Lakes Region.

PERFORMANCE DATA

Table 11 shows the combined activities of WTN and GLITeC for fiscal years 1996 and 1997. The majority of firms assisted were first time clients for both years. ITA's were the largest category of service provided, making up more than half of all services.

Table 11: WTN/GLITECH ACTIVITIES

	FY 1996	%	FY 1997	%
Assistance and Training				
New establishments	998	77%	541	68%
Return/repeat	292	23%	259	32%
Total assisted	1290		800	
Services				
Projects	135	11%	260	23%
Assessments	7	1%	0	0%
Referred projects	310	25%	119	11%
ITA	696	56%	562	50%
Events	68	5%	125	11%
CRADA/Space Act Agreements	32	3%	54	5%
Total Services	1242		1120	

Source: Ohio's Thomas Edison Program Progress Report FY 1996-1997

Table 12 shows the combined leverage of funds for the two centers. The main source of funding is federal, accounting for more than half of funds in both years. Edison funding comprises 32 to 34 percent of funding.

Table 12: Leverage for WTN/GLITeC (thousand \$)

	Industry	Federal	State-Edison	State-Non Edison	Other	Total
FY96	Cash	411	1711.6	1116.2	62.5	3448.7
		12%	50%	32%	2%	100%
	In-kind	0	376.4	0	144	520.4
FY97	Cash	486.4	2026.7	1281.5	12.1	3806.7
		13%	53%	34%	0%	100%
	In-kind	56.7	589	0	9.9	655.6

Source: Ohio's Thomas Edison Program Progress Report FY 1996-1997

PAST EVALUATIONS

Two earlier evaluation studies have looked at the operation and impact of the Centers, *Ohio's Thomas Edison Centers: A 1990 Review*, which was conducted by the National Research Council, and *The Edison Technology Centers: An Economic Impact Study*, conducted by Battelle in 1996.

Ohio's Thomas Edison Centers: A 1990 Review

The National Research Council formed the Committee to Review the Ohio Edison Technology Centers, made up of representatives of government, industry, and academe who did not reside in Ohio. The Committee concluded that the Technology Centers were generally healthy and well managed. Nine centers were reviewed and the Centers' performance was to be judged by how effectively they served target communities.

The State identified seven criteria for successful performance by the Centers:

1. economic development
2. increase competitiveness and productivity
3. diversification of Ohio's economy
4. formation of effective partnerships and consortia involving private sector, colleges and universities and government
5. developing highest possible technical competence
6. developing financially and scientifically viable instruments
7. establish and improve education and training programs

Based on these criteria, the report made a number of conclusions and recommendations. It found that wide diversity characterized the Centers. Each Center reflected the available resources and the needs of the communities it serves. Thus, there was diversity in both missions and achievements. It was also noted that due to an absence of hard data, evaluations of the Centers must be qualitative.

The report determined that the Program was successful and had achieved significant increases in technical assistance to small industries. In addition, the Centers' scopes of activities were appropriate and generally corresponded to Ohio's historic strengths in manufacturing and materials and its emerging strength in biotechnology. Suggestions were also made to improve technical programs. Industry should define generic research projects rather than universities to ensure relevance to industry. It was also stressed that the issues of intellectual property and proprietary information needed to be dealt with. Excellent management was also seen as critical. Managers need both business skills and technical skills and the report emphasized that an industry led board of directors is crucial. Finally, the study also felt that training activities should have addition emphasis.

Battelle's Economic Impact Study of the Edison Technology Centers

In early 1996, the Ohio Department of Development contracted with Battelle Memorial Institute to study the economic impact of the seven Edison Technology Centers (ETCs) on the Ohio economy. Battelle analyzed outcome data collected by the ETCs, and applied Battelle's proprietary econometric model of the Ohio economy. Battelle concluded through their economic impact assessment that the ETCs are valuable to Ohio's economy, and validate the State's initial and continuing investment in the ETCs. The CSU Urban Center is currently working with the Centers, under a separate contract, to update the impact analysis. The CSU research team is in the data collection stage and expects to complete its analysis by late February 1999.

Conclusions for Calendar Years 1992-1995:

- The direct impact of the ETCs' operations on Ohio's economy is estimated to be over \$700 million, and the total impact over \$1.2 billion on Ohio's gross state product.
- Client companies have been able to create or retain more than 2,500 jobs.
- The jobs created were directly responsible for a boost of approximately \$92 million in personal income and a total impact on personal income of \$169 million.
- Assistance from the ETCs has helped Ohio companies increase their sales by more than \$110 million.

- The ETCs have worked with their client companies and other Ohio organizations to provide the State with \$150 million in funding.
- Ohio funds have been replenished through the collection of additional income, sales, gas, and franchise taxes.

CONCLUSIONS

The Edison Program is one of the State of Ohio's longer standing economic development initiatives. The program has gone through a number of changes over the years. This is an opportune time to consider the direction of the program over the next decade. Like all other economic development programs, the state's technology initiatives must become more performance-based in the future. These initiatives' contributions to the growth of the overall Ohio economy, and the state's major existing and emerging industry sectors and clusters must be better understood in the future. We recognize the difficulty in reaching this understanding, but we do see the need for much improvement in this regard.

Our analysis indicates that Ohio's Thomas Edison Program has seriously attempted to confront some of the difficult evaluation questions being asked of all State of Ohio economic development programs included in the Ohio Economic Development Study Project. This is especially evident in examining the Edison Centers' 3-year old Key Performance Measures (KPM) effort. We applaud this effort to make these programs more effective and more accountable in the future. One easy conclusion of this analysis is that the KPM effort should be continued and expanded on. In fact, we believe that there is much that other State of Ohio economic development programs can learn from the process followed by the Edison Centers.

Looking toward the future, several important policy direction questions come to mind. Many of which cannot be answered fully by the research conducted for this limited program review study. First, what role should the State of Ohio play in supporting technological innovation by industry in the future? Our analysis of state technology programs nationally reveals that states anticipate playing a continuing role in industry technological innovation, but this future role will likely include greater reliance on the private sector to make things happen. Should this future role depend more upon the private marketplace to increase technological innovation and new technology commercialization by firms? Can the Edison Program serve a vital "market-building" role in Ohio by identifying, networking, and enabling private R&D, technology consulting,

engineering, and financial service companies to help Ohio build a more technologically advanced economy for the 21st Century?

Some have argued that the private sector market simply fails to provide the types of services that smaller manufacturing firms need. Others suggest that the services are available but that the cost of these services is too high for the smaller manufacturers. In order to cover the costs of providing services, private sector consultants focus on larger firms. Larger firms are more likely to hire consultants for large, long term projects. This reduces the costs of providing services because private consultants do not have to devote as much time and financial resources to the marketing of their services.

In either case, small and medium sized firms do not receive the services they need to become more efficient, technologically advance, and/or globally competitive. By subsidizing these services, governments are able help promote further economic growth and development.

Is the State of Ohio and its major stakeholders sufficiently satisfied with the accomplishments and future direction of the Edison Program? How clear have these expectations, especially by state government itself, been over the past 15 years? On the one hand, these initiatives are expected to provide highly concrete and tangible assistance to businesses with technology modernization and other needs. On the other hand, some expect the Edison Program to provide leadership in bringing about new basic innovations serving as the foundation for future industries. These two expectations are found on different ends of the continuum.

Some of our interviews suggest that the technology centers themselves would like further clarification on future mission and goals from both the Administration and the Legislature. Marked differences exist in the structure and function of the technology centers, the incubators, and the Federal technology transfer agents. In general, we find many satisfied industry customers at the individual center level. Those centers with the most active relationships with business and industry have the most satisfied customers.

Many additional strategic questions emerge. Should this role stay on the current course of using focused technology centers and incubators to assist firms with innovation and commercialized needs? While the centers exist as separate organizations, they are working to function as an effective innovative network across Ohio. What incentives would motivate further progress in developing this network? Do new future roles exist for private firms, universities, federal research facilities, and state government in this growing 'web?'

A number of questions emerge with respect to the centers and what they do. Should the State of Ohio modify the mission and role of existing centers? Should existing centers be expanded to increase the response to current and future challenges and opportunities? Should the State of Ohio create any new centers reflecting the need for the types of services that the technology centers provide is in demand by private sector firms. Several reasons have been offered to explain why government, whether federal, state or local, should be involved in providing these services.

As the State of Ohio examines new overall economic development goals for the first decade of the next century, what role should the Edison Program play? Some argue that the Ohio Science and Technology Council's efforts should be better connected with the Edison Program. Smart firms, universities, and economic development organizations are constantly asking the question whether they are pursuing the 'right' technologies, and are they working with the 'right' industries to adopt and use these technologies.

We observe that the Edison Program, by and large, serves the manufacturing sector. While all forecasts indicate that manufacturing will be a driving component of Ohio's future economy, the wisdom in avoiding the service sector of the economy is not clear. The State of Ohio has invested heavily in the past decade in the development of facilities, infrastructure, and human resources for professional sports, travel and tourism, the arts and culture, education and learning, and a myriad of other functions and activities enhancing Ohio citizens' quality of life. If the state is to invest in these activities as an aspect of its overall economic development strategy, shouldn't these facilities and infrastructure be as technologically advanced as possible? One thought is for the State of Ohio to invest in an

Advanced Technology Center for the Arts, Entertainment, and Leisure Industries. This type of thinking is needed to ensure that the Edison Program is properly focused for the future.

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