



MANUFACTURING TECHFORMATION

A STATUS REPORT & GROWTH STRATEGIES FOR
MANUFACTURING INNOVATION IN PENNSYLVANIA

> ready > set

> Innovate

pennsylvania
STATE OF INNOVATION



Over the last half-century, the face of manufacturing has changed dramatically. To meet changing conditions, companies have had to redefine their core businesses, adopt new technologies, identify new markets and adapt production processes to increase efficiency.

To support these businesses, we have designed programs that will help Pennsylvania manufacturers meet these demands by encouraging education, training and innovation.

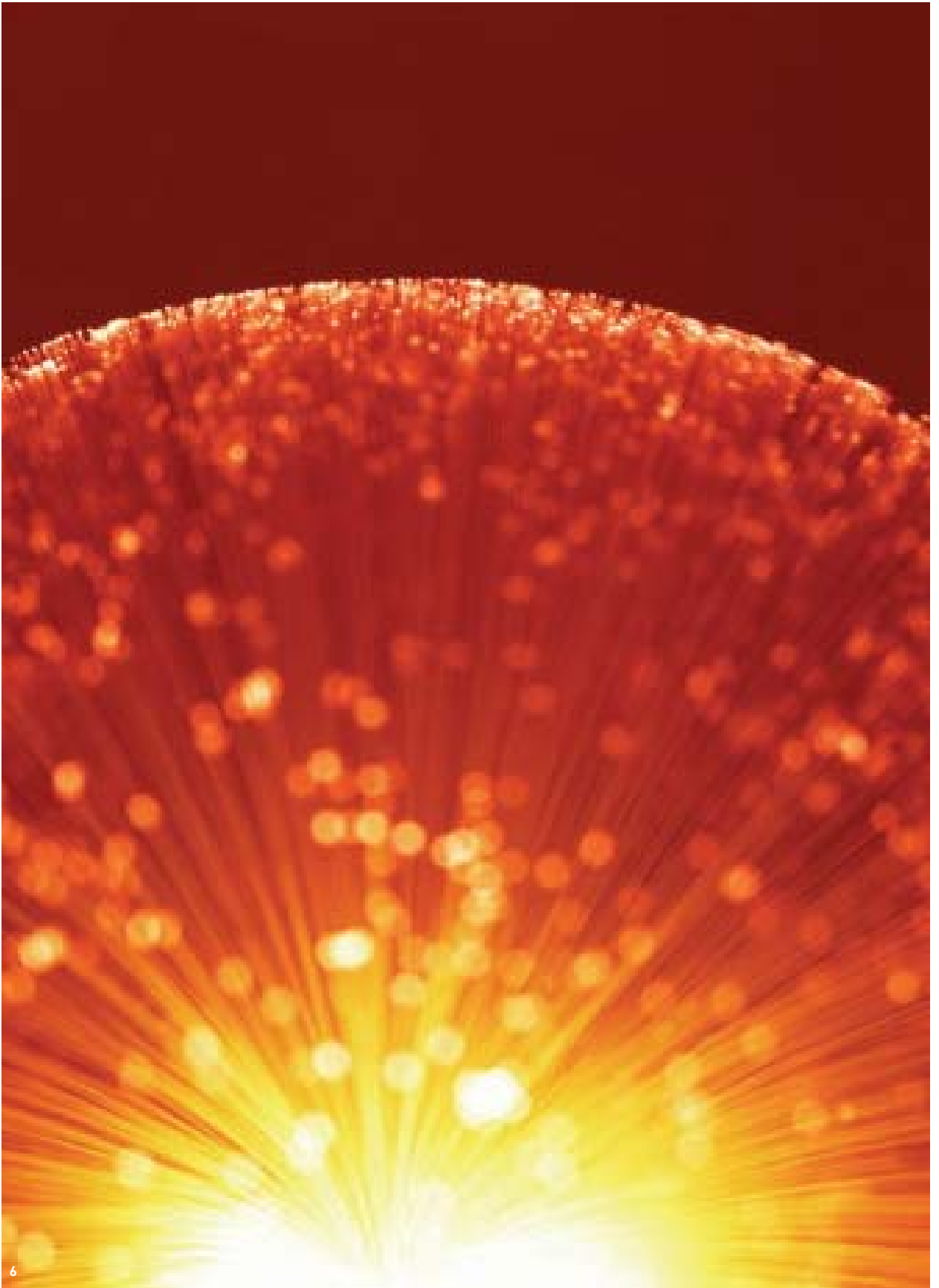
—Edward G. Rendell, Governor

Keynote speech, Siemens-Forbes Innovation Summit, New York City, September 30, 2005.

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The purpose of this report is to gauge Pennsylvania's manufacturing innovation position and to provide the basis for continued improvement strategies. To do this, we compare the Commonwealth to states with legacy economies similar to our own—economies built on traditional manufacturing which are now in the process of transitioning to compete in the global economy. The states we have used as a benchmark are Ohio, Michigan, Illinois, North Carolina, New York, New Jersey, Maryland and Delaware.

This special report belongs to a series of Pennsylvania technology based economic development reports that exist under the "TechFormation" brand name. Many of the benchmarking statistics provided in this special report are updates on the statistics outlined in the flagship "Pennsylvania 2005 TechFormation Report: A Status Report and Growth Strategies for Technology Based Economic Development."

Beginning with an overview of the factors that are critical to an innovative economy, this report will provide an analysis of the impact of the manufacturing sector on Pennsylvania's economy, as well as an outline of the Commonwealth's competitive manufacturing clusters. Later, this report will provide details on the types of investments that the Commonwealth is making that are stimulating the transformation of this critical component of the state's economy.

The case studies and testimonials included in this report capture the strength of the collaborations that exist between the Commonwealth's manufacturing industry and its technology based economic development organizations. Pennsylvania's community of innovation-focused economic development organizations is providing resources and technical assistance at all stages of the business lifecycle that are critical to manufacturers.

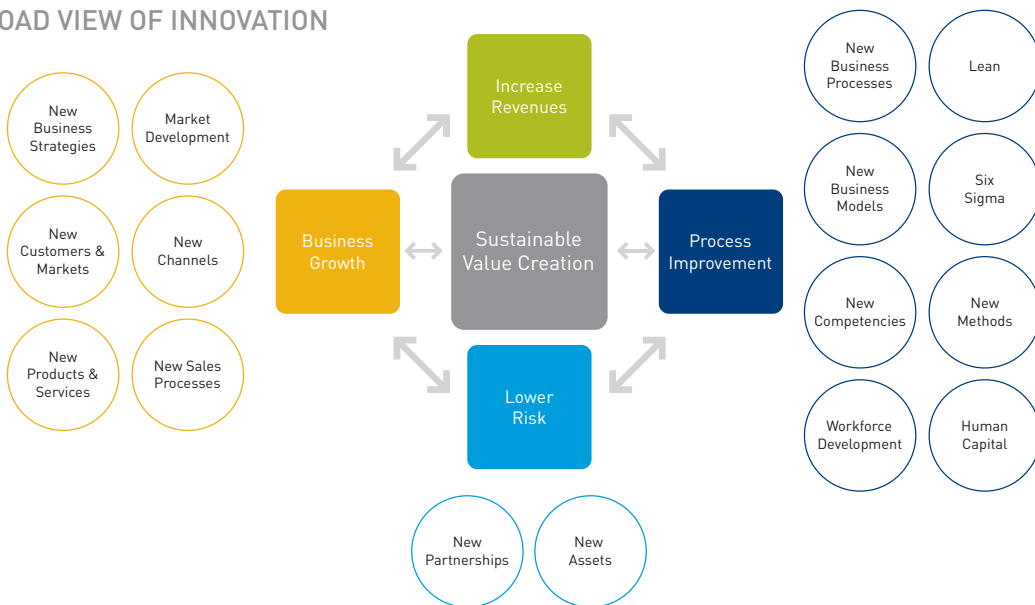
Guiding this effort is Governor Edward G. Rendell's comprehensive Manufacturing Strategy, which, as detailed in this report, is built on the premise that manufacturers that innovate are more likely to succeed in the global economy.



For more information on the state programs mentioned throughout this report, and to obtain a copy of the flagship "Pennsylvania 2005 TechFormation Report" please call 866.GO.NEWPA or visit newPA.com

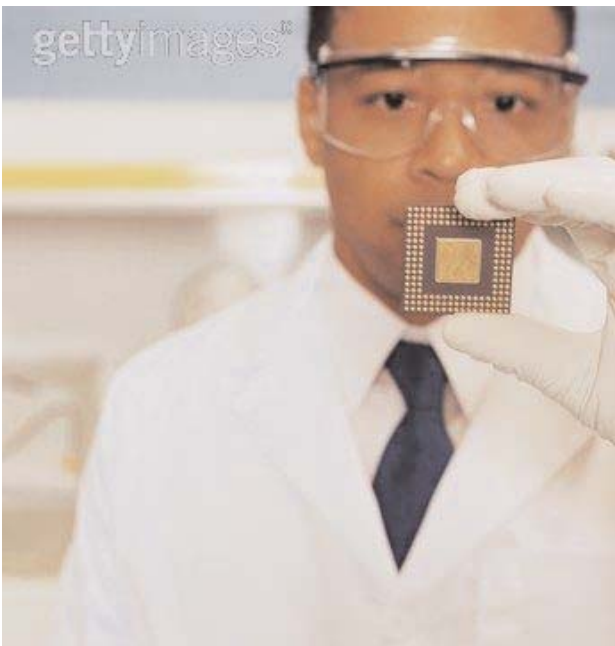
manufacturing innovation: a legacy and lever for the Commonwealth

BROAD VIEW OF INNOVATION



Traditionally, innovation involved new technologies, applications, products, services, and manufacturing processes, all designed to increase revenues. Today's focus must be expanded beyond revenue generation to encompass creating sustainable value. Building value for the long term can reduce risk, helping companies compete more effectively worldwide. Innovation embraces not only new technologies, but also new strategies for business growth and performance improvement. An ever increasing number of Pennsylvania firms drive hard along this path of innovation, supported by smart state investments and initiatives.

Pennsylvania is creating an innovation economy where our culture and infrastructure exist to develop ideas, thoughts, processes and products—and to translate these assets into sustainable economic value and wealth.



More than 40% of the U.S. and Canadian populations are within 500 miles of Pennsylvania, including over 40 percent of U.S. manufacturers and service industries.

THE BUSINESS CASE FOR MANUFACTURING INNOVATION

The Commonwealth is in the midst of the critical process of transforming its legacy economy—one that made Pennsylvania an industrial leader in the 19th and 20th centuries—into a new economy that is fueled by its globally competitive manufacturing sector. While some states are building new economies from the ground up, Pennsylvania is actively working to leverage two centuries worth of industrial infrastructure to build an agile economic engine with the capacity to renew these existing industries and create new markets.

The tactics and tools that help manufacturing businesses grow have changed dramatically over the past 40 years in response to a constantly changing global marketplace. Today, firms in other countries with long term labor cost advantages are daunting competitors in all commodity production and, increasingly, in higher-value goods as well. Multinational corporations are able to select suppliers globally and can set high bars for quality, cost and innovative solutions.

Pennsylvania's economic raw materials are its greatest competitive advantage—smart labor, an entrepreneurial spirit, creative people, available capital and critical support services. State government has been visionary in the creation and continued support of critical programs. Technology based economic development organizations across the state are pushing for increased prosperity. And it's working.

To succeed in the global marketplace, Pennsylvania manufacturers must: develop new products, product features and services; master the technologies that support innovation; and cut costs from their operations through lean processes. Market analysis and product life cycle management must become core business disciplines.

Dating to the days of Benjamin Franklin, Pennsylvania has consistently set new standards, created new economic opportunities and been at the forefront of many groundbreaking technological discoveries. The toil and perseverance of those who kept drilling deeper until they struck oil, the synergies of natural resources and human skills that built the steel industry, the clear vision of a simple glass jar that gained the public's trust and led to 57 varieties of Heinz ketchup; ingenuity was at the heart of these Pennsylvania manufacturing innovations. Now, in the early years of the 21st century, Pennsylvania manufacturers must continue on the path of innovation begun over the last two centuries in order to compete in today's global economy.

the impact of manufacturing in pennsylvania



Manufacturing contributes far more than any other sector to Pennsylvania's economy, generating more than \$65 billion, or over 16 percent of the annual gross state product.

According to the Pennsylvania Department of Labor & Industry, in 2005, more than 678,400 Pennsylvanians were employed in the manufacturing industry.

Manufacturing Value Added is one method of measuring the productivity of labor and capital. High Value Added suggests the presence of a highly skilled workforce, firms with higher productivity or capital intensive manufacturing firms.

Pennsylvania's importance is seen below based on its relative standing among the referenced group of states, against which it was measured in the 2005 Pennsylvania TechFormation Report; this data updates those statistics.

BENCHMARKING PENNSYLVANIA MANUFACTURING: COMPARISON STATES

STATE	PA BORDER STATE	SHARE OF US V.A.*	US RANK	STATE V.A./PA V.A.
Ohio	Yes	5.7%	3	117%
Michigan	No	5.1%	4	104%
Pennsylvania	--	4.9%	5	100%
Illinois	No	4.9%	6	100%
North Carolina	No	4.7%	7	95%
New York	Yes	4.2%	9	86%
New Jersey	Yes	2.7%	12	55%
Maryland	Yes	1.0%	30	20%
Delaware	Yes	0.2%	44	5%

*Technical Definition of Manufacturing "Value Added" is a measure of output at the source. Unlike other accounting formulas, it is designed to eliminate material, such as purchased parts, and other costs not associated with the in-plant production-providing just a measure of "value added." All outputs are then gathered and aggregated to avoid "double-counting."

Data are for 2003. Source: US Census Bureau, Annual Survey of Manufacturers, May 2005

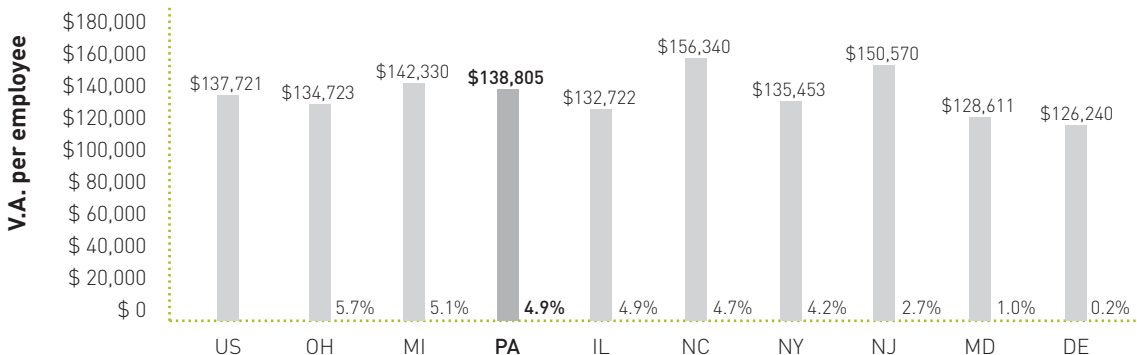


PA MAKING PROGRESS

Together, the below nine states (including Pennsylvania) account for one-third of the nation's manufacturing output. Pennsylvania ranks fifth in the nation for manufacturing value added, accounting for 4.9 percent of the U.S. total, up two-tenths of one percent from two years earlier.

MANUFACTURING VALUE ADDED, 2003

(State share of US V.A.)



Source: US Census Bureau, Annual Survey of Manufacturers, May 2005

Manufacturing Value Added—Major Manufacturing Sectors

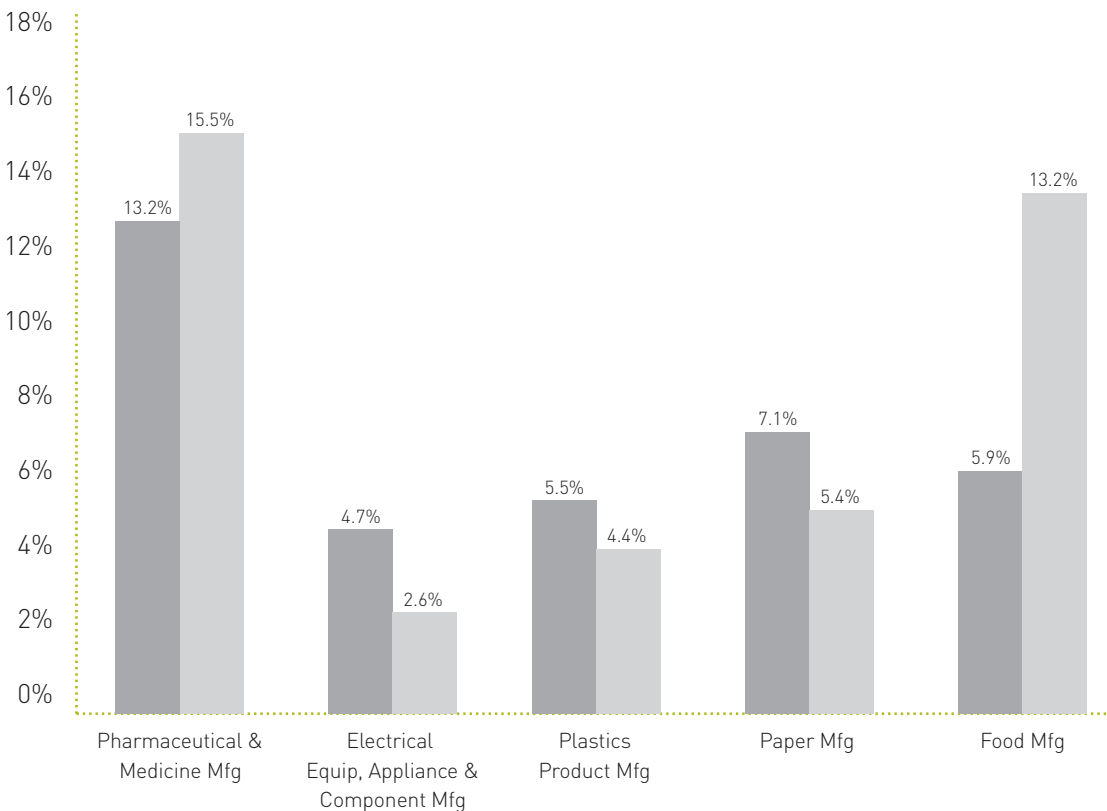
Five sectors account for just over 40 percent of Pennsylvania’s total manufacturing output, as measured by value added: pharmaceuticals and medicine; electrical equipment, appliances, and components; plastics products; paper manufacturing; and food manufacturing. By comparison, those sectors are not as concentrated nationally, accounting for just over one quarter of U.S. manufacturing output.

Pennsylvania’s large and prominent pharmaceutical and medicine manufacturing sector accounts for 13 percent of all U.S. output for the sector. Located in the heart of the bio-pharma corridor, Pennsylvania is home to eight of world’s largest bio-pharmaceutical companies, as well as world-class academic/research institutions that garner substantial National Institutes of Health funding.

Pennsylvania’s food manufacturing sector stands out nationally, as well, for the prominence of its candy and chocolate producers, bakeries, pasta manufacturers, and producers of snack foods.

PENNSYLVANIA VALUE ADDED: MAJOR SECTORS

■ Share of US Sector
 ■ Share of PA Total Mfg

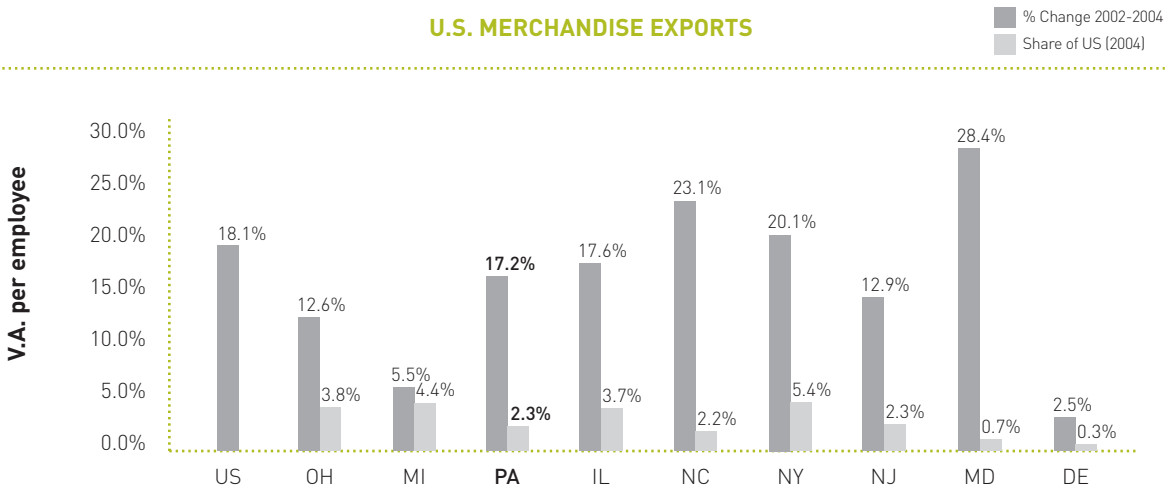


Source: US Census Bureau, Annual Survey of Manufacturers (2009)



Pennsylvania merchandise exports grew significantly faster than inflation from 2002-2004. The Commonwealth's foreign exports represent a smaller share of its manufactured output than other states because of strong domestic demand for products such as medicines, printing and food. At the same time, the Commonwealth is producing goods that are in demand abroad.

U.S. MERCHANDISE EXPORTS



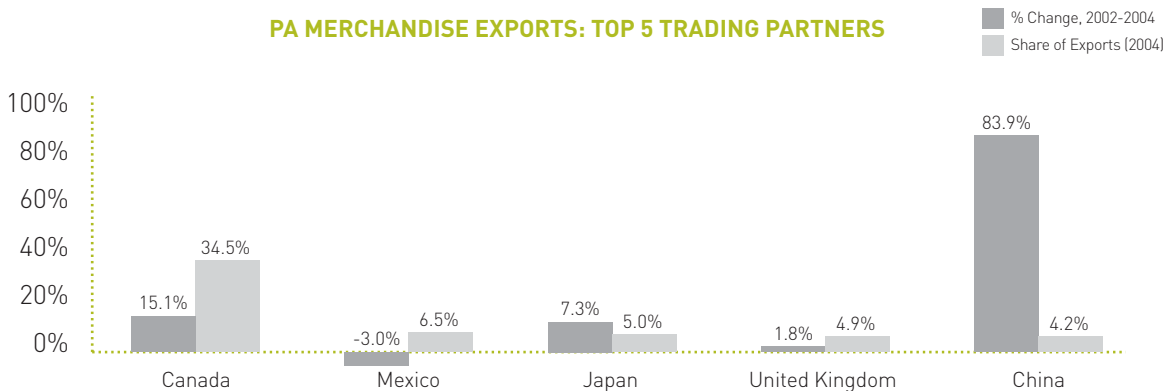
Source: US Census Bureau, Foreign Trade Bureau

Merchandise Exports—Top Trading Partners and Commodities

Merchandise exports enhance competitiveness and provide the region from which they originate with many benefits. Export income flows into a region and increases spending through a series of ripple—or “multiplier”—effects.

Pennsylvania's merchandise exports are not as concentrated when measured by commodity distribution trade partners and total output. The top five export commodities account for a little less than 7 percent of the Commonwealth's total merchandise exports, while the top 25 account for 18.5 percent. That diversity presents opportunities to discover new markets and new applications for existing products.

PA MERCHANDISE EXPORTS: TOP 5 TRADING PARTNERS



Source: US Census Bureau, Foreign Trade Division

Pennsylvania's top trading partners represent a mix of old relationships and new opportunities. The Commonwealth's top five partners receive 55 percent of shipments, with the next 20 percent consuming another one-third of all merchandise shipped. As the example of China illustrates, dramatic growth may arise from a small base—so that in a few years, the pattern of trade relationships may change. Motorcycles, medicine, aircraft parts, IT equipment and electrical plugs made up the top five Pennsylvania commodities and merchandise exports in 2004.

pennsylvania's competitive manufacturing clusters



Recently the Commonwealth and the Team Pennsylvania Foundation commissioned IBM Business Consulting Services to create the "Action Plan for Investing in a New Pennsylvania" which identified opportunities for Pennsylvania to compete in the global economy. This plan identifies manufacturing as one of Pennsylvania's four key competitive clusters, with two of the other three key clusters—life sciences and high technology—having manufacturing sub-sectors.

Clusters and their in-state suppliers contribute a substantial portion of Pennsylvania manufacturing export earnings.

While some industries in Pennsylvania's relatively mature economy have declined, at least 16 industry clusters, as identified by Deloitte Consulting in the 2004 "Manufacturing Pennsylvania's Future" report, are increasing output. These industries are brimming with opportunities for innovation.

To support these drivers, workers will need to shift from manual skill occupations into more technology driven manufacturing jobs. The Commonwealth's workforce development system has developed a list of high-priority occupations to guide investment through a Targeted Industry Cluster Strategy, developed by the Pennsylvania Department of Labor & Industry's Center for Workforce Information and Analysis. These job categories are in demand by employers, require higher skills and can provide family-sustaining wages.

One of nine high priority occupation clusters identified by this strategy is Advanced Materials and Diversified Manufacturing (AMDM). This cluster includes nearly all durable goods manufacturing and several non-durable goods industries. The AMDM cluster includes a group of high wage subclusters in which the Commonwealth retains potential competitive advantages—chemicals, electronics, metals, vehicles and printing. This cluster does not include food production, tobacco, lumber, paper, pharmaceuticals and manufacturers producing materials for the building industries. The AMDM cluster alone provides nearly half a million jobs with wages 20 percent higher than the statewide average.

Knowing which industries drive economic growth in Pennsylvania enables the Commonwealth to concentrate and leverage resources.

Pennsylvania Industry Clusters

(ranked by 2003 output dollars in millions)

Pharmaceuticals	\$6,684
Electrical Equipment	\$4,612
Plastics	\$2,818
Printing	\$2,287
Food	\$2,149
Paper	\$2,109
Basic Chemical	\$1,944
Metalworking Machinery	\$1,842
Architectural & Structural Metals	\$1,653
Machine Shops, Screw, Nut & Bolt Manufacturing	\$1,614
Other Fabricated Metals	\$1,398
Wood Products	\$1,302
Furniture	\$1,271
Resin, Rubber and Fibers	\$1,248
Glass	\$ 938
Medical Equipment	\$ 855

The above data was part of the macroanalysis performed by Deloitte Consulting, LLP in 2004 as part of the Manufacturing Pennsylvania's Future: Regional Strategies That Build From Current Strengths and Address Competitive Challenges report, as submitted to the Industrial Resource Centers of Pennsylvania, the Pennsylvania Department of Community & Economic Development, and the Team PA Foundation.

Advanced Materials & Diversified Manufacturing Cluster Statistics (2002)

Companies	12,338
Number of Jobs	495,482
Percent of Total PA Jobs9%
Average Annual Wages	\$43,061

Top Five Industry Clusters

(ranked by 2002 employment)

- Plastics Product Manufacturing
- Commercial Lithographic Printing
- Iron and Steel Mills
- Machine Shops
- Railroad Rolling Stock Manufacturing

Top Five Occupations & Average 2002 Annual Wage

- Team Assemblers (\$25,120)
- Supervisors, Production (\$44,280)
- Machinists (\$32,150)
- Production Workers (\$24,730)
- Electrical & Electronic Equip. Assy. (\$25,360)

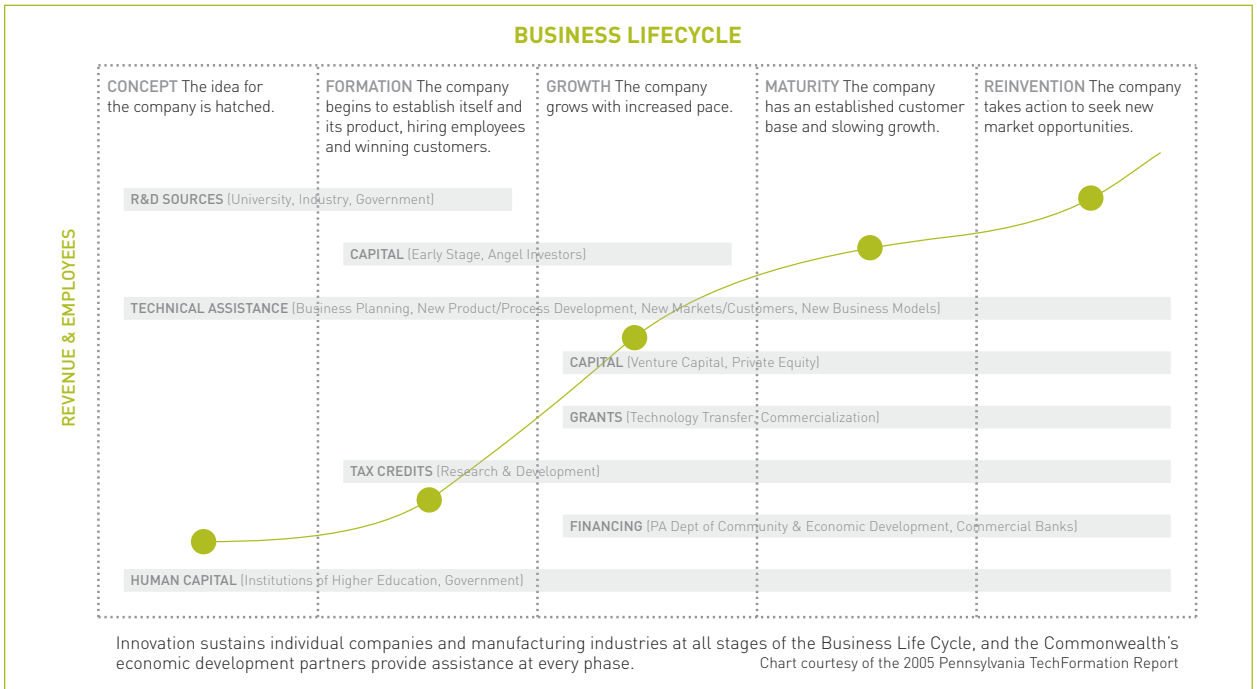
The above data was part of the macroanalysis performed by the Center for Workforce Information and Analysis, PA Dept. of Labor and Industry as part of their 2002 "Pennsylvania's Targeted Industry Clusters" report.

growth through
innovation



HELPING MANUFACTURERS INNOVATE AT EVERY STAGE

Manufacturing sectors, like individual companies, have life cycles and the Commonwealth's strategy is helping industries innovate: at concept, formation, growth, maturity, and perhaps most important to our manufacturing base, reinvention.



CONCEPT >FORMATION >GROWTH

CASE STUDY: SOLAR TECHNOLOGY

Solar Technology employs 55 and manufactures innovative, solar powered traffic control equipment and devices for industrial and commercial applications. The business has grown in 13 years from a rented garage to a 65,000 square foot facility. Early on, Solar sought help from the Small Business Development Center at Lehigh University, one of 16 university-based centers across the state to formulate a business plan and learn how to market the business and grow.

When the company moved into the Bridge Works Enterprise Center, a new business incubator, to start manufacturing, Ben Franklin Technology Partners funded product research and technology innovation. Solar Technology contacted the Manufacturers Resource Center (MRC) for marketing assistance and Penn State's Pennsylvania Technical Assistance Program for environmental and safety issues.

Among the 30 projects Solar has carried out with MRC assistance were ISO 9001:2000 implementation and

laying out a new manufacturing facility. MRC helped the firm enter the promotional and special events market by assisting with engineering plans and documents for marketing a new line of Agile Displays. Currently, MRC is helping the company develop an enhanced product through the Integrated Product Development Program at Lehigh University. A team of engineering, finance and marketing students will design a solar powered radar speed trailer meeting Pennsylvania Department of Transportation requirements.

"Our experience in Pennsylvania is definitely unique. When we meet with other equipment manufacturers nationwide, they tell us that other states do not have a support network like Pennsylvania's that helps companies grow and prosper throughout their life cycle."

—Byron Zerphy, President, Solar Technology

Private and public professionals are working together as never before to help Pennsylvania manufacturers innovate.

Economic development organizations and industry associations serve Pennsylvania manufacturers throughout the Commonwealth to forge collaborations among geographically dispersed initiatives. For instance, the Pennsylvania Economic Development Association, a statewide association of local, state, corporate and nonprofit economic development professionals, provides leadership and communication between statewide economic development initiatives.

Local economic development organizations including the Johnstown Area Regional Industries and the Bucks County Economic Development Corporation partner with the Commonwealth and other regional business leaders to bring new, international business and industry to Pennsylvania, as is detailed in the below Gamesa Corp. case study.

GROWTH

CASE STUDY: GAMESA CORP

After 18 months of investigating suitable U.S. locations for its first North American factory, Gamesa Corp. of Spain chose the Cambria County Industrial Park located in Southwest Pennsylvania. Its aptly named Fiberblade LLC plant, made possible in part through a total of \$22 million in Commonwealth assistance, will produce blades for modern windmills. In addition, the Commonwealth's assistance has helped Gamesa create three new modern manufacturing centers on 20-plus acres of U.S. Steel's former Fairless Hills industrial site in Bucks County. The combination of the Cambria and Bucks County new operations establishes a strong presence for Gamesa in Pennsylvania, where the company has invested a total of \$84 million to locate its North American headquarters in Philadelphia and expand its manufacturing presence in the two counties. The Fiberblade plant, plus Gamesa's development of wind farms and Philadelphia region operations in Bucks County will create up to 1,000 jobs during the next five years, securing a portion of the United States' burgeoning wind-power industry.

"More than two dozen state, federal, and local organizations from both the public and private sectors provided resources to help Gamesa establish its new Fiberblade subsidiary near Johnstown. The help and cooperation we received from Commonwealth agencies, coupled with the enthusiasm and assistance of local organizations, made our choice of locations easy. We simply could not ask for a better place to build our first U.S.-based manufacturing operation."

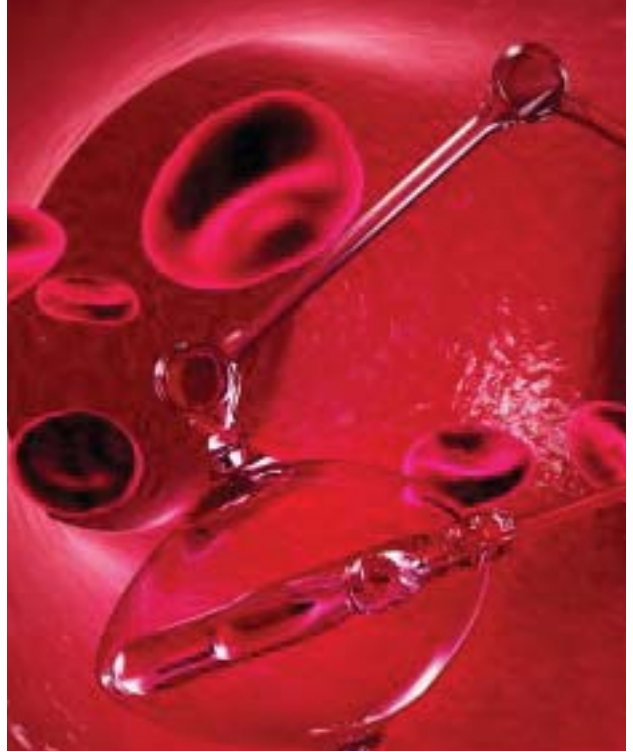
—Alberto Gros Isla, Plant Manager, Fiberblade LLC

Three Pennsylvania industries in the midst of transformation illustrate the business life cycle:

Nanotechnology, an emerging field, will drive established industries to new growth and give birth to industries now unknown.

Powder metals is considered a mature industry—yet Commonwealth investment and cooperative stakeholder efforts have concentrated and fueled growth, reinventing the industry.

Plastics technologies and processing, an industry maturing in growth potential and job opportunities, is seeing growth through new materials, new processes, and new customer applications for its products.



NANOTECHNOLOGY

Nanotechnology operates at an incredibly tiny level, with particles smaller than 1/800th the size of a human hair. At this basic molecular level, common materials change their characteristics and offer possibilities that are attracting a large and growing level of research dollars. By 2015, nanotech is expected to be a \$1 trillion industry, one that Pennsylvania and many other states are betting heavily on to emerge as an economic winner. Already there are at least 80 consumer products on the market using nano materials, from car paint to stain resistant trousers.

Pennsylvania's statewide strategy, the Pennsylvania Initiative for Nanotechnology (PIN), is bridging the commercialization gap to help companies bring products to market. The PIN combines the efforts of the Commonwealth's six research universities, the state system of higher education, economic development organizations, the Pennsylvania Department of Community and Economic Development, and dozens of companies.

To date, more than \$42 million in public funds has been invested to build out facilities and jump-start programs, leveraging more than \$375 million in private, university, and federal awards

for work in nanotechnology and related areas. More than 125 companies have directly benefited.

Over the past six years, Pennsylvania has made a concerted effort to coordinate nanotechnology research and development and workforce development efforts throughout the Commonwealth. These investments are helping to make Pennsylvania a worldwide leader in nanocommercialization. Two examples of such nanotechnology commercialization-focused investments are: The Pennsylvania Nanomaterials Commercialization Center comprised of a team of regional leaders and the Pittsburgh Technology Council, and the Nanotechnology Institute, founded by the Ben Franklin Technology Partners, the University of Pennsylvania and Drexel University.

Underpinning all of the Commonwealth's commercialization investments in nanotechnology is its investment in workforce development, as exemplified by the Nanomanufacturing Technology Partnership, administered by The Pennsylvania State University and involving 30 colleges and universities across the state. More than 150 associate degrees in nanofabrication have been awarded and more than 30 companies using nanotech are employing these graduates.

GROWTH

CASE STUDY: PLEXTRONICS, INC.

Over the next decade, electronics will permeate our lives at an evermore personal level. Small transistors will be printed on consumer packages. Lighting and displays that use print technology will allow displays to be printed on the back of cereal boxes and other surfaces targeted by advertisers. Printable solar cells will power portable electronic devices.

Plextronics, Inc. is riding this wave of technology development by pioneering the commercialization of inherently conductive polymers. Using nanotechnology, Plextronics has developed a way to make ordinary plastics conduct electricity. A Carnegie Mellon University offshoot, the company leverages more than a decade of research, for a new generation of materials that combines the functional benefits of conductivity with the design, processing, weight and cost advantages of plastics.

Funding from the Ben Franklin Technology Partners, the Pennsylvania Department of Community & Economic Development, and local investors has provided an expanded laboratory and additional capital for workforce expansion.

“Critical economic assistance from the Commonwealth has been instrumental to our growth. From loans aiding in the expansion of our manufacturing equipment through the Machinery Equipment Loan Fund, to key resources from the Department of Community and Economic Development, Ben Franklin Technology Partners, the Department of Environmental Protection, Pennsylvania Energy Development Authority, and Allegheny County; these resources have insured that we can grow and thrive in Pennsylvania. This invaluable support means that we can look forward to another year of significant growth and industry leadership.”

—Andy Hannah, CEO of Plextronics

POWDER METALS INITIATIVE

An outgrowth of the carbon industry, which began making battery electrodes for the automobile industry in the early 1900s, powder metals developed rapidly as major carbon manufacturers developed the technology to make other economical components for automobiles.

Powder metals manufacturing has grown from its beginnings in the 1950s into a viable industry, creating more than 50 Pennsylvania companies that are providing 15,000 well-paying jobs.

The Ben Franklin Technology Partners and the North Central Regional Planning and Development Commission developed a program designed to increase employment in the powder metals industry. The powder metals companies based in the region were awarded contracts to develop and implement plans for creating commercially viable, new powder metals parts applications.

The Commonwealth has supported the powder metals workforce initiatives in north central Pennsylvania with annual funding to maintain and create a competitive, skilled workforce. Funding supported the development of a powder metals technology degree at Penn State Dubois Campus. Training support for incumbent workers across the region is organized through the regional community education councils. Secondary school students have also benefited through access to the Tech Prep Program, which links secondary and post-secondary schools, and a metalworking facility at St. Mary's High School. Mini-grants to the region's secondary and vocational technical schools will help develop the future powder metals workforce.

MATURE

CASE STUDY: ALLEGHENY COATINGS

Allegheny Coatings, which employs 82 at its Ridgway facility, applies high performance coatings for parts used in a variety of industries. Their coatings are used primarily to fill the surface voids, or porosity in powder metals parts, and combat corrosion. Allegheny Coatings sought to commercialize their promising research.

Allegheny Coatings has increased employment and is relocating to a larger facility. Growth in use of P/M parts because of Allegheny Coatings' innovation will have a ripple effect throughout its industry and its supply chain, especially in Pennsylvania.

"The Ben Franklin funding enabled Allegheny Coatings to bring material R&D to initial commercial fruition expeditiously, resulting in the creation to date of 30 powder metals industry-related jobs. It is estimated that those jobs contribute between \$800,000 and \$1 million to the local economy."

—Brian R. Smith, Manager
Technology & Development, Allegheny Coatings

"Programs like this Ben Franklin Powered Metals Initiative in partnership with the North Central Regional Planning and Development Commission have the potential to reduce the loss of manufacturing jobs we've experienced in Pennsylvania over the last two decades.

With increased access to new technology and new markets, the Commonwealth's manufacturers will continue to create more jobs."

—Dennis Yablonsky, Secretary, PA Department of
Community & Economic Development

Pennsylvania's plastics industry has achieved new growth and direction with assistance from significant Commonwealth and private resources.

PLASTICS TECHNOLOGY

The Pennsylvania Plastics Initiative, supported by a US Department of Labor grant, offers funding and support to link regional initiatives into a broader statewide workforce network supporting every aspect of the plastics industry's transformation. This network includes the Pennsylvania Workforce Investment Boards, the Pennsylvania State University, Pennsylvania College of Technology, the statewide system of Industrial Resource Centers and the Ben Franklin Technology Partners.

The Plastics Technology Center & the Plastics Manufacturing Center at Penn College

The Northwest Pennsylvania Industrial Resource Center in Erie and Penn State Erie, The Behrend College operates the Plastics Technology Center. This program promotes competitiveness and growth, in products and knowledge, in the smaller manufacturing business sectors.

The Plastics Manufacturing Center at the Pennsylvania College of Technology offers extensive material testing laboratories, industrial scale process equipment, world-class training programs and consulting staff.

Both centers support new product design and development with material selection, testing and analysis, process technology, and workforce development.

MATURE

CASE STUDY: SAY PLASTICS, INC.

Since 1986, Say Plastics, Inc. of McSherrystown has custom designed and manufactured parts and part holding devices, such as packaging and fixtures, for Original Equipment Manufacturer companies, primarily using vacuum thermoform technology.

When several larger clients relocated manufacturing facilities to southern states and offshore, Say Plastics realized it had to diversify to survive. It sought new markets outside current heavy manufacturing applications to serve more local and regional customers.

Say Plastics also needed to convert from 'job-to-job' mode to full-time production to maximize plant capacity and turned to MANTEC, Inc., the York-based Industrial Resource Center. The team researched local industries, identifying a heavy concentration of food manufacturers that were prime candidates for Say's products.

Say Plastics added a new product process, blow molding, to produce wide-mouth PET resin containers for food packaging. Adding this process required an investment of \$1.4 million in machinery and equipment upgrades and worker training, supported by a significant Commonwealth investment. Subsequently the firm entered the market with new capability, gained new customers and won new contracts.

"The production-based mode has increased our sales significantly ...this change has taken us to another level."

—Ronald Staub, General Manager, Say Plastics

At every stage of the manufacturing business life cycle, information technology is both essential to doing business and a major tool for innovation.

Ben Franklin Technology Partners (BFTP), a Commonwealth program providing technology based economic development assistance throughout Pennsylvania, helps companies innovate through funding, expertise, and innovative business alliances. From 2002 to 2004, the four regionally based BFTPs provided nearly \$22 million in assistance to manufacturing companies, attracting a match of approximately \$42 million. These investments created more than 1,100 Pennsylvania jobs and retained more than 2,400.

REINVENTION

CASE STUDY: NOBLE BIOMATERIALS, INC. AND SAUQUOIT INDUSTRIES

Sauquoit Industries, one of the oldest textile mills in the United States, manufactures metal-coated fibers that control electrical static discharge and electromagnetic interference. To help the company stay competitive, the Ben Franklin Technology Partners linked it with Penn State and the University of Scranton to improve its silver technologies and streamline its manufacturing operations.

Noble Fiber Technologies, Inc. provides value and performance-enhancing textile products with anti-microbial and therapeutic uses to consumer, medical, and military markets. Its main product, X-STATIC®, is used by Johnson & Johnson, Adidas, Puma, Umbro, and Hugo Boss. X-Static has been adopted by NASA, the European Space Agency, and the U.S. Army and Marine Corps for use in undergarments and boot socks.

Following an investment from TL Ventures, a venture capital firm, Sauquoit and Noble Fiber merged to form Noble Biomaterials. To date, the Sauquoit and Noble Fiber strategic partnership has created 24 jobs and retained 44. Noble Fiber has gone from \$70,000 in

annual sales seven years ago to recently generating more than \$1 million in sales in one month. Recently, the company placed 86th on Inc. magazine's top 500 fastest-growing private companies.

“Ben Franklin Technology Partners had tremendous faith in X-STATIC® and all its possibilities. They asked us very direct questions, making us think about how to best use our resources. When you work with Ben Franklin Technology Partners, you get the overwhelming feeling that you are not alone.”

—Jim Walsh, CFO, Noble Biomaterials, Inc.

investment in manufacturing innovation



Pennsylvania invests significantly in manufacturing innovation, positioning the Commonwealth as an epicenter of manufacturing innovation on a global scale. **In fact, from 2003 to 2004, the Governor's Action Team, a group of economic development professionals, increased the number of successfully completed manufacturing company projects by 68 percent and provided over \$282 million in assistance to those firms.**

These investments have been driven by "Manufacturing Innovation: A Strategy to Enhance the Competitiveness of Pennsylvania Manufacturers" which was released by Governor Rendell in 2004. This comprehensive strategy initiates, expands and integrates programs supporting areas critical to manufacturing innovation: financial, workforce development, technical support, communications and research.

Governor Rendell's Manufacturing Strategy is built on the premise that businesses that innovate and actively try to remake themselves are more likely to succeed than those that resist change.

In 2004 the Governor's Manufacturing Summit brought together more than 200 manufacturers, labor leaders, government workers, economic development organizations and service providers. These stakeholders examined current challenges facing Pennsylvania manufacturers and discussed strategies to create a globally competitive, advanced manufacturing industrial sector.

THE COMMONWEALTH'S COMPREHENSIVE STRATEGY OFFERS SEVERAL OTHER POWERFUL TOOLS FOR PENNSYLVANIA MANUFACTURERS:

The Pennsylvania Manufacturing Ombudsman provides information and referrals to manufacturers requesting services in areas such as financing, education and training, technical assistance and regulatory issues. The Ombudsman also serves as the primary advocate for manufacturing businesses to help them navigate programs and regulations when dealing with state agencies.

The Office of Trade Policy helps develop Pennsylvania's trade and investment policies, advocates for businesses, and works to ensure that competitors play by the rules. It serves as a resource and can advise firms on how to take advantage of trade rules and how to navigate the export control and sanctions regime.

The Governor's Action Team is the single point of contact for businesses considering locating or expanding in Pennsylvania. The team provides critical information for evaluating facility locations, including workforce characteristics, demographic information, permit and regulation assistance, infrastructure and utility data, state and local tax information, quality of life statistics and information, and site details.

CASE STUDY

Recently the Governor's Action Team worked with **Seton Company** to consolidate its operations in Bedford County from its New Jersey facility, creating 100 new jobs over the next three years and retaining 265 jobs at its Saxton facility. Seton Company manufactures leather interior products for the automobile industry. Its expansion included purchasing and relocating machinery and support equipment, renovating the Saxton finishing facility and adding on 6,000 square feet. The company was offered a \$400,000 Opportunity Grant and \$150,000 in Job Training Assistance.

"This project will result in the preservation and addition of jobs and economic development for Saxton and Bedford County. It is also a model for bi-partisan government action and business cooperation."

Improving the Commonwealth's business climate and meeting manufacturers' financing needs will help companies prosper and create jobs. Capitalizing on manufacturing innovation will also attract high growth firms focused on the research, development, and commercialization of new products and technologies. The following Commonwealth-funded programs are promoting manufacturing innovation:

The Machinery and Equipment Loan Fund (MELF) supports machinery projects for businesses creating or retaining jobs within the Commonwealth. Recent programmatic changes have increased available funding by \$50 million.

The New Pennsylvania Venture Capital Investment Program is expanding equity investments through the infusion of \$60 million into venture capital partnerships that commit to a 3:1 match of those funds. This program will result in an additional \$240 million pool of equity capital for Pennsylvania companies.

The New Pennsylvania Venture Guarantee Program is attracting investment from top tier investment funds by guaranteeing a portion of the investments in Pennsylvania companies. This \$250 million guarantee will create a \$500 million pool of available new capital.

Commonwealth Partnerships have further expanded access to capital by partnering with commercial banks to create three low interest loan pools totaling \$450 million for manufacturers and small businesses.

The Research and Development Tax Credit Program has been expanded by \$15 million, for a pool of \$30 million, and now allows for the tradability of the credits, which can be a financing resource for early stage manufacturers. Commitment to research and development investment by public, private and academic labs breeds new companies and enables employers to compete in global markets. Turning in-state research into new jobs is critical to the Commonwealth's economic success.

The Second Stage Loan Guarantee Program is another source of working capital for young companies, 2-7 years old, in key sectors: manufacturing, biotech and technology oriented companies. The guarantee allows participating Pennsylvania banks to increase their investment in early stage technology companies.

Governor Rendell signed into law a \$2.8 billion economic stimulus package that will leverage an additional \$5 billion in matching funds, much of it benefiting manufacturers.

The Pennsylvania Industrial Development Authority is the Commonwealth's low-interest loan financing program for land and building acquisition, construction and renovation, resulting in the creation or retention of jobs.

The Innovation Partnership, created by a team of economic development organizations and partly funded by the Commonwealth, is increasing the quality and success of Pennsylvania companies' proposals to federal research agencies, specifically for funding from the **Small Business Innovation Research Program (SBIR)**. The partnership provides technical review and financial assistance.

The Commonwealth's transportation and communications networks transport products to these customers quickly and efficiently. Pennsylvania manufacturers pay no sales tax on machinery and equipment and no capital stock tax on assets used in manufacturing. In addition, there is no tax on personal property or inventory. Businesses located in Pennsylvania's **Keystone Opportunity Zones** pay virtually no taxes for ten years.

The Office of International Business Development provides international trade services to Pennsylvania's manufacturers through export consulting, access to ports, attraction of foreign direct investment and opens doors to world markets through 22 authorized Pennsylvania international representatives located in 17 countries worldwide.

The SBIR program provides almost \$2 billion in federal research and development set-asides for small technology oriented businesses. Companies can develop technologies, products, and services for sales to the private sector or to the government. Ten federal agencies set aside 2.5 percent of their external R&D budget for SBIR research topics.

The federal government's **Small Business Technology Transfer Program (STTR)** is similar to the SBIR Program in that it funds cooperative R&D projects between a small business and a university, federally-funded R&D center, or nonprofit research institution.

The Technology Adoption Grant Fund, launched by the Ben Franklin Technology Partners in 2004, provides up to \$50,000 in grant funds to manufacturing companies with less than 250 employees that are conducting research and development initiatives to bring new products to market, refine existing manufacturing processes or create new processes. This program, which is offered in nine counties in the southwest region of the state, links companies with nonprofit centers of excellence (including the Industrial Resource Centers) to find solutions for product development or manufacturing process development problems.

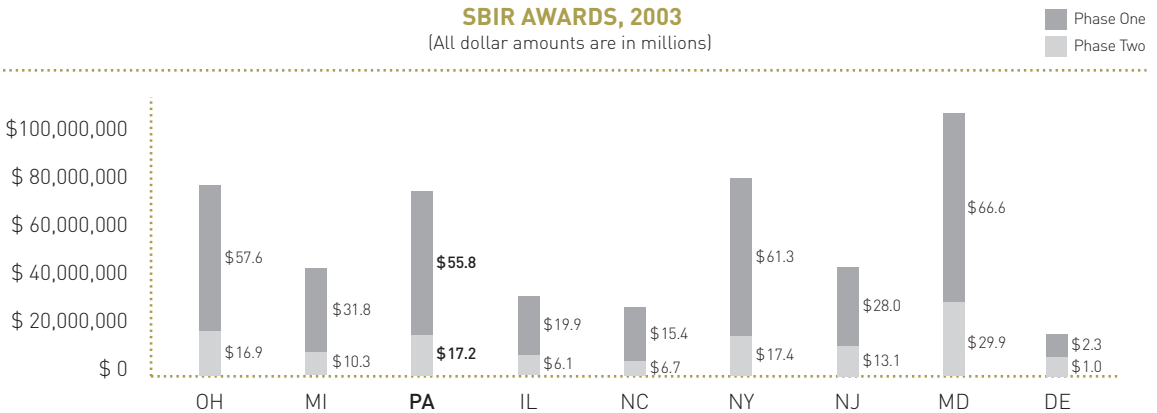


PA MAKING PROGRESS

Pennsylvania ranked 8th in the nation in the value of Phase 1 and Phase 2 awards in 2003, up from 9th place in previous years.

SBIR AWARDS, 2003

(All dollar amounts are in millions)



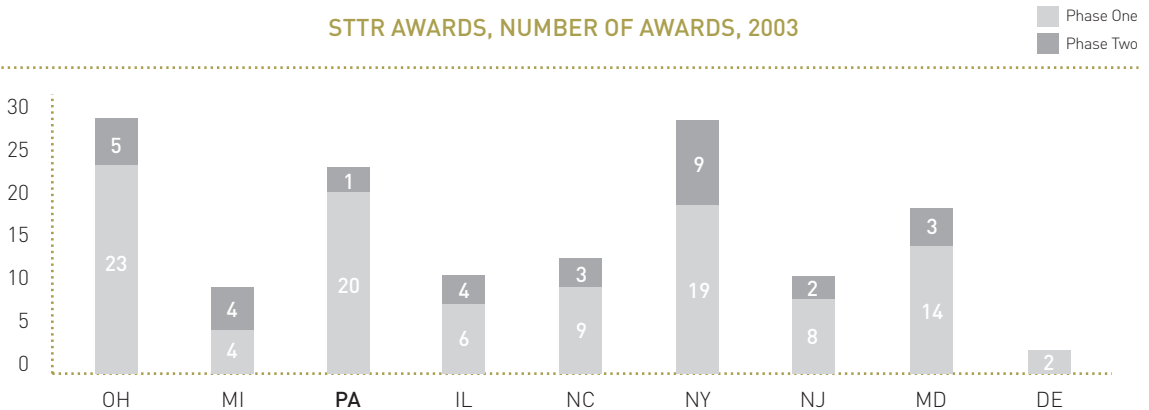
Source: US Small Business Administration, Office of Technology



PA MAKING PROGRESS

Despite receiving only a single Phase 2 award in 2003, the Commonwealth's increased Phase 1 STTR activity continues to signal improvement. Pennsylvania moved up to 7th place from 11th, based on Phase 1 award dollars, and to 6th place from 10th, based on the number of Phase 1 awards. Funded STTR proposals totaled \$2.4 million.

STTR AWARDS, NUMBER OF AWARDS, 2003



Source: US Small Business Administration, Office of Technology

Manufacturers need a trained and educated workforce that can adapt to new business models, innovative practices, and shifting priorities.

Today 82 percent of businesses report that they have trouble hiring qualified workers. This dilemma will be compounded by 2012, when it is estimated that 60 percent of the job growth will be in occupations demanding at least post secondary vocational training.

Pennsylvania is answering this challenge with the **'Jobs Ready PA' Initiative**, investing \$91 million in new state funds to leverage \$2 billion in the state's workforce and education systems.

OTHER HIGHLIGHTS OF THE COMMONWEALTH'S WORKFORCE DEVELOPMENT PROGRAM:

- **Industry Partnerships Grants** and **Incumbent Worker Training Grants** identify and address common workforce needs within similar industries. The PA Department of Labor & Industry is providing \$5 million and \$15 million, respectively, for these programs.
- **Workforce Advancement Grant for Education Program** provides \$10 million in grants through the Pennsylvania Higher Education Assistance Agency Foundation to less-than-half-time students for continued higher education in High Priority Occupations.
- **The Workforce Leadership Grant** and **Dual Enrollment** programs allow students to earn both two- and four-year degree credits while in high school or community college.
- **Customized Job Training Program** and the **WEDNet** programs provide more than \$30 million in job training grants to train new hires and upgrade existing workers' skills. This flexible program teaches both basic skills and operations specific to the employer's business.
- **Pennsylvania CareerLink** delivers one-stop career services to both employers and job seekers. These include posting job opportunities, screening, and referrals to manufacturers looking for qualified employees.

CASE STUDY

Education innovations are shaping the Commonwealth's future technicians, technologists, and engineers. The **Applied Engineering Technology Initiative (AET)** is a regional industry-led education and economic development effort involving the state and federal governments, community colleges, four-year institutions, high schools, regional economic development organizations, and the workforce investment community. Core partners include Delaware County Community College, Drexel University, and the Philadelphia-based Delaware Valley Industrial Resource Center.

The project is building an integrated AET infrastructure with a career and educational path that begins in high school and culminates in a baccalaureate degree. The AET initiative includes the **2+2+2 Career Pathways Project** at Delaware County Community College, which won a Governor's Achievement Award from the Pennsylvania Department of Education. The project was funded by the Pennsylvania Department of Community & Economic Development under the **Workforce Leadership Grant Program**.

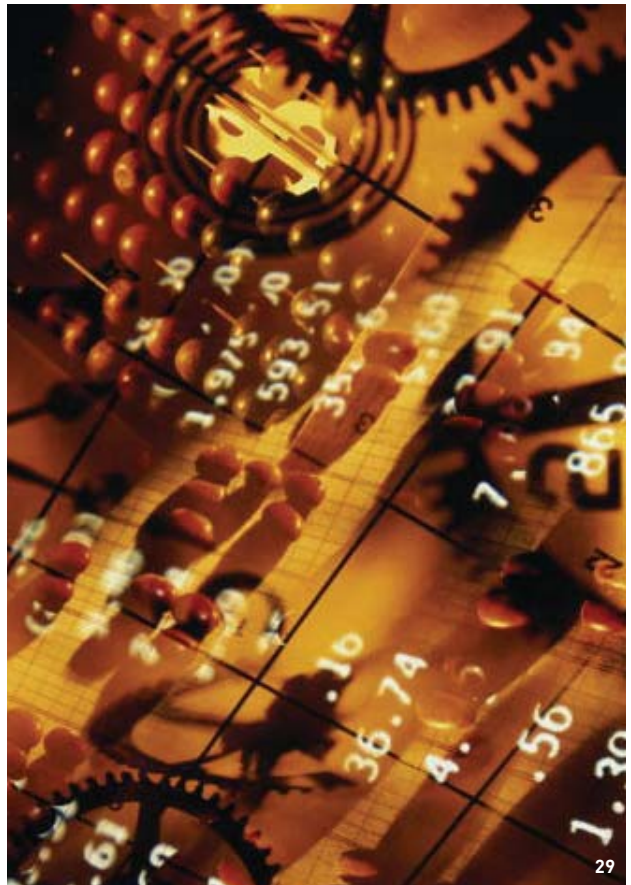
A major component of the Governor's Manufacturing Strategy is the Industrial Resource Center Program: a unique economic development partnership with access to state and national networks of expertise.

Created in 1988, the **Industrial Resource Centers (IRCs)** are providing an array of technical assistance to small and medium-sized manufacturers in Pennsylvania, funded by the Commonwealth. The IRCs provide:

- Market analysis and development, strategic planning
- Product development assistance
- Technology selection, implementation and optimization
- Production, planning and inventory control
- Quality assurance and improvement (ISO certification assistance) and lean manufacturing
- Supply chain development
- Training and workforce development
- Information technology services, e-business, website assistance, and Customer Relationship Management assistance

PENNSYLVANIA'S 2005 STATE BUDGET ALLOCATED AN ADDITIONAL \$5 MILLION TO THE IRCS TO EXPAND SUPPORT IN THESE CRITICAL AREAS:

- **Small-to-Medium-Sized Manufacturing Enterprise Strategy Capability** A business strategy service delivering world-class business planning, marketing, and sales processes, leadership and innovation consulting services
- **Product Innovation** A new product development capability with 'cradle-to-grave' services such as investment capital, product strategy and market identification, intellectual property licensing, design, engineering and manufacturing support
- **Performance Improvement** New and existing services to impact productivity and optimize operational performance



The IRCs are helping their clients break new ground in all aspects of their businesses.

INNOVATIVE MARKETING & SALES EFFORTS

CASE STUDY

SpectruMedix had nationwide product sales and solid relationships with many clients, but consumable items sales were not at desired levels. Central Pennsylvania's IRC, the Williamsport-based Industrial Modernization Center (IMC), determined weaknesses and opportunities through market research and interviewing 23 customers. IMC also researched one vertical market and developed a sound sales model. SpectruMedix now has information to guide customer service, product development, and sales efforts. The sales model offers a more systematic approach to targeting vertical markets, resulting in a higher return on sales efforts.

"SpectruMedix LLC has gained valuable insight into our customers' needs that we could not ascertain internally. This information was the foundation for the development of our new consumables sales strategy. We consider the work performed by IMC to be critical in the creation of our mature sales."

—Kevin R. Gutshall, Director of Sales & Business Development, SpectruMedix

INNOVATION THROUGH SUPPLY-CHAIN INTEGRATION

CASE STUDY

In 1987, **A-LOK** saw an opportunity to expand sales of construction seals to the precast, concrete pipe, tunnel segment and plastic pipe industries. The company looked at supply chain integration as an innovative way to achieve the goal and therefore made a strategic acquisition of **Poly-Tec Products Inc.**, a South Carolina manufacturer of custom extrusions. After two years, the company relocated Poly-Tec to Tullytown, Pennsylvania to fully integrate its manufacturing capabilities.

This growth strategy demanded innovative leadership and work processes. A-LOK/Poly-Tec formed a partnership with the Delaware Valley Industrial Resource Center (DVIRC). The company and DVIRC began creating a culture of operational excellence as they developed and executed a strategic plan. The DVIRC helped A-LOK/Poly-Tec train front-line leaders and conduct annual meetings with leaders across its enterprises to encourage change and increase communication.

With the full integration of steel fabrication, plastic injection molding and thermoforming, A-LOK/Poly-Tec and its partners are projected to supply more than \$15 million to the North American precast industry.

"The DVIRC and its strategic planning service enabled us to take a long-range view of where our business was heading. Our management team has stepped up to play a bigger leadership role in our growth and continued success. The DVIRC has improved our entire business, and I would not hesitate to recommend its services."

—Jim Westhoff, President, A-LOK/Poly-Tec

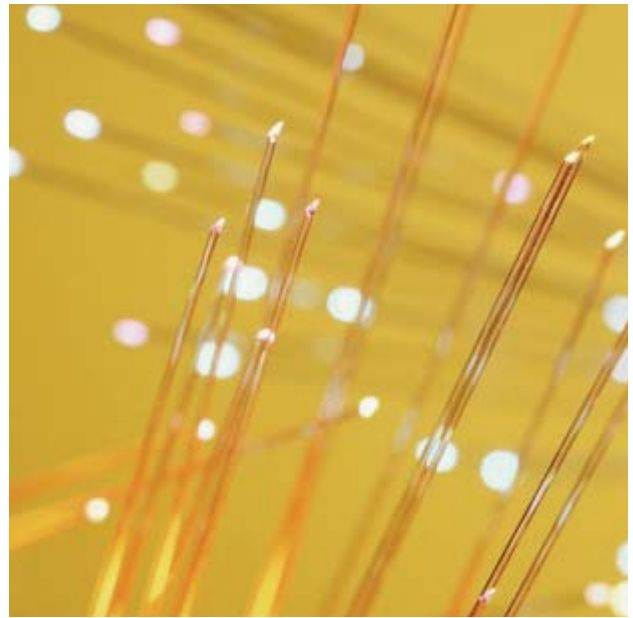
INNOVATIVE STRATEGIC PLANNING

CASE STUDY

Chamberlain Manufacturing supplies artillery projectiles/mortars to the U.S. Department of Defense. A changing business environment and increased reliance on “smart bombs” threatened to reduce the need for Chamberlain’s product. The Northeast Industrial Resource Center (NEPIRC) provided high-level strategic planning services to the company for more than a year. With this help, Chamberlain identified new opportunities in commercial business and developed a plan to seize those opportunities. The company also identified new strategic relationships and approaches to increasing opportunities in their business segment with the Department of Defense. As a result, Chamberlain experienced approximately \$7 million in increased business.

“NEPIRC provided us with needed clarity in our business direction and helped us bring a more formalized strategic planning process in-house.”

—Jim Flaherty, President
Chamberlain Manufacturing Corp.



INNOVATIVE PRODUCT DEVELOPMENT

CASE STUDY

Pittsburgh’s **Kerotest Manufacturing Corp.** produces high pressure valves. In business since 1909, Kerotest has a history of producing new products. Since the 1960s, foreign competition has been increasing, and now dominates some market segments. Bob Visalli, Kerotest’s president, believes the company can only survive through continuing innovation. Working with Catalyst Connection, the IRC in Southwestern Pennsylvania, Kerotest implemented a systematic product development process, then developed the Polyball™ polyethylene valve, getting the product to market faster because of the process. First year sales exceeded expectations and the valve continues penetrating niches identified during product development.

“Get ideas anywhere you can. You can never have enough. This process is a ‘funnel, not a tunnel,’ so only the good ones will make it through no matter how many you start with. Then, if you have more good ideas than money, just do the ones with the best potential.”

—Bob Visalli, President and CEO
Kerotest Manufacturing Corp.

transformation through innovation



The root of innovation is imagination. Conceive the greatness your manufacturing company has waiting for it—then contact any of the named partners in this report to begin the transformation.

Across the Commonwealth and the range of industries which built its legacy, transformation through innovation is under way. Responding to global competition requires going far beyond technology, far beyond new products and processes, reaching into every aspect of the manufacturing enterprise, including, but not limited to: business models and strategies; market research and analysis; sales process development; new product processes; supply chain integration; operational performance improvements and workforce talent initiatives.

Businesses, government, and education are bringing their strongest resources to bear, helping manufacturers reinvent themselves and build sustained value and growth for Pennsylvania. A comprehensive strategy and significant funding underpin these efforts. The initiatives summarized in this report are providing the capital, workforce and technical assistance throughout all stages of the business lifecycle, encouraging innovation and helping manufacturers compete in the global economy.

The Commonwealth, with leadership from the Pennsylvania Department of Community & Economic Development, has many partners that support innovation in the manufacturing industry. The following partners are playing an active role in helping to shape the future of manufacturing in Pennsylvania.

Department of Community & Economic Development DCED fosters opportunities for businesses and communities to succeed and thrive in a global economy, thereby enabling Pennsylvanians to achieve a superior quality of life. newPA.com

Department of Labor & Industry L&I promotes economic development and an improved business climate through a variety of initiatives and programs to help Pennsylvania's workforce remain world-class and globally competitive. www.dli.state.pa.us; to access your local CareerLink or local Workforce Investment Board, visit www.paworkforce.state.pa.us

Ben Franklin Technology Development Authority The BFTDA is a \$50 million state-based technology development program, one of the largest in the nation. BFTDA programs offer financial and technical assistance to businesses, entrepreneurs, communities, local governments, educators, and nonprofit organizations. newPA.com

Ben Franklin Technology Partners BFTP is an international model for innovation in technology based economic development. Serving the entire state, BFTP invests risk capital in emerging technology based enterprises and established businesses; provides hands-on technical and business expertise to spur growth and accelerate commercialization activities; and provides entrepreneurs with access to its extensive network of public and private resources. www.benfranklin.org

Catalyst Connection As part of the Commonwealth's Industrial Resource Center Network, Catalyst Connection exists to strengthen the Southwestern Pennsylvania economy by advancing the performance of the 13-county region's small- and medium-sized manufacturing businesses. The organization provides consulting services in advanced manufacturing techniques, workforce development, specialized training, strategic partnerships and the sharing of best practices. www.catalystconnection.org

The Center for eBusiness and Advanced Information Technology eBizITPA assists companies in Northwestern Pennsylvania all along the business lifecycle. Specific services include education and training programs in e-business and advanced information technology; access to online supply-chain management solutions; and programs to attract and establish viable businesses. www.eBizITPA.org

The Delaware Valley Industrial Resource Center The DVIRC serves manufacturers in the Greater Philadelphia Region through services such as education and training programs, consulting services, government affairs, workforce development, economic development partnerships, and world-class best practices. DVIRC is part of Pennsylvania's Industrial Resource Center Network. www.dvirc.org

Great Valley Technology Alliance The GVTA is helping create a self-sustaining technology based economy in Northeastern Pennsylvania. Services, programs and facilities include venture capital investment, research centers, technical education, and the attraction and retention of human capital. www.greatvalleyalliance.com

The Industrial Modernization Center As part of the Commonwealth's Industrial Resource Center Network, the IMC of central Pennsylvania helps small and medium-sized manufacturers by building awareness of best manufacturing technologies and management practices, and assisting in their implementation. www.imcpa.com

The Innovation Partnership IPart is a consortium of economic development and business assistance organizations located throughout Pennsylvania, dedicated to helping early stage technology companies secure federal funding opportunities. www.innovationpartnership.net

Local Development Districts Funded through the federal Appalachian Regional Commission and the Commonwealth, seven regional centers serve as liaisons to the federal and state governments throughout the 52 Appalachia designated counties in Pennsylvania. The LDDs provide services in international trade development, government procurement, electronic commerce development, rural transportation and infrastructure, and workforce development. www.paldd.org

MANTEC For South Central Pennsylvania manufacturers committed to attaining measurable improvement in productivity, profitability and competitiveness, MANTEC leverages private and public monies for cost-effective solutions delivered by proven providers. MANTEC is a member of the Industrial Resource Center Network. www.mantec.org

Manufacturers Resource Center The MRC of eastern Pennsylvania, part of the Commonwealth's Industrial Resource Center Network, helps small- and mid-size manufacturers enhance their ability to compete successfully by providing them with consulting, education and strategic partnering. www.mrcpa.org

The Nanomanufacturing Technology Partnership The NMT Partnership is a higher education collaborative dedicated to creating and updating a workforce in Pennsylvania trained in the exciting field of nanotechnology, coordinated by the Center for Nanotechnology Education and Utilization at the Pennsylvania State University. www.nanofab.psu.edu

The Nanotechnology Institute The NTI is a collaboration led by Ben Franklin Technology Partners, Drexel University and The University of Pennsylvania. It is the first comprehensive model of its kind designed to facilitate the research, development and commercialization of nanotechnology's real world applications. www.nanotechinstitute.org

Northeastern Pennsylvania Industrial Resource Center NEPIRC helps manufacturers by identifying opportunities to make the business more effective, constructing a plan that prioritizes key issues and ultimately developing solutions to the identified problems. www.nepirc.org

Northwest Pennsylvania Industrial Resource Center The NWIRC works to strengthen the competitive performance of smaller manufacturing firms in Northwest Pennsylvania. The NWIRC promotes workforce development and the implementation of best manufacturing technologies and management practices. www.nwirc.org

Pennsylvania Economic Development Association PEDA is the statewide association of local, state, corporate and non-profit economic development professionals that promotes sound economic development policies, provides leading edge economic development education, and nurtures an effective statewide economic development network to foster the economic health of the Commonwealth. www.peda.org

Pennsylvania Small Business Development Centers The statewide network of sixteen university-based SBDCs assists high growth and technology firms with sophisticated business management issues, including alternative financing, human resources, intellectual property, and product commercialization. www.pasbdc.org

Pennsylvania Technical Assistance Program PENNTAP supports technology based economic development by helping Pennsylvania companies improve competitiveness by providing a limited amount of free technology assistance to help resolve specific technology needs. www.penntap.psu.edu

Plastics Manufacturing Center The PMC at Pennsylvania College of Technology is one of the top plastic technology centers in the country with extensive material testing laboratories, industrial scale process equipment, world-class training programs, and highly skilled consulting staff. www.pct.edu/pmc

Plastics Technology Center The PTC at The Pennsylvania State University provides product design and development services within the United States for both business start-ups and existing small manufacturers. ptdc01.bd.psu.edu

Team Pennsylvania Foundation Team PA's goal is to make Pennsylvania the national leader in economic growth by working to keep and attract talent in Pennsylvania; providing business location decision-making information; networking state leaders, and funding important economic development, expansion and retention opportunities. www.teampa.com

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Edward G. Rendell, Governor



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STATE OF INNOVATION