JOBS IN THE MAKING:
ECONOMIC DEVELOPMENT STRATEGIES TO GROW MANUFACTURING
International Economic Development Council

IEDC is the world’s largest membership organization serving the economic development profession, with over 4,600 members and a network of over 30,000 economic development professionals and allies. From public to private, rural to urban, and local to international, our members represent the entire range of economic development experience. Through a range of services, including conferences, training courses, webinars, publications, research and technical assistance efforts, we strive to provide cutting-edge knowledge to the economic development community and its stakeholders. For more information about IEDC, visit www.iedconline.org.

Dennis G. Coleman, CEcD, FM
President and CEO
St. Louis County Economic Council
Chairman of the Board

William E. Best, FM
Senior Vice President, Manager Community Development Banking
PNC Bank
Immediate Past Chair of the Board

Jeffrey A. Finkle, CEcD
President and CEO
International Economic Development Council

© Copyright 2011 International Economic Development Council
Economic Development Research Partners (EDRP)

The EDRP Program is the “think tank” component of IEDC, designed to help economic development professionals navigate today’s rapidly changing economy by sponsoring and guiding practice-oriented research on critical issues. EDRP members represent the leaders in the field of economic development, working through the program to improve the knowledge and practice of the profession.

Ronnie Bryant
President and CEO
Charlotte Regional Partnership
EDRP Co-Chair

Paul Krutko
President and CEO
Ann Arbor SPARK
EDRP Co-Chair

Chuck Alvey
President and CEO
Economic Development Authority of Western Nevada

Darrell Auterson
President and CEO
York County Economic Development Corporation

Dyan Brasington
Vice President, Economic & Community Outreach
Towson University

Steve Budd
President
CityWide Development Corporation

Rob Camoin
Principal
Camoin & Associates, Inc.

John Chaffee
President and CEO
Economic Development Council of North Carolina’s Eastern Region

Tim Chase
President and CEO
Wichita Falls Chamber of Commerce and Industry

Kurt Chilcott
President and CEO
CDC Small Business Finance Corporation

Denny Coleman
President and CEO
St. Louis County Economic Council

JoAnn Crary
President
Saginaw Future, Inc.

Vann Cunningham
Asst. Vice President
Economic Development
BNSF Railway Company

Buzz David
President and CEO
Amarillo Economic Development Corporation

Julie Engel
President and CEO
Greater Yuma Economic Development Corporation

Michael Finney
President
Michigan Economic Development Corporation

Kurt Foreman
President
North Louisiana Economic Partnership

Jim Fram
Senior Vice President
Economic Development
Tulsa Metro Chamber

Greg King
Strategic Partners Officer
Georgia Tech Enterprise Innovation Institute

Tom Kucharski
President and CEO
Buffalo Niagara Enterprise

Michael Langley
President and CEO
Minneapolis Saint Paul Regional Economic Development Partnership
Barry Matherly  
Executive Director  
Lincoln Economic Development Association

Susan Mazarakes-Gill  
Executive Director  
Longview Economic Development Corporation

Kenny McDonald  
President and CEO  
Columbus 2020!

Phil Mitman  
President and CEO  
Lehigh Valley Economic Development Corporation

Jay Moon  
President and CEO  
Mississippi Manufacturers Association

Dierde Myers  
Director, Research & Economic Analysis  
Oklahoma Department of Commerce, Office of Business Location

Rick Platt  
President and CEO  
Heath-Newark-Licking County Port Authority

Sandy Pratt  
Director  
Oklahoma Department of Commerce, Office of Business Location

Craig Richard  
Chief Economic Development Officer  
Greater Houston Partnership

Robin Roberts-Krieger  
Executive Vice President  
Greater Oklahoma City Partnership

Liz Rooks  
Interim Presidents and CEO  
Research Triangle Foundation of North Carolina

Bill Sproull  
President and CEO  
Richardson Economic Development Partnership

Allison Thompson  
Executive Director  
Cedar Hill Economic Development Corporation

Kim Walesh  
Chief Strategist  
City of San Jose, Office of Economic Development

Rick Weddle  
President and CEO  
Metro Orlando Economic Development Commission

Roy Williams  
President and CEO  
Greater Oklahoma City Partnership

Greg Wingfield  
President and CEO  
Greater Richmond Partnership, Inc.
Acknowledgements

IEDC would like to thank the Economic Development Research Partners (EDRP) program for providing the impetus and resources for this research. This product is the result of a genuinely collaborative process that has touched more professionals than can be listed here. In particular, we would like to thank Steve Budd, Tom Croft, Gene DePrez, Kim Didier, Dennis Donovan, Wayne Early, Stephen Ezell, William Hearn, Joan Herron, Brant Ingalsbe, John Kaliski, David Lohr, Kate McEnroe, Lawrence Molnar, Tim Monger, Mary Ann Moon, Michael Mullis, Paula Nissen, John Provo, Ethan Rogers, Mark Sweeney, Jerry Szatan, Mark Troppe, and Joel Yudken. We are immensely grateful to the EDRP members, numerous other economic development professionals, and industry experts who provided their insight throughout the research and development of this report. Finally, we would like to thank Jeffrey A. Finkle, President and CEO of IEDC for his oversight of this project.
# Table of Contents

**Executive Summary** .................................................................................................................. 1

**CHAPTER 1: History And Importance Of Manufacturing In The United States** .... 8
- Why Manufacturing is Important ......................................................................................... 8
- Challenges Facing American Manufacturing ...................................................................... 10
- Cause for Optimism .............................................................................................................. 13
- The Jobless Recovery: .......................................................................................................... 15
- A Lingering Paradox ............................................................................................................. 15

**CHAPTER 2: The New Manufacturing Marketplace: Integrated, Accelerated, And Globalized** ................................................................................................................................. 17
- Change is the New Normal .................................................................................................. 17
- The Interdependent and Networked World ......................................................................... 18
- Trends in Public Policy and Programming ......................................................................... 21

**CHAPTER 3: Remaining Competitive In The Global Manufacturing Market** ...... 24
- Overview of Global Manufacturing Competitiveness ......................................................... 24
- Key U.S. Advantages ........................................................................................................... 26
- Keys to Sustaining Competitive Advantages ..................................................................... 28
- Conclusion .......................................................................................................................... 36

**CHAPTER 4: Supporting Manufacturing With Traditional Economic Development Strategies** ........................................................................................................................................ 38
- Business Retention and Expansion .................................................................................... 38
- Attraction and Marketing ..................................................................................................... 49

**CHAPTER 5: Emerging Strategies To Support Manufacturing** .................................... 64
- Workforce Development .................................................................................................... 65
- Building Innovation Capacity ............................................................................................. 71
- Supporting Manufacturing Entrepreneurship ..................................................................... 82
- Conclusion .......................................................................................................................... 85

**CHAPTER 6: Financing Manufacturing** ......................................................................... 86
- Overview ............................................................................................................................. 86
CHAPTER 7: Lessons Learned ................................................................. 113

CHAPTER 8: Case Studies .................................................................................................................. 118
  Benjamin Franklin Technology Partners of Pennsylvania: Creating Networks to Grow Advanced Manufacturing .......................................................... 118
  Great Lakes Wind Network: Supply Chain and New Market Cultivation ........................................... 118
  Austin Polytechnical Academy: Enhancing Pre-College Manufacturing Education ................................. 121
  Brooklyn Navy Yard Industrial Park: Creating Space for Sustainable and Collaborative Manufacturing ........................................................................ 124
  Newton, Iowa: Leveraging Workforce Strengths to Recover from Mass Layoffs ..................................... 127
  Mississippi’s Integrated Longitudinal Education and Workforce Performance Management System: Measuring Results ........................................... 130
  Union Labor Life Insurance Company: Economically Targeted Investment of Pension Funds .... 133
  Green Manufacturing Training and Certificate: Building the Workforce Needed for Sustainable Manufacturing ........................................................................ 136
  Strategic Early Warning Network: Preventing Mass Layoffs ............................................................... 138
  79/Seventy: Creating Manufacturing a Certification Program .............................................................. 140
  Kurzarbeit Program: Building Workforce Strengths During Economic Downturns ................................. 142
  Advanced Manufacturing Park – Sheffield, United Kingdom: A Model for Advanced Industrial Parks .................................................................................. 143
  Commonwealth Center for Advanced Manufacturing: Fostering Collaborative Innovation ...... 147

CHAPTER 9: Toolkit ............................................................................................................................. 150
  Dislocated Worker Survey ................................................................................................................. 150
  Layoff Aversion Tools ......................................................................................................................... 157
  Transportation and Logistics Self-Assessment Tool ............................................................................. 163

CHAPTER 10: Federal Resources ......................................................................................................... 170
  Department of Commerce ................................................................................................................... 170
  Small Business Administration (SBA) ................................................................................................. 174
  National Institute of Standards and Technology ................................................................................. 179
  Internal Revenue Service .................................................................................................................. 179
  Department of Labor ......................................................................................................................... 180
# Table of Figures

Figure 1: Average Yearly Income for Manufacturing and All Private Employees (2001-2009) ...................... 8
Figure 2: Total Manufacturing Employment (1939-2010) ........................................................................ 10
Figure 3: Manufacturing Employment as Percent of all Private-Sector Jobs (1939-2008) ......................... 10
Figure 4: Value Added by Manufacturing as a Percentage of Gross Domestic Product (1947-2009) .... 10
Figure 5: U.S. Manufacturing Output (1930 – 2009) .............................................................................. 11
Figure 6: Job Losses by Manufacturing Sector (2007 to 2010) ................................................................. 13
Figure 7: Purchasing Managers’ Index (January 2008 – July 2011) ......................................................... 14
Figure 8: Total U.S. Manufacturing Jobs (January 2008 – July 2011) ....................................................... 15
Figure 9: Educational Attainment of Manufacturing Employees (2000 vs. 2010) ................................... 28
Figure 10: Change in Education Level from 2000 to 2010 (Manufacturing vs. Non-Manufacturing) ...... 29
Figure 11: Median Age of Manufacturing Workers by Sector ................................................................. 30
Figure 12: High-Technology Exports as Percent of All U.S. Manufacturing Exports (1989 – 2008) .... 31
Figure 13: Rail Capacity (2007) ............................................................................................................... 34
Figure 14: Projected 2035 Rail Capacity without Improvements ............................................................ 35
Figure 15: Total Incoming Foreign Direct Investment Deals (2003 – 2010) ............................................. 60
Figure 16: Incoming Investment in Traditional FDI Powerhouse Sectors in Manufacturing (2003 – 2010) ... 61
Figure 17: Incoming Investment in Emerging FDI Manufacturing Sectors (2003 – 2010) ................... 62
Figure 18: Change in Number of Incoming FDI Deals by Manufacturing Sector (2003 - 2006 vs. 2007 - 2010) ............................................................................................................................................. 63
Figure 19: Differences between Debt and Equity Financing .................................................................... 89
Figure 20: Equity Sources by Stage of Company Development ............................................................ 90
Figure 21: Example Analysis of Supply Chain Opportunities ................................................................. 123
Figure 22: Data Flow for Mississippi’s Integrated Education and Workforce Management System .... 131
Figure 23: Example Dislocated Worker Survey ..................................................................................... 153
Figure 24: Example Dislocated Worker Survey Continued .................................................................... 154
Figure 25: Example Dislocated Worker Summary Hand-Out .................................................................. 155
Figure 26: Example Related Jobs Hand-Out ......................................................................................... 156
Table of Tables

Table 1: New vs. Old Manufacturing Business Models ................................................................. 21
Table 2: Factors Driving Global Manufacturing Competitiveness (2010) ....................................... 24
Table 3: Most Competitive Manufacturing Nations (Current and 5 Years Out) .............................. 25
Table 4: Ranking of National Innovation Competitiveness (2011) ............................................... 32
Table 5: Manufacturing BRE Services Provided Directly by EDOs ............................................. 39
Table 6: Changes to Marketing and Attraction Strategy Over Last Five Years ............................. 50
Table 7: Activities Performed by EDOs that are Active in Workforce Development ..................... 65
Table 8: Activities Performed by EDOs that are Active in Innovation Acceleration and Technology Commercialization ........................................................................................................... 72
Table 9: Funding Sources by Stage of Entrepreneurial Development ......................................... 83
Table 10: Financing Services Provided by EDOs ........................................................................... 86
Table 11: EDOs Directing Firms to Financing Services ................................................................. 87
Table 12: Typology and Sources of Business Financing ............................................................... 87
Table 13: Information Sources for Layoff Aversion Early Warning System .................................. 158
Table 14: Example Layoff Threat Dashboard ................................................................................. 161
Table 15: Technical Assistance Asset Mapping Tool .................................................................... 162
Table 16: Transportation and Logistics Self Assessment Guide .................................................... 164
Table 17: Breakdown of Survey Respondents by Organization Type ........................................... 190
Table 18: Breakdown of Survey Respondents by Community Size ............................................. 190
EXECUTIVE SUMMARY

This report explores the evolution of the manufacturing sector and what communities can do to foster its viability. It combines high-level discussions of important market trends with nuts-and-bolts guidance on what those trends mean for local communities that are working to protect and grow manufacturing jobs.

Manufacturing is Viable and Vital

Pundits have been predicting the total demise of manufacturing in developed countries for decades. As labor-intensive assembly work moved to regions of the globe with low wages and few worker protections, it often seemed that manufacturing had entered an inexorable race to the bottom. Manufacturing employment in many developed nations fell, manufacturing communities were ravaged, and many talented young people no longer saw manufacturing as an appealing career. All of this was before the onset of the Great Recession, which hit manufacturing faster and harder than many other sectors.

Yet even after 30 years of declining employment, the United States remains the world’s leading manufacturer and accounts for $1.4 trillion in goods produced in 2009 and 12 million direct jobs. Even as many developing nations have become major global players, a number of developed nations have remained manufacturing powerhouses. Pressured by an integrating and dynamic global marketplace, manufacturing in developed nations is experiencing a dramatic transformation into a more high-tech, nimble, and innovative sector.

The perception that manufacturing in developed nations is dead lingers, but writing off the sector would be a grave mistake. Manufacturing in developed nations will likely never have the employment footprint that it once did, or provide jobs for workers with limited education, but it remains vital to the long-term viability of developed and developing economies. Manufacturing is a major driver of investment in research and innovation, a key draw for foreign direct investment, and source of good jobs.

Manufacturing Has Transformed

If a manufacturing worker or plant owner from 1960 were transported to the present, he or she would recognize little in the modern world of manufacturing. Manufacturing has become a highly technical, innovative, dynamic, and networked industry. A number of important transformations are discussed in this report.

Manufacturing Sector is Extremely Dynamic

Leading companies lose market dominance more frequently, disruptive technologies are introduced more regularly, and the integration of the global economy means
that market shocks are felt across the world with greater force. As impediments to market entry have eased, the field is open to small firms and new innovations in a way that it never was before. As technological change accelerates, disruptive products and processes enter the market much more regularly. As the global movement of goods has expanded, the need for flexible transportation and logistics systems has increased.

Manufacturing is a Vital Source of Innovation
Manufacturing competitiveness requires serious investment in research and development. Only by constantly improving products and production techniques can manufacturers stay globally competitive. As a result, many manufacturers are leading the way in creating new partnerships, with other firms and public research institutions, to improve their competitive position through innovation.

Modern Manufacturing is High-Tech
Assembly work is increasingly carried out by machines, so manufacturing workers have to be more technically proficient than in the past. This has placed new demands on manufacturing workers, who now need specialized training and technical skills. Manufacturing firms often struggle to find the skilled workers they need, making this area vital for economic development.

Manufacturing is Highly Networked and Specialized
Companies no longer operate entire supply chains, conduct all research and development in-house, or contract with firms only in their own region. The incidence of collaboration within and across supply chains is on the rise, as companies enlist each others’ expertise to stay on the cutting edge. Supply chains have become globally integrated at a level unheard of 20 years ago. As the pace of change accelerates, many companies are pursuing flexible, globally dispersed strategies that can react to the ever-changing marketplace.

Because of these industry changes, drivers of global manufacturing competitiveness have shifted as well. Talent-driven innovation has replaced low costs as the most important advantage in developed economies. The United States is well positioned for success in this environment, but faces challenges particularly in terms of supplying skilled workers, maintaining its innovation edge, and ensuring the availability of reliable, competitively priced transportation options.

New Manufacturing Realities Create New Economic Development Imperatives
The changed nature of modern manufacturing has prompted new responses from economic developers. Because those most adaptable to change are the most likely to survive, communities are changing their approach to building a vibrant manufacturing presence in a host of ways. Some of the key trends in economic development practice around manufacturing include:

Building a Quality Workforce
Many manufacturing executives cite workforce concerns as the leading factor that
determines where they can be competitive. As a result, workforce development — once treated as a social service concern — must be viewed as a core competency for the economic development profession. The manufacturing jobs of today require a level of skill and training that was rare even 10 years ago. Strategies and tools that economic developers are using to build a 21st century manufacturing workforce include new data analysis techniques to better understand their region’s workforce strengths and weaknesses, improving workforce training by connecting firms with training providers, and working to foster young people’s interest in (and skills for) manufacturing careers. A Mississippi State Workforce Investment Board program called Integrated Longitudinal Education and Workforce Performance Management System helps workforce training providers better analyze the effectiveness of their training programs. The Austin Polytechnical Academy (APA), located on Chicago’s west side, is an example of exposing students in high schools to curricula focused on manufacturing and engineering to boost their interest in careers in these fields and provide them with the skills and training necessary for jobs in advanced manufacturing. The 79/Seventy Manufacturing Certification Program in Ohio is another example of a workforce program that is aimed at improving the baseline skills of potential manufacturing workers and connecting them directly to firms that are hiring.

**Cultivating Innovation Capacity**

As effective research and technology deployment become more important to more manufacturing firms, economic developers are devoting more time and resources to building the innovation capacity of their communities. Roles that economic developers are playing to help local manufacturers stay on the cutting edge include engaging colleges and universities, fostering research and development collaborations, and helping small firms become more innovative. For example, the Commonwealth Center for Advanced Manufacturing (CCAM) in Virginia is a public-private partnership supporting aerospace manufacturers through research and development conducted by local university researchers, from both the University of Virginia and Virginia Tech, and private sector researchers. CCAM was instrumental in attracting a Rolls Royce’s aerospace manufacturing facility, which is currently under construction, to Virginia.

**Supporting Manufacturing Entrepreneurship**

While entrepreneurship was not a common economic development focus 20 years ago, there is evidence that the majority of new jobs created in the U.S. over the last 25 years came from young entrepreneurial companies. Economic developers can help new manufacturing firms form and survive by providing many of the same services that they provide to other types of firms, such as assistance with permitting, financing and facilities, and helping to foster an entrepreneurial culture in the community. Examples of incubators and accelerators exist in virtually every community, with many focused on helping small manufacturers. The Brooklyn Navy Yard industrial park is one such example of how local communities are helping small and medium sized companies be more successful.
Forging Global Networks
Economic development increasingly requires a global perspective, global reach, and global networks. Nowhere is this more evident than in the manufacturing sector. Economic developers are increasingly combining efforts to lure foreign direct investment with efforts to open up foreign markets for their existing manufacturers. In an integrated global marketplace, developing specific supply chain relationships is often the key to both attracting FDI and increasing exports. Global networking is also vital to modern research and development, so economic developers are playing new roles in fostering innovation partnerships. The Advanced Manufacturing Park in Sheffield, England was created so that global supply chain partners could share one space to conduct mutually important research and development.

Going Green
Manufacturers face a variety of pressures to operate more sustainably. Customer demand is one major impetus to go green, but increasing energy and material costs are often more important. As major manufacturers aggressively pursue energy and waste reductions, corporate decision-makers are increasingly evaluating locations in these terms. Moses Lake, Washington attracted a carbon-fiber manufacturer partially based on the availability of renewable energy. In a manufacturing marketplace where sustainability is increasingly relevant, communities are helping firms “green” their operations and are connecting firms to training opportunities to improve the sustainability expertise of their workers. The Purdue University Technical Assistance Program (TAP), for example, offers a variety of courses on green manufacturing.

Adapting Traditional Economic Development Strategies to New Realities
Of course, many traditional economic development strategies remain critical to supporting manufacturers and are part and parcel of the emerging strategies outlined above. A strong business retention and expansion (BRE) program is the foundation for successful economic development in any community, and its importance has only increased since the recession. For example, layoff aversion strategies remain as critical as ever. The Strategic Early Warning Network (SEWN) is a program of the Steel Valley Authority that provides early layoff warning and job retention services to manufacturers in Pennsylvania. In the case of business attraction and marketing, economic developers are leveraging workforce assets for attraction, using attraction to enhance innovation capacity, paying closer attention to transportation and logistics competitiveness, developing investment-oriented incentives, and taking advantage of opportunities in re-shoring and attracting foreign direct investment.

New Resources Being Used
Fortunately, communities don’t have to reinvent the wheel as they work to support manufacturers; there are many examples of successful approaches to manufacturing support that economic developers can learn from. Case studies included in this report address strategies such as creating networks to grow advanced manufacturing, cultivating
supply chains and new markets, creating spaces for collaborative innovation, commercializing technologies, building worker pipelines, averting mass layoffs, creative financing, and more.

In addition to case examples, there are also many resources for technical assistance. Federal resources in the areas of business finance, innovation, export promotion, brownfields redevelopment, energy efficiency, supply chain development, business plan improvements, and production process upgrades all are catalogued in the report. Many public and private financing resources, including both debt and equity financing, are also outlined. Finally, a toolkit is included that contains guidance on designing and administering dislocated worker surveys, developing a layoff aversion network, and assessing transportation and logistics capacity.

Conclusion

The ways in which today’s manufacturing firms need support, and the ways to provide that support, have changed dramatically over the last decade. As the global manufacturing marketplace has become more dynamic, high-tech, and integrated, the needs of manufacturers have changed and diversified. Economic developers have to respond more quickly and flexibly, look farther afield, draw on a wider range of resources and partners, and use increasingly sophisticated strategies. This report attempts to provide some of the clarity, tools, and direction that will help economic developers succeed.

Organization of This Report

This report is organized into three sections.

1. Overview of the Manufacturing Sector: Chapters 1 through 3 provide an overview of the history, current status, and outlook of the global manufacturing marketplace. These chapters provide the context in which economic development efforts must function.

2. Best Practices in Economic Development: Chapters 4 through 7 review traditional economic development strategies to support manufacturing, emerging strategies, financing resources, and lessons learned.

3. Case Studies, Toolkit, and Federal Resources: Chapters 8 through 10 provide case studies on effective economic development efforts to support manufacturing, economic development tools, and federal resources available to manufacturing communities and firms.

Section 1 – Overview of the Manufacturing Sector

Chapter 1 – History and Importance of Manufacturing in the United States
Chapter 1 traces the trajectory of American manufacturing from World War II through the worst of the Great Recession and into the early stages of a tenuous recovery.

Chapter 2 – Welcome to the Integrated, Accelerated, and Globalized Manufacturing Marketplace
Chapter 2 looks at the nature and structure of today’s global manufacturing
marketplace and discusses how the pace of change is forcing manufacturers to become more flexible, collaborative, innovative, and global.

Chapter 3 – Remaining Competitive in the Global Manufacturing Marketplace
Chapter 3 examines what makes manufacturing firms and nations competitive in the 21st century. It also looks closely at the key advantages of U.S. manufacturers and the investments and efforts that will be required to keep American manufacturing competitive.

Section 2 – Best Practices in Economic Development

Chapter 4 – Supporting Manufacturing with Traditional Economic Development Strategies
Chapter 4 examines how traditional economic development strategies are changing to meet the demands of the modern manufacturing sector. In the context of business retention, expansion and attraction, it discusses strategies for accelerating innovation, addressing workforce needs, developing supply chain relationships, export promotion, and layoff aversion. It also covers transportation and logistics competitiveness, investment-oriented incentives, re-shoring opportunities, and attracting foreign direct investment.

Chapter 5 – Emerging Strategies to Support Manufacturing
Chapter 5 focuses on areas of economic development practice that are becoming increasingly vital to manufacturing, including workforce development strategies, best practices in innovation and technology commercialization, and ways to foster entrepreneurship.

Chapter 6 – Financing Manufacturing
Chapter 6 discusses the roles that economic development organizations play in helping manufacturers to secure financing and reviews a wide array of private and public sources of debt and equity.

Chapter 7 – Lessons Learned
Chapter 7 summarizes the lessons learned from the research covered in sections 1 and 2.

Section 3 – Supplementary Materials

Chapter 8 – Case Studies
Chapter 8 provides detailed information on many of the examples and case studies mentioned in Section 2. The cases cover a range of topics, including: workforce development, innovation, technology commercialization, finance, redevelopment, layoff aversion, and supply chain development.

Chapter 9 – Toolkit
Chapter 9 provides three tools to support economic development programming in the area of manufacturing: dislocated worker surveys, guidance on developing layoff aversion networks, and a transportation and logistics self-assessment tool.

Chapter 10 – Federal Resources
Chapter 10 provides an overview of the federal resources available to support manufacturing firms and communities, including: programs that cover business finance, innovation, export promotion, brownfields redevelopment, energy efficiency, supply chain development, business plan improvements, and production process upgrades.
SECTION I

Overview of the Manufacturing Sector
CHAPTER 1
History and Importance of Manufacturing in the United States

Why Manufacturing is Important

When Mark Twain heard that the New York Journal had published his obituary, he noted that “reports of my death are greatly exaggerated.” The same should be said of manufacturing in the United States. Manufacturing in developed countries faces serious challenges, but it is wrong to start writing eulogies for the sector.

The United States remains the world’s largest manufacturing nation, with over $1.4 trillion in goods produced in 2009. As will be discussed below, U.S. manufacturing still creates over 12 million direct jobs, pays above average wages, is a major driver of investment in innovation, and attracts more foreign direct investment than any other sector. This report does not shy away from the challenges facing manufacturing, but it maintains that we cannot turn our back on manufacturing without seriously undermining the long-term health of the American economy.

Manufacturing Creates Good Jobs

Manufacturing employees earn more per year than the national average for all private-sector employees. As seen below in Figure 1, the income gap between all private-sector employees and those in manufacturing has persisted over the last decade.

Even during the Great Recession of 2007 - 2010, when average yearly income for private-sector employees leveled off, manufacturing workers continued to make income gains. In 2001, manufacturing employees earned around $6,800 more than the national average and the gap grew to nearly $10,000 in 2009. The

---


manufacturing sector suffered substantial job losses during the Great Recession, but the jobs that survived continue to support a decent standard of living.

Manufacturing Is a Driver of Research & Innovation

In 2007, American manufacturers were responsible for approximately 70 percent of all research and development (R&D) conducted by private industry and employed nearly two-thirds of all scientists and engineers in the United States.

There is reason to worry that if the United States loses its manufacturing base, a great deal of advanced R&D activity will follow the plants offshore. Evidence shows that when production of current prevailing technology moves, research into future technologies ceases to be profitable.

Manufacturing Attracts Substantial Foreign Direct Investment

Manufacturing is also a major draw for foreign direct investment (FDI). In 2009, manufacturing attracted nearly $800 million of FDI, more than any other sector of the American economy.

Manufacturing does not account for as large a share of inward FDI today (less than 35 percent) as it did in the late 1990s (over 40 percent), but it remains an important draw and actually increased its share of total FDI during the Great Recession. Moreover, manufacturing is particularly important to attracting investment from other developed countries, the source of most FDI coming to the United States. Clearly, without manufacturing, the United States would be much less successful at attracting foreign investment and the jobs that come with it.

As a later chapter addresses, the number of FDI deals coming into the United States has increased over the past decade, particularly in developing markets such as alternative energy.

---


Figure 2: Total Manufacturing Employment (1939-2010)

Figure 3: Manufacturing Employment as Percent of all Private-Sector Jobs (1939-2008)

Figure 4: Value Added by Manufacturing as a Percentage of Gross Domestic Product (1947-2009)

Challenges Facing American Manufacturing

The United States remains the largest manufacturing nation in the world in terms of overall productivity, but employment in the manufacturing sector has been eroding for decades. As shown in Figure 2, total manufacturing employment in the United States peaked in 1979 at nearly 20 million jobs. By the close of 2010, total manufacturing employment had dropped to 11.6 million positions, the lowest level in 70 years.

---


10 Ibid.


The decline in manufacturing employment is even more striking when one examines the percentage of all private-sector jobs that manufacturing provides. As shown in Figure 3, the proportion of all private-sector jobs provided by manufacturing has steadily declined since the end of WWII. In 1945, manufacturing created over 35 percent of all private-sector jobs, but it accounts for less than 11 percent of those positions today.

A similar picture emerges from the contribution of manufacturing to overall U.S. gross domestic product (GDP). As Figure 4 shows, the share of total U.S. GDP created by manufacturing has been declining since the late 1960s. Between the end of WWII and 1968, manufacturing always contributed more than 25 percent of U.S. GDP, a level not reached in any year since.

While both employment and the share of total GDP generated by manufacturing have been declining for the last several decades, raw output has actually grown over the past 50 years, as seen in Figure 5. At the close of WWII, total manufacturing output was just over $200 billion in current U.S. dollars. By 2007, U.S. manufacturers were producing over $1.4 trillion in goods, a figure that declined only marginally during the Great Recession.

It is a striking paradox to confront. How could employment in manufacturing decrease while manufacturing output expanded almost sevenfold? A number of factors have contributed to this apparent paradox, but two key forces deserve particular attention: offshoring and improved productivity through technological advancements. The next two sections discuss how offshoring and improved productivity have resulted in decreased manufacturing employment and proportional share of U.S. GDP while raw manufacturing output has greatly expanded.

**Offshoring**

Since the late 1970s there has been a significant trend of manufacturing firms offshoring production. A deepening trade deficit in manufactured goods underscores the impact of offshoring; between 1999 and 2007, U.S. manufacturing exports grew by 58 percent, while imports grew by 78 percent over the same period.

A host of factors have driven this trend toward offshoring manufacturing. The goal to decrease labor costs is doubtless one of

---


the key drivers, with some industry groups estimating a 30-60 percent increase in profits to be realized by locating production in low-wage nations\textsuperscript{15}. Second, as the world has become more networked and the cost of digital communication has declined, manufacturers have become more adept at managing globalized supply chains. Third, many developing nations have increased their numbers of skilled workers, allowing these nations to compete in high-tech sectors, in addition to those that are labor-intensive. In many instances, manufacturing engineers and technicians educated in developed nations are returning to their home countries and helping to grow newly competitive regional manufacturing hubs. For example, the emergence of China, India, Korea, and Taiwan as manufacturing powerhouses is partially attributed to the return of highly skilled employees from Silicon Valley and other high-tech regions in developed nations\textsuperscript{16}.

\textit{Technology-Driven Efficiency Means Fewer Jobs}

Technological advances of the last half century have substantially increased the average productivity of the American worker. The National Association of Manufacturers reports that productivity improvements (output per hour worked) has risen more rapidly in the United States than in peer nations, noting that “since 1986, unit labor costs have declined by 40 percent relative to the average unit labor costs of 14 countries that are major competitors in global markets”\textsuperscript{17}. Between 1973 and 1995, manufacturing productivity increased by an average of 2.7 percent each year, a figure that increased to 4.1 percent annually after 1995\textsuperscript{18}. The bulk of improved productivity in recent decades is due to investment in manufacturing technology and a shift away from labor-intensive sectors.

World-leading productivity is touted as a badge of honor for American workers, but it also presents an economic development dilemma. Technological advances have allowed the American manufacturing sector to survive when lower labor costs are available elsewhere, but it also means that fewer jobs are created. Local economic developers can do little to change this, but it is an essential reality to keep in mind.

\textbf{The Great Recession Caps Decades of Decline}

Many manufacturing workers and manufacturing communities took the Great Recession particularly hard. Long-term forces that have undermined manufacturing employment were greatly exacerbated and new pressures were created by a global decline in demand. Between 2007 and 2010, the manufacturing sector in the United States shed over 2.2 million positions\textsuperscript{19}. As can be seen in Figure 6, every sub-sector lost jobs during the Great Recession, but industries such as transportation equipment


\textsuperscript{17} Manufacturing Institute, “Facts About Modern Manufacturing, 8th Edition.”

\textsuperscript{18} Brauer, Factors Underlying the Decline in Manufacturing Employment Since 2000.

and fabricated metal products were particularly hard-hit.

While the past few years have been rough for American manufacturers and manufacturing workers, there is reason to believe that the worst is over, for now. The next section examines evidence that the manufacturing sector is poised to stabilize and, potentially, to recover some lost ground.

Figure 6: Job Losses by Manufacturing Sector (2007 to 2010)

Cause for Optimism

It was inevitable that a global economic downturn as severe as the Great Recession would substantially depress manufacturing productivity and employment. However, mounting evidence indicates that the worst of the economic storm has passed. The manufacturing sector has been growing for more than a year as new orders, employment, inventories, supplier deliveries and overall production have all improved. Likewise, global confidence and productivity in the manufacturing sector has also strengthened substantially since the end of 2008.

Broad Evidence of Manufacturing Recovery

The Purchasing Manager’s Index (PMI), published monthly by the Institute for Supply Management, provides strong evidence that the U.S. manufacturing sector has exited recessionary mode and is growing once again. Based on a national survey of manufacturing purchasing managers, the PMI incorporates five components (New Orders, Production, Employment, Supplier Deliveries and Inventories) into a single measure of growth or contraction in the manufacturing sector. A PMI over 50 percent indicates growth in the manufacturing industry and a

---


PMI under 50 indicates that manufacturing is shrinking.

As Figure 7 shows, the PMI has been above 50 in every month from mid 2009 to mid 2011, indicating sustained growth over that period. For economic developers, this strengthening signals that the worst may be over. Manufacturers that survived and stayed are probably unlikely to close or leave in the near future. In addition, growing demand brings the potential for expanded manufacturing operations and the need to hire more workers.

Although this is heartening, the composite index does not provide detailed insight into how current productivity compares to future productivity or to actual employment. The next three sections review the recent performance of the production, new orders, and employment indices.

**Figure 7: Purchasing Managers’ Index (January 2008 – July 2011)**

![Chart showing Purchasing Managers' Index from January 2008 to July 2011]

**Production Recovering**

The Institute for Supply Management’s Production Index measures growth or decline in current production and, as such, is viewed as an excellent measure of current manufacturing strength. Since June 2009, the Production Index has not fallen below 50, an indication that manufacturing activity has picked up substantially since the savage plunge of the Great Recession. Bolstering the picture derived from the Production Index, Federal Reserve data show that productivity in 2010 outpaced 2009 by an average of 5.4 percent.

As current production grows, the potential for new employment continues to improve. Growth in manufacturing is not distributed evenly across industries or local communities, so economic developers will still need more detailed information to gauge the health of their local manufacturing sector, but at least the macro-economic picture is improving.

**More New Orders Being Placed**

Future prospects for manufacturing are also improving. As today’s new orders are tomorrow’s production, ISM’s New Orders Index provides some intelligence about the future strength of the sector. Just as with current production, the New Orders index depicts sustained optimism from managers, suggesting that demand of U.S. manufactured products is becoming firmer. The New Orders index has been above 50 (indicating improvement) in each month between July 2009 and June 2011.

---


2011 was the first month in two years wherein the New Orders Index dropped below 50.

**Employment Prospects Improving**

ISM’s Employment Index also has recovered from the depths of the Great Recession. Manufacturing managers have reported growth in expected employment in each month from October 2009 through July 2011.

While these data are encouraging, actual levels of manufacturing employment have not recovered to pre-recession levels and are unlikely to do so in the near future. These data tell us that the worst hemorrhaging is over, and potential for some growth exists. However, no strong indications suggest that manufacturing employment will recover substantially in the near future.

**Capacity Utilization Recovering**

Unused capacity partly explains why the current recovery is creating meager job growth. When the recession set in, a substantial portion of the manufacturing capacity in the United States ceased. From 1972 through 2009, manufacturing capacity utilization averaged 79.2, but utilization dropped to 65.4 percent during 2008 and 2009. This means that many of the manufacturers that survived have unused capacity that can be leveraged without hiring substantial numbers of new employees.

Moreover, with capacity utilization below historical levels, some resurgent demand can be met without building new facilities or expanding existing operations. As capacity utilization creeps back to more normal levels, expectations of increased employment opportunities will surface. From July 2010 to the end of the year, capacity utilization hovered around 72 percent, much closer to historical levels than was the case during the worst of the recession.

**The Jobless Recovery: A Lingering Paradox**

Although manufacturing managers believe that employment prospects for the sector are looking brighter, this optimism has not translated into significant growth in actual jobs.

Manufacturing appears to currently be experiencing a “jobless recovery.” As Figure 8 shows, manufacturing employment has stabilized after the massive declines of 2008.
and 2009, but has not recovered to anything near pre-recession levels. During 2008 and 2009, U.S. manufacturers shed over 2.5 million jobs, most of which have not returned. For many economic developers, communities and individuals, the meager post-recession gains are deeply troubling.

Although some of the employment losses are rooted in temporary forces unique to the recession, many observers worry that the recession accelerated structural changes that have been in the works for decades. For many businesses and sectors that were already struggling with structural disadvantages, the Great Recession likely sealed their fate.

If history is any guide, some amount of permanent employment loss is likely. Manufacturing employment declined sharply during the recession of the early 2000s and much of the loss was never recovered\textsuperscript{28}.

CHAPTER 2
The New Manufacturing Marketplace: Integrated, Accelerated, and Globalized

Change is the New Normal
We live in challenging times. Global markets are more dynamic, innovation is accelerating every year, and the world is now much more densely networked on a global scale. All of this changes the game for manufacturing companies and their employees.

This chapter offers an overview of the changing market landscape in which manufacturers operate. As later chapters will show, these market changes often necessitate new economic development strategies and efforts.

Increasing Competitive Pressure
Operating a manufacturing business in the globalized market can be a white-knuckle ride. There is significant evidence that contemporary markets exert more dynamic pressure on participants than they did several decades ago. Economy-wide return on investment has declined from over six percent in 1965 to less than two percent today\(^\text{29}\). Leading companies lose market dominance more regularly today\(^\text{30}\), with the incidence of companies exiting the S&P 500 doubling between 1975 and 1995.

All of this signals that today’s market has more competitive pressure and dynamism than in decades past, which is clearly true in the manufacturing sector. Dominant players from decades past have declined and entire regional supply chains have been undermined. As examined below, intensifying competitive pressures have forced modern manufacturing to become more flexible, more innovative, and more dynamic than ever before.

Accelerating Innovation
We are constantly reminded that the pace of technological innovation has greatly accelerated. Today’s hot item may be cutting-edge only for a few months—a phenomenon that was unthinkable for most of human history. “In the 19th century, we saw more technological change than in the nine centuries preceding it. Then in the first 20 years of the 20th century, we saw more advancement than in all of the 19th century”\(^\text{31}\). Looking forward, “the 21st century will see something more on the order of 20,000 years of progress”\(^\text{32}\).

---

\(^\text{29}\) John Hagel et al., *Measuring the Forces of Long-Term Change: The 2010 Shift Index* (Deloitte, 2010).


The accelerating parade of innovation poses fundamental challenges for modern manufacturers. Disruptive technology used to come along only so often, allowing companies to enjoy sustained market dominance based on a fundamental breakthrough. Today, the period of stability between disruptive technologies can be virtually non-existent. So it should come as no surprise that manufacturing companies ranked “new product innovation” as the most important driver of business success. Change has indeed become the new normal, and many manufacturers are still grappling with what that means for their business models.

Leveling of the Playing Field
Technological innovation has substantially leveled the playing field in a variety of ways. It has empowered small companies and entrepreneurs that never would have been competitive in previous eras driven by economies of scale.

First, the declining price of computing power allows smaller operations to participate in and gain from the development of new products and processes. With the declining price of computing power, small companies and entrepreneurs can now be viable global players in a way that would have been unimaginable several decades ago. Cheap computing power makes it possible for smaller manufacturers to be part of cutting-edge innovation and to incorporate emerging management techniques more readily.

Revolutions in communication technology also break down barriers to market entry. The maturation of the Internet, coupled with a massive reduction in the cost of moving data around the world, is a major contributor to intensifying competition and accelerating innovation. The declining cost of communication allows even small manufacturers to be truly global players.

The increasing pace of innovation just discussed also increases opportunities for small and medium-sized firms to become major market players. As disruptive innovations become more common, it is more difficult to defend market dominance. All of these forces have worked to level the playing field in many manufacturing sectors.

The Interdependent and Networked World
This section outlines some of the ways that the new business environment is changing how manufacturing firms operate.

Breaking Down Institutional Boundaries
Traditional institutional boundaries are being undermined all around the world. Political, economic, and cultural boundaries that have stood for centuries are becoming blurred almost beyond recognition. Even the boundaries between companies are becoming more fluid. There is evidence that employees are increasingly communicating across company boundaries and competitor companies often collaborate in

---


ways that were virtually unheard of 30 years ago.

The recently coined term “co-opetition” refers to the growing trend toward cooperative competition, in which private firms collaborate on some ventures while remaining competitive on others. The rise of co-opetition is one example of how manufacturing firms are changing to survive in a dynamic and interdependent world.

The Rise of Flexible Specialization

Since the middle of the 20th century, there has been a gradual shift away from the Fordist model of production in which OEMs controlled the entire process, from raw input to the final output. Today, “flexible specialization” has become the dominant approach to manufacturing. Flexible specialization emerged as companies sought to find the most competitive location to produce each component of the final product and to insulate themselves from fluctuations in the global marketplace.

The question used to be, “Where should we make chairs?” Now, the dilemma is, “Where can we make textile cushions, milled wood components, and conduct final assembly?” Today, the answer to “where” depends very much on which component of the final product that one is talking about.

Flexible specialization influences the location and structure of manufacturing supply chains. A company that dominates a particular sector today may see its competitive advantage disappear if exchange rates shift, new transportation links are formed, or new production methods emerge. In this world, many companies seek to build flexible networks of suppliers that can be utilized in different ways as economic circumstances change.

Firms now outsource the production of many individual components and focus on those parts or processes for which they have a specialized competitive advantage. Although there is potential for supply chains to re-aggregate in some sectors, many industry observers see the trend toward flexible specialization continuing into the foreseeable future.

General Dynamics Relies on Collaboration

General Dynamics C4 Systems (GDC4S) is a subsidiary of General Dynamics that focuses on secure communication and information technology. The firm relies on sustained relationships with its suppliers to execute innovation and increase efficiency. Bill Sylvia of GDC4S highlights the importance of sustained collaboration with the firm’s suppliers. “Creating long-term relationships with our suppliers is essential to our success…GDC4S can’t do everything ourselves; we must rely on other sources to collaborate with us.”

It appears that we are entering a world in which dynamic and distributed networks perform the work that was once done by hierarchical institutions. This is not to say that large companies are disappearing or that boundaries between firms have vanished. However, firms of all sizes are recalibrating their business models to survive in a more dynamic and interdependent world.
future. As will be seen throughout the rest of this report, the shift toward flexible specialization often forces economic developers to change their approach to attracting and growing manufacturing.

Rise of Open Innovation
The process of discovery and commercialization is fundamentally changing as well. One way to think about the change is the shift from “closed innovation” to “open innovation.” The concept of open innovation has been around since the 1960s, but the concept has moved from the margins to the core of modern business practice.

Under the closed model, the entire innovation process, from idea to final commercialization, happened within the confines of a single large company, something that only large corporations like DuPont, IBM and AT&T could accomplish.

In place of closed innovation, more and more manufacturers are moving to an open model, where technology alliances and shared intellectual property have become commonplace. The complexity and dynamism of modern innovation forces manufacturers to incorporate advances that were developed by other organizations. Even large firms with long histories of innovation under the closed model are moving with the times. Proctor and Gamble is “transforming its traditional in-house research and development process into an open-source innovation strategy” and aiming to produce 50 percent of the company’s new products outside P&G’s lab. Toyota also has embraced the open innovation model.

Open innovation goes hand-in-hand with flexible specialization and co-opetition. First, open innovation supports flexible specialization because it allows manufacturers to minimize their investments in particular research programs. Rather than betting heavily on a specific avenue of research, manufacturers can maintain flexibility by leveraging the innovations of other corporate or public research. Open innovation also reinforces co-opetition because the model often requires competing manufacturers to collaborate on specific research issues. Even when manufacturers remain competitors, pursuing open innovation leads to more cross-firm information and licensing flows.

Contract Manufacturers Vital Partners in Open Innovation
In an era of flexible specialization, contract manufacturers play an increasingly important role in successful innovation. Contact manufacturers are firms that, while not conducting the core research, provide the technical expertise needed to move from idea to actual product. While large companies used to handle the production end of innovation in house, many are now turning to contract manufacturers to solve the production challenges inherent in new product development. As a general rule, contract manufacturers are the most vital during the early phases of development.

---

before all of production issues are ironed out.

**Scalable Efficiency vs. Scalable Learning**

In a dynamic market characterized by flexible specialization, co-opetition, and open innovation, competitiveness requires more than scalable efficiency. Manufacturers up and down the supply chain have to be better at learning about market shifts and incorporating new technological advances.

Given the accelerating rate of change in products and processes, “the real product is information, not a physical object built around that information”38. In a world of constant innovation, long-term market viability depends on how good manufacturers are at perceiving and utilizing new information or productive techniques.

**Broad Sea Change in Manufacturing Business Models**

The previous sections have outlined some of the key transformations in how manufacturers operate. In an article published in IEDC’s *Economic Development Journal*, Robert Atkinson produced a table that summarizes many of the changes discussed here.

Table 1 provides a succinct summary of how global market changes have forced many manufacturers to become more flexible, dynamic, and networked. The rest of this chapter reviews the key drivers of manufacturing competitiveness in the modern world, what the United States’ key advantages are, and the investments that will be needed to keep the U.S. among the world’s manufacturing leaders.

| Table 1: New vs. Old Manufacturing Business Models |
|---|---|---|
| **Issue** | **Old** | **New** |
| Markets | Stable | Dynamic |
| Scope of Competition | National | Global |
| Organizational Form | Hierarchical | Networked |
| Production System | Mass Production | Flexible Production |
| Key Factor of Production | Capital/Labor | Innovation/Ideas |
| Key Technology Driver | Mechanization | Digitization |
| Competitive Advantage | Economies of Scale | Innovation/Quality |
| Relations among Firms | Go it Alone | Collaboration |
| Skills | Job-specific | Broad and Changing |
| Workforce | Organizational Man | “Intrapreneur” |
| Nature of Employment | Secure | Risky |

Source:39

---


development efforts surrounding manufacturing are shifting.

**Federal Policy**

Federal manufacturing policy has always been somewhat fractured, with different agencies addressing different needs. That said, there are new points of emphasis within federal programming that reflect new thinking about how to best support manufacturing in the United States.

Supporting innovation has become more and more important in recent years. From founding technology transfer programs within federal research institutions to expanding broadband accessibility, federal policy is placing more emphasis on helping American companies to stay on the cutting edge of innovation.

The importance of workforce development also is receiving renewed attention. As millions of manufacturing workers have lost their jobs, and as manufacturing becomes increasingly high tech, workforce development has become vital. As such, agencies across the federal government, including the Department of Energy, the Department of Defense, National Institute of Science and Technology, and the Environmental Protection Agency are devoting more resources to workforce training and development.

The last few years have also seen increased attention to export promotion. Given that relatively few American manufacturers export to foreign markets, coupled with the growth of new markets in developing countries, many federal leaders are looking to help U.S. companies to locate and enter foreign markets. Last year, President Obama issued an executive order forming the National Export Initiative, with the goal of doubling exports over the next five years and supporting 2 million American jobs.

Finally, the federal government increased its effort to help manufacturers reduce energy usage and make production processes more environmentally sustainable. As industry leaders work to reduce their exposure to volatility in energy costs and to satisfy increasing consumer demand for sustainably made goods, the federal government is engaged in a variety of efforts to support green manufacturing.

This report will go into more detail on the specific federal programs aimed at supporting manufacturing where they are relevant. For a review of specific federal programs that address manufacturing challenges, see Chapter 10.

**State and Local Policy**

The diversity of challenges facing different states and local communities has, as one would expect, occasioned a wide range of state and local responses. However, there are a few broad trends in economic development policy and programming that deserve mention.

First, many state and local economic development organizations have shifted their attention away from attraction and toward retention and expansion. During the recent recession, there were fewer manufacturers looking to establish new facilities, particularly in developed countries. This fact,
coupled with the dire consequences that come when established manufacturers leave communities, has lead many state and local EDOs to focus first in keeping what they have. Of course, state and local EDOs have not abandoned marketing and attraction programs, but the shift in emphasis is visible nevertheless.

Second, an increasing amount of economic development programming is aimed at supporting industry clusters or sectors, rather than individual firms. Instead of looking at each company in isolation, economic developers are increasingly attuned to how cultivating regional supply chain networks can support broader and more sustainable economic growth.

Finally, most of the shifts in emphasis discussed for federal policy are also visible at the state and local levels. As will be seen in later chapters, many of the state, local, and regional EDOs that focus on manufacturing are seriously engaged in workforce development, innovation capacity building, and export promotion.
CHAPTER 3
Remaining Competitive in the Global Manufacturing Market

Overview of Global Manufacturing Competitiveness

The “2010 Global Manufacturing Competitiveness Index”\textsuperscript{41}, a report published by the U.S. Council on Competitiveness, provides an overview of the factors that determine where manufacturers locate and the key advantages and disadvantages of major manufacturing nations around the world.

Based on interviews with senior executives at global manufacturing firms, the survey speaks directly from industry perspective. This report does not study what makes some communities within nations more competitive than others, but it does provide a useful picture of the global forces that influence where manufacturing happens.

Drivers of Manufacturing Competitiveness

What factors have the most influence on manufacturing location decisions worldwide? Respondents to the 2010 Global Manufacturing Competitiveness Index were asked to rank the importance of ten broad drivers of national competitiveness. The average score for each competitiveness factor is provided in Table 2 below.

Table 2: Factors Driving Global Manufacturing Competitiveness (2010)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Average Importance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talent-driven innovation</td>
<td>9.22</td>
</tr>
<tr>
<td>Cost of labor and materials</td>
<td>7.67</td>
</tr>
<tr>
<td>Energy cost and policies</td>
<td>7.31</td>
</tr>
<tr>
<td>Economic, trade, financial, and tax systems</td>
<td>7.26</td>
</tr>
<tr>
<td>Quality of physical infrastructure</td>
<td>7.15</td>
</tr>
<tr>
<td>Government investments in manufacturing and innovation</td>
<td>6.62</td>
</tr>
<tr>
<td>Legal and regulatory framework</td>
<td>6.48</td>
</tr>
<tr>
<td>Supplier network</td>
<td>5.91</td>
</tr>
<tr>
<td>Local business dynamics</td>
<td>4.01</td>
</tr>
<tr>
<td>Quality and availability of healthcare</td>
<td>1.81</td>
</tr>
</tbody>
</table>

*1=Lowest; 10=Highest

Source:\textsuperscript{42}

Talent-Driven Innovation Tops All Factors

Global manufacturers see a nation’s capacity to support talent-driven innovation as its most important asset in the modern

\textsuperscript{41} Deloitte, 2010 Global Manufacturing Competitiveness Index (Council on Competitiveness, 2010).

\textsuperscript{42} Ibid.
manufacturing market. Although we cannot compare these results to previous years, there is little doubt that talent-driven innovation has become more important to a wider range of manufacturing operations than it was in the past.

What is remarkable is that talent-driven innovation ranked so far ahead of every other site selection factor. Manufacturing executives ranked their need for talented employees, from scientists to shop floor technicians, as more important than financing, taxes, transportation, labor rates, or energy costs. This speaks to the profundness of the transformations discussed in Chapter 2. Accelerating innovation and global market pressure demand a talented and educated workforce.

Cluster of Traditional Drivers
After talent-driven innovation, there is a significant drop-off in importance to the group of factors that includes many of the familiar drivers of manufacturing competitiveness. Labor and material costs, energy costs, tax burden, financial systems and physical infrastructure all remain key considerations for manufacturers searching the world for a place to establish operations. Falling slightly behind these traditional drivers, governmental investments in manufacturing and innovation, legal and regulatory framework, and supplier network are all above the halfway point on the competitiveness scale.

The importance of talent and innovation capacity is good news for nations that are at a competitive disadvantage when it comes to labor costs, tax burden, or other traditional drivers of manufacturing competitiveness. Traditional considerations have not been discarded; but, as many manufacturing sectors increasingly become technically advanced, new competitive advantages and disadvantages are being created.

Table 3: Most Competitive Manufacturing Nations (Current and 5 Years Out)

<table>
<thead>
<tr>
<th>2010 Competitiveness</th>
<th>Expected Competitiveness in 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>County</td>
<td>Score</td>
</tr>
<tr>
<td>China</td>
<td>10.00</td>
</tr>
<tr>
<td>India</td>
<td>8.15</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>6.79</td>
</tr>
<tr>
<td>United States</td>
<td>5.84</td>
</tr>
<tr>
<td>Brazil</td>
<td>5.41</td>
</tr>
<tr>
<td>Japan</td>
<td>5.11</td>
</tr>
<tr>
<td>Mexico</td>
<td>4.84</td>
</tr>
<tr>
<td>Germany</td>
<td>4.80</td>
</tr>
<tr>
<td>Singapore</td>
<td>4.69</td>
</tr>
<tr>
<td>Poland</td>
<td>4.49</td>
</tr>
</tbody>
</table>

Source:43

43 Ibid.
National Competitiveness Rankings

Deloitte also used the survey to create national competitiveness scores, based on a large range of factors like labor costs, energy prices, regulatory systems, infrastructure, and existing supplier networks. Using these scores, Deloitte ranked nations according to manufacturing executive perceptions about current competitiveness and where they expect each nation to be in five years. The top ranking countries are reported in Table 3 above.

Balance of Power Shifting

These data clearly show the emergence of China, India, Korea, and Brazil as manufacturing powerhouses and new major players that will remain competitive into the foreseeable future. Each of these countries has benefited from the search for cheaper labor costs, but their strength is increasingly based on the emergence of domestic markets. By 2015, expectations are that all four of these countries will be ranked ahead of the United States in competitiveness for manufacturing.

Europe Expected to Struggle

The survey also shows that most of Western Europe is expected to become less competitive over the next five years. As can be seen in Table 3, Germany is the only Western European nation that is expected to remain among the world’s 10 most competitive countries. The Netherlands, Switzerland, the United Kingdom, Ireland, Italy, and Belgium are all expected to slip in the rankings over the next several years.44

U.S. Expected to Remain Among World Leaders

While the international playing field is leveling and new powerhouse nations are challenging U.S. dominance, it is wrong to write off the future of manufacturing in North America. The growing importance of innovation capacity and workforce talent is helping to keep the United States among the world’s most competitive nations, but maintaining that position will require effort and investment.

Key U.S. Advantages

In the United States, a shift is taking place toward sectors and business models that are viable in the new integrated global marketplace. We cannot delve into the United States’ competitive advantages and disadvantages for each specific sub-sector of manufacturing here, but some broad trends deserve attention.

Advanced Manufacturing

For several decades, labor-intensive manufacturing has been moving to developing countries in search of lower wages. For this reason, increasingly, any mass manufacturing that is done in the United States is considered “advanced manufacturing.” One recent study found that the competitiveness of American firms relies more heavily on providing unique processes or products to gain a competitive advantage than on low-cost or natural resources.45 As a result, many of the competitive operations that remain in United States rely on machines, not people, to perform the actual assembly work.

44 Ibid.

Collaborative Innovation Increasingly Vital to Advanced Manufacturing

Advanced manufacturing is increasingly characterized by the importance of continual innovation. As discussed above, the ability to drive innovation is increasingly vital to the long-term success of manufacturing firms. Firms working in advanced manufacturing sectors are usually fighting for market share within a space defined by rapid and continual improvement. Product and process life cycles are shrinking as the pace of innovation accelerates, forcing companies in advanced manufacturing to invest heavily in research, development and commercialization.

More and more companies are relying on open and collaborative innovation models. As was discussed in Chapter 2, and will be expanded upon in later chapters, even large firms need to foster collaborative research relationships, with both private and public entities, to keep pace with the rate of technological change in many advanced manufacturing sectors. Companies with different research, development and production expertise must often collaborate to successfully bring new products and processes to market. All of this means that advanced manufacturing must be understood in terms of how firms execute research, as much or more so than what is being researched and produced.

Access to the North American Market

North America remains an enormous market for manufactured goods. The United States is the largest market for goods and services in the world. Growing markets in Asia and other developing countries are becoming increasingly attractive to manufacturers, but having access to the North American market will continue to be important.

For example, General Electric announced that it would move 400 jobs from China to Louisville, Kentucky, to produce its new lines of energy-efficient washers and dryers. Of the roughly 5.5 million Americans that work for foreign-owned companies, 38 percent are in manufacturing, more than any other sector. The world may be getting smaller, but the advantages of manufacturing goods in close proximity to their ultimate market appear to be rebounding.

One advantage that is often overlooked in the discussion of U.S. manufacturing competitiveness is that the United States is still growing in population. In his book The Next Hundred Million Americans, Joel Kotkin discusses the importance of the fact that, while most of the developed nations in the world and China are not growing, the population of the United States is still on the rise. The combination of higher fertility rates and robust immigration means that the United States will continue to expand in population for the next several decades. Although population growth carries its own challenges, it also means that the U.S. market for manufactured goods will remain strong. This should continue to entice manufacturers to locate operations in North America.

---


Keys to Sustaining Competitive Advantages

Supporting the long-term vitality of manufacturing in the United States requires a variety of investments in people and places. This section briefly outlines some of the most pressing investments needed to keep American manufacturing communities and companies competitive.

Need for Skilled Workers

U.S. manufacturers are concerned about where they will find the skilled technical workforce that is required by modern manufacturing plants. Even during the depths of the Great Recession, a third of manufacturers reported moderate to severe workforce shortages. Even more saw shortages coming in the next few years. The increasing technological sophistication of modern manufacturing operations means that workers will need more education and specialized training than was true in the past. Although it may seem odd to speak of insufficient workforce capacity with unemployment rates at their current levels, there is good evidence that the pipeline of skilled manufacturing workers needs to be substantially enlarged.

Manufacturing workers need more education today than they have in the past. As shown in Figure 9 below, the last 10 years have seen a marked shift in the educational profile of the average manufacturing worker. First, there are fewer employment opportunities in manufacturing for workers with no education beyond high school. On the other hand, there has been a substantial increase in the proportion of manufacturing workers with at least a bachelor’s degree, moving from less than 22 percent of all manufacturing employees in 2000 to nearly 28 percent in 2010.

![Figure 9: Educational Attainment of Manufacturing Employees (2000 vs. 2010)](image)

The shift toward greater educational attainment is happening even more rapidly among manufacturing workers than for the rest of the American workforce.

Figure 10 below shows how education levels have shifted over the last decade within manufacturing compared to the rest of the private sector. There has been a more severe decline in manufacturing positions for workers without a high school diploma than there has been for non-manufacturing workers with the same level of education. The proportion of workers with a high school diploma but no college has also declined across the economy, with manufacturing

---

50 Deloitte and Oracle, People and Profitability: A Time for Change.

losing a greater share of its positions with little education requirement than the rest of the economy. On the other end, the surge in manufacturing employees with at least a bachelor’s degree has substantially outpaced workers in other fields. As shown below, the increased need for workers with advanced technical training has many manufacturers worried that the United States is not graduating enough manufacturing scientists and engineers to keep pace with what the industry needs.

Figure 10: Change in Education Level from 2000 to 2010 (Manufacturing vs. Non-Manufacturing)

It comes as no surprise that manufacturing is trending toward the more highly skilled and highly technical, but it is significant to see that this trend is more marked within manufacturing than for the rest of the economy.

Lack of Skilled Production Workers
Manufacturers have expressed a great deal of concern regarding the future availability of technically skilled workers. Across the entire economy, “the United States could face a 1.9 million shortfall in technical and analytical workers”\(^{53}\). Even during the Great Recession, with unemployment rates high across the country, some manufacturers have had difficulty finding the skills and experience they need. The shortage of technical workers will only become more acute as the United States emerges from the recession.

A 2009 survey of manufacturing organizations in the United States found that a flexible, highly-skilled workforce is critical to manufacturers’ competitiveness, and it is a particular focus among the most profitable manufacturers\(^{54}\). The survey also measured the level of workforce shortages across manufacturing subsectors. The greatest workforce shortages were reported in advanced sectors like aerospace and defense, life sciences and medical services and energy and resources.

Lack of Manufacturing Scientists and Engineers
The overall shortage in manufacturing scientists and engineers is not as dire as is the case for skilled production workers, but there is still substantial need\(^{55}\). The shortage of scientists and engineers was the most dramatic within the Energy and Resources sector, with almost three-quarters of

\(^{52}\) Ibid.


\(^{54}\) Deloitte and Oracle, People and Profitability: A Time for Change.

\(^{55}\) Ibid.
respondents reporting difficulty finding the intellectual talent needed. The need is also marked in Aerospace and Defense, with over half of the survey respondents indicating a need for more scientists and engineers. These results are particularly worrisome given that the sectors that report the greatest need for innovative talent are the sectors that many observers see as the best opportunities for manufacturing growth in the future.

The Aging Manufacturing Workforce

While many manufacturers are having trouble finding the workers they need today, the outlook is even more alarming. The manufacturing workforce is aging, and many observers worry that not enough skilled production workers, engineers and scientists are ready to replace those that retire. The median age for manufacturing workers increased by two years during the last decade, while the median age of the non-manufacturing workforce increased by just over one year.\(^{56}\)

More evidence of the looming dearth of skilled manufacturing workers emerges when one examines the median age of employees by manufacturing sector. As shown in Figure 11, many of the manufacturing sectors with the oldest median age are sectors that are the most reliant on workers with advanced skills and training.

---


\(^{57}\) Ibid.

At the low end, the three sectors that have a median worker age below the national median (beverages and tobacco products,
food manufacturing, and wood products) tend to be sectors that demand less technical expertise and experience. On the other end, many of the sectors that require the highest levels of technical proficiency (petroleum and coal products, transportation equipment, machinery manufacturing, primary metals and fabricated metal products) are all sectors with aging workforces. While this trend is not perfect, and there is a diversity of skill levels required within each manufacturing sector, Figure 11 partly explains why U.S. manufacturers are concerned about replacing their most experienced employees.

**Accelerate Innovation**

The edge that the United States currently enjoys in advanced manufacturing cannot be treated as a given. As labor-intensive manufacturing has moved out of the developed world in search of lower wages and minimal worker protections, many observers have claimed that the United States should focus on advanced and innovative manufacturing sectors. However, there is disturbing evidence that advanced manufacturing in the United States faces increasing pressure on the global stage.

Figure 12 shows, there has been a marked decline in the proportion of all U.S. manufacturing exports that come from high-technology sectors. The World Bank defines high-technology sectors as those with “high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery”\(^58\).

Examining the trend in more detail, one can clearly see the impact of the dot-com bust at the end of the 1990s. Where high-technology exports had driven by the dot-com bubble, the collapse of the high-tech sector sent the long-term trend back into decline. In subsequent years, there has been consistent erosion in high-tech goods as a percentage of all U.S. manufacturing exports.

**Benchmarking Innovation Competitiveness**

While some information can be gleaned from the contribution of high-technology goods to all U.S. exports, a more comprehensive picture emerges from comparing innovation-based competitiveness across nations. The Information Technology and Innovation Foundation (ITIF) tracks

---


\(^{59}\) Ibid.
innovation competitiveness for the United States and most of its major competitors. A study was first conducted in 1999 and was repeated in 2011. ITIF measures innovation competitiveness based on a range of metrics, including human capital, public and private investment in innovation, entrepreneurship, and economic policy.

While any broad benchmarking exercise has its limitations, the ITIF study released in 2011 contains some useful information about the current international innovation landscape. Table 4 shows the top 10 nations according to ITIF’s 2011 ranking and selected other nations that are major players in the international manufacturing marketplace. The United States remains among the world’s innovation leaders, but it has plenty of robust company. Many of the developed nations around the world are near or surpass the United States in innovation competitiveness.

The United States does not fare as well in many of the specific elements of innovation competitiveness captured by this study. The United States ranks 10th in education, 11th in venture capital, 11th in broadband deployment, 14th in research publications, and 34th in foreign direct investment.

**Change in Innovation Competitiveness, 1999 to 2011**

While the United States still ranks among the world’s more competitive innovation economies, it has made scant progress over the past decade. Of the nations studied, only Italy made less headway in innovation competitiveness.

At the other end of the scale, this study indicates that China has improved its competitive position with regard to innovation more significantly than any other nation. Other notable manufacturing nations that posted significant gains include South Korea, Singapore, and India.

While most of the developed nations made more gains between 1999 and 2011 than did the United States, few were among the most rapidly improving economies. Based on degree of improvements to innovation competitiveness between 1999 and 2011, Japan ranked 17th, the United Kingdom 24th, Canada 34th, France 37th, and Germany 38th out of the 41 nations studied.

These data indicate that the global innovation landscape is rapidly changing. Without serious effort and investment, the United States stands to lose its privileged position within in the international innovation economy. Later chapters will discuss what the United States can do to bolster innovation capacity and will outline similar measures that some competitor nations are taking.

---


61 Ibid.

62 Ibid.
China Ramping Up Domestic Innovation

Of all nations, China appears to be making the greatest strides in cultivating its innovation capacity. In 2006, China initiated a medium- to long-term innovation plan that set the goals of making China into an innovation-oriented society by 2020 and becoming the world leader in science and technology by 2050 (Cao, Suttmeier, and Simon 2006). According to the plan, China will invest 2.5 percent of gross domestic product in R&D, an increase of 150 percent compared to 2005 levels. The plan also calls for major governmental investments in engineering megaprojects including drug innovation and development, high-definition earth observation systems, manned aerospace and moon exploration, and next-generation telecommunication. Most evidence indicates that China is making good on its plans. The ITIF analysis of competitiveness discussed here found that between 1999 and 2011, China improved its innovation competitiveness more dramatically than any other nation.

Transportation Investments

America’s transportation infrastructure is aging and in need of substantial investment. While the United States was among the top 10 nations in terms of quality of infrastructure in 2001, its ranking has dropped to 23rd out of 139 countries studied in 2010.\(^6^3\)

Railroad transportation is particularly important to many manufacturers who ship large or heavy goods and those who rely on large shipments of raw materials. Currently, the quality of U.S. railroads ranks 18th in the world.\(^6^4\) The real concern for railroad infrastructure is the future. As the overall demands for railroad capacity increases, the United States will need to invest heavily to keep pace.

Figures 13 and 14 below show the current and future capacity of rail transportation in the United States. In these figures, green lines indicate the most rail capacity relative to demand and red lines the points of greatest congestion, with yellow and orange in between.

---


\(^6^4\) Ibid.
Figure 13: Rail Capacity (2007)

Source: Cambridge Systematics, National Rail Freight Infrastructure Capacity and Investment Study (Association of American Railroads, September 2007).
Looking at the current map, there are points of congestion, but they are not widespread. A few corridors along the West Coast and several in the Midwest are strained to some degree, but most of the system has excess capacity. A future without substantial investments in rail capacity is much more alarming. Figure 14 maps the level of traffic expected by 2035 if the U.S. rail system does not add any additional capacity. Clearly, the current rail system is not prepared for the levels of traffic that are expected in coming decades. By 2035, today’s isolated bottlenecks will have become the norm. This will undoubtedly harm competitiveness for manufacturers across the United States.

With energy prices rising and becoming more volatile, access to rail and water-based shipping is becoming more and more important. In addition, manufacturers are also seeking locations with flexible transportation options so they can adjust their shipping strategies as market conditions change.

---

66 Ibid.
As companies seek to reduce the carbon footprint of their operations, there is reason to expect demand for rail capacity to rise even more. Furthermore, an increase in customer demand for low-carbon manufactured goods means that “carbon emissions will become a selection criterion in transportation purchasing decisions”\(^{67}\).

Although the coming crisis in rail capacity is of particular concern for many manufacturers, the need for fundamental infrastructure improvements does not stop there. U.S. roads rank 19\(^{th}\) in the world, its ports rank 22\(^{nd}\), and air transport ranks 32\(^{nd}\)\(^{68}\). If the United States hopes to remain a manufacturing powerhouse, it will require substantial investments in fundamental infrastructure over the coming decades.

Intermodal logistics hubs are becoming much more important for today’s manufacturers. As manufacturers work to maintain flexibility in the dynamic marketplace, they are placing more importance on having a variety of transportation options. Modern manufacturers want to avoid putting all of their eggs in one truck, so locations that can only be served by one mode of transport look less and less appealing. The importance of intermodal hubs has not gone unnoticed, but there is still need for greater integration of the various modes of transportation.

Finally, it is important to note that managing flexible and integrated transportation requires capacity beyond roads, rail, ports, and intermodal facilities. The availability of logistics support services figures prominently in manufacturing companies’ decisions about where to locate. As such, economic developers must work to build and market the logistical expertise needed to make the most of existing physical infrastructure.

**Conclusion**

This chapter sought to highlight the key market forces that are reshaping modern manufacturing. The next two chapters illuminate what the changed manufacturing landscape means to the practice of economic development. With such fundamental shifts occurring in the marketplace, economic developers continually need to update their approach to supporting and growing the manufacturing presence in their communities.

\(^{67}\) Paul Bingham, “Global Economic Trends as they Impact Transportation”, September 2009.

SECTION 2

Economic Development Strategies and Programs
CHAPTER 4
Supporting Manufacturing with Traditional Economic Development Strategies

This chapter focuses on how traditional economic development programs are shifting to meet the challenges of today's manufacturing sector. This chapter features strategies, best practices, and innovative tools that can be implemented as part of business retention, expansion and attraction programs.

Business Retention and Expansion

As a direct consequence of the decline in the total number of manufacturing attraction deals, as well as pressures from a globalizing market, many EDOs are devoting more resources to helping their existing companies to survive and grow. Moreover, in many communities, the majority of new jobs are created by existing businesses, not newly arrived firms. In lean economic times (as in boom years), it is often easier and cheaper to save jobs than to create new ones.

Overview of BRE Activities

In developing this project, IEDC conducted a web survey of economic developers who work with manufacturing firms. While the survey methodology does not ensure a representative sample, the respondent pool does reflect a wide range of local, state, and regional economic development organizations.

From these data, reported in Table 5 below, a few conclusions can be drawn:

- **Business retention and expansion (BRE) is the most common area of focus:** All but one respondent reported that they work to retain and expand manufacturing firms in their communities, an indication that BRE efforts are particularly important to protecting and growing manufacturing jobs.

- **EDOs are focused on entrepreneurs and small manufacturers:** Support for entrepreneurs and small firms was the most common BRE activity identified. Given the importance of entrepreneurs and small businesses to the manufacturing sector, this result makes sense. It is also evidence of how far economic development practice has evolved.

- **Workforce development is key:** In another indication that economic development practice around manufacturing has expanded into new territory, workforce development was the second most common form of BRE support according to survey respondents.

- **EDOs play a connecting role:** The survey found that where EDOs do not directly

---


70 For more information on this survey, see the Data Appendix.
provide one of the services listed, they usually work to connect manufacturers to resources offered by other agencies or organizations.

**Table 5: Manufacturing BRE Services Provided Directly by EDOs**

<table>
<thead>
<tr>
<th>Service Type</th>
<th>% Directly Providing Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurship &amp; small business support</td>
<td>62%</td>
</tr>
<tr>
<td>Workforce development</td>
<td>60%</td>
</tr>
<tr>
<td>Supply chain development</td>
<td>45%</td>
</tr>
<tr>
<td>Transportation and logistics</td>
<td>42%</td>
</tr>
<tr>
<td>Business finance</td>
<td>37%</td>
</tr>
<tr>
<td>Innovation &amp; technology acceleration</td>
<td>33%</td>
</tr>
<tr>
<td>Production or business model technical assistance</td>
<td>29%</td>
</tr>
<tr>
<td>Export assistance</td>
<td>28%</td>
</tr>
<tr>
<td>Layoff aversion</td>
<td>26%</td>
</tr>
</tbody>
</table>

With these results in mind, the remainder of this section outlines strategies, approaches, and best practices for important types of BRE services that EDOs can provide. This section cannot cover every possible type of program, but seeks to focus on issues that are increasingly important to the health of firms in a globalized and rapidly evolving manufacturing market.

**Supporting Innovation and Technology Acceleration**

The long-term viability of manufacturing firms is increasingly dependent on their ability to continually innovate and improve. As such, economic developers are becoming more engaged in creating and utilizing programs to speed research, development, and commercialization. The next chapter offers more detailed discussion of economic development strategies to support innovation in the manufacturing sector.

**Assist in Addressing Workforce Development Challenges**

The next chapter will cover in more depth the roles that economic developers can play in ensuring that manufacturers can find the workers they need. Briefly, here are some of the key strategies that economic developers are pursuing to address workforce issues and leverage workforce assets in their communities:

- **Use BRE surveys/interviews:** Ensure that BRE surveys and interviews capture manufacturers’ workforce needs.
- **Use manufacturers’ knowledge to identify training needs:** Engage manufacturers in identifying needed course offerings and updating curriculum at local training institutions (e.g. community colleges, high schools, non-profits, public programs).
- **Recruit manufacturers for local workforce investment boards (WIBs):** Given the importance of WIBs to shaping local workforce delivery systems, it can be extremely valuable to ensure that savvy manufacturers represent the needs of the sector as WIB members.
- **Collect and analyze workforce data:** Rigorously measure local workforce needs and assets, whether through local data collection or use of publicly available data sources. EDOs are using data to identify workforce development priorities, evaluate the effectiveness of existing programs, and inform existing
manufacturers about opportunities and challenges in the local labor market.

**Explore New Supply Chain Opportunities for Local Manufacturers**

While large global corporations have the resources to identify and pursue new market opportunities, many small and medium-sized manufacturers need technical assistance along the way. Whether a company is trying to survive collapsing demand from its traditional customers, to become an exporter, or to find demand for innovative products, many smaller firms lack the resources needed to expand into new markets. This section outlines several techniques that economic developers can use to identify promising supply chain opportunities and help local manufacturers take advantage of them.

**Target Supply Chain Opportunities**

The first step is to identify supply chain opportunities that local firms can fill. This generally involves identifying specific growth markets or supply chain bottlenecks where demand is strong or growing. While there is no single way to accomplish this task, several approaches can anchor the process:

- **Consult industry organizations:** Many industry groups publish a list of North American Industry Classification System (NAICS) codes for their industry’s supply chain. Often, industry groups identify specific supply chain bottlenecks that need to be addressed, or links that are poised to grow in the future.

- **Approach original equipment manufacturers (OEMs) and tier 1 suppliers:** Another approach is to meet with OEMs and top-level suppliers directly to learn about their supply chain needs. As companies at the top of the supply chain take an increasingly active role in managing their suppliers, they are developing deep knowledge of where supply chain opportunities exist. As will be seen below, categorizing promising supply chain opportunities by NAICS code can make it easier to search for local firms that may be able to fill the demand.

- **Approach Manufacturing Extension Partnerships (MEP):** Starting with an agreement with the Department of Defense, the MEP conducts supplier scouting to identify manufacturers that can fill identified supply chain needs. This makes the MEP an excellent source of information on promising defense markets. MEP centers increasingly provide similar services for civilian manufacturers and so can provide market insights beyond the defense industry.

The next section discusses techniques for evaluating which of the identified supply chain opportunities are a good fit for your local manufacturing base.

**Identify Local Strengths within the Targeted Supply Chain**

Once supply chain opportunities are identified, a supply chain analysis will reveal where your community’s strengths lie. As mentioned in the previous section, cataloging supply chain opportunities by NAICS code can help in identifying local firms that are suited to enter the target markets. While

---

NAICS codes are imperfect, they provide a useful baseline for evaluating which supply chain opportunities to pursue.

Starting with a list of supply chain opportunities categorized by NAICS code, the following steps can assist in identifying which opportunities to pursue more extensively:

- **Use location quotients to assess relative local industry strength:** The Bureau of Labor Statistics provides a location quotient (LQ) calculator that can be used to compare the density of local employment in each identified NAICS code compared to the regional, state, or national average (see data.bls.gov/location_quotient/). An LQ higher than 1 indicates that a given sector accounts for a larger percentage of all employees in the focus region than for the nation as a whole. In addition to industry concentration, the LQ calculator also gives the total number of companies for a particular NAICS code. While a large concentration of suppliers may be more relevant when determining where to focus economic development funds, a large number of suppliers creates a stronger lure for manufacturers who are interested in a critical mass. The calculator also allows LQs to be compared across years, which will show whether the industry concentration is growing or declining compared to the nation.

- **Use shift share analysis to track growing and shrinking sectors:** Shift share analysis is an explicitly dynamic metric that captures how the distribution of jobs across economic sectors is changing in a chosen economic region. As opposed to location quotients, which are based on a snapshot of data from a specific time point, shift share analysis is a time-series technique designed to identify growth opportunities and the most pressing contraction threats. Like LQs, shift shares can be calculated using the Quarterly Survey of Employment and Wages published by the Bureau of Labor Statistics.

- **Use BRE interviews to identify firms with relevant capacity:** While location quotients are often helpful, BRE surveys can also be used to assess whether local manufacturing firms have the capacity to enter potential supply chain opportunities.

Having narrowed the list of promising opportunities down to those that fit well with the local manufacturing base, the next step is to identify specific local manufacturers that may be able to exploit the targeted markets.

**Identify Specific Local Firms within Targeted NAICS Codes**

EDOs in smaller cities and towns may anecdotally know who their manufacturers are, but this becomes more difficult in larger cities. Therefore it is often useful to consult comprehensive databases of companies based on NAICS code, geography, number of employees, sales revenue, growth and more. Although many of these online tools are subscription-based, they often can be accessed through a local library or university, and many offer free trials. Some of these top resources include:

- **Dunn and Bradstreet:** Provides a wealth of business information on over 130 million
companies in more than 190 countries (see http://www.dnb.com/).

- **Hoovers**: Offers a free searchable database of over 65 million companies worldwide, including basic data on public and larger private companies (see www.hoovers.com/).

- **Reference USA**: Similar to Hoovers and also has a separate database for new companies, which can be useful to examine trends in industry growth (see referenceusa.com).

- **ThomasNet**: A supplier database that allows companies to search for a manufacturer, distributor or service provider based on industry category and subcategory. The suppliers can be further narrowed by geographic location. ThomasNet allows suppliers to register for free to be included in its database (see thomasnet.com).

- **Manta**: A free service that sorts companies by category and subcategory rather than NAICS codes. Manta also creates charts and other visual aids to depict the results of the search (see manta.com/mb).

- **OneSource**: Collects data from various business information sources and combines the data into streamlined profiles (see onesource.com).

A variety of other databases may prove valuable in strengthening supply chain relationships, such as Moody’s Investor Service, Standard and Poor’s, CorpTech’s Directory of Technology Businesses, ThomasNet, and Ward’s Business Directory. There are, of course, many ways to identify local firms that fall within targeted NAICS codes, but the databases discussed here are some of the best tools for the task.

**Help Local Firms to Exploit Identified Opportunities**

This section outlines some of the steps that EDOs can take to help local manufacturers exploit the opportunities that have been identified. Even where promising opportunities have been identified, there is often significant work needed to realize the potential. Several approaches can make it easier for existing firms to enter new supply chain markets:

- **Forming and enhancing supplier networks**: The information gap between OEMs and suppliers can partly be solved by a supplier network, a directory or clearinghouse of local suppliers based upon their capabilities. Economic developers should think about what level of geography makes sense for the targeted industry, and whether a local, state or regional network is most appropriate. Industry associations are a great resource for supplier information for broader geographies. Regardless of the specifics, the key is to create mechanisms for OEMs and suppliers to learn about each other’s requirements and capabilities.

- **Hold supplier conferences**: In the past few years, a number of states have also begun to conduct supply chain conferences to offer potential suppliers a more in-depth look at the opportunities available in emerging industries. These supplier conferences are often organized jointly by economic development organizations, universities, and manufacturing extension centers. For example, in July 2010, the Illinois Department of Commerce and Economic Opportunity, the Center for Renewable
Energy at Illinois State University, and the Illinois Manufacturing Extension Center hosted the second annual “Building the Wind Supply Chain” workshop. The workshop was held the day before the annual “Advancing Wind Power in Illinois” conference to capture the synergies of both events. Attendees learned about opportunities in the wind supply chain and quality expectations directly from industry leaders. Manufacturing specialists also helped suppliers with developing a market penetration plan and connecting with potential customers.

**The Northwest Connectory**

The Northwest Connectory is an Oregon-based supply chain database operated by Business Oregon and the Pacific Northwest Defense Coalition (Business Oregon 2011). The service is free to use and to join, and provides detailed profiles of participating businesses, including capabilities, products and services.

- **Connect manufacturers to technical assistance:** Many small and medium-sized firms need assistance in understanding and fulfilling the requirements needed to move into new supply chain markets. This may entail understanding and meeting new quality standards, developing new transportation routes, or other changes that can be difficult for smaller manufacturing firms to achieve without support. Again, many Manufacturing Extension Partnership centers can provide technical assistance in this area, but it may be necessary to provide additional support as well.

- **Connect manufacturers to financing:** In addition to technical assistance with production, EDOs can also play a critical role in helping companies that need financing assistance. Often, diversifying into new markets requires new equipment, staff, and raw materials, all of which pose significant financing challenges that must be overcome.

**Overcoming Supply Chain Bottlenecks**

While the previous section focused on helping companies to find and exploit new supply chain opportunities, this section discusses how EDOs can help companies to overcome their own supply chain deficiencies.

A robust supply chain is key to a manufacturer’s success. Bottlenecks in the supply chain can cost OEMs and top-tier suppliers expensive production backlogs. These production needs are best met by a diverse and highly qualified supplier base. Large OEMs may have the in-house capabilities to effectively manage their own supply chains, but small and medium-size firms need more help in connecting with additional suppliers to strengthen their supply chains.

Addressing OEM supply chain needs requires an intermediary that is intimately familiar with regional suppliers and their capabilities. While many EDOs can develop this expertise for the key manufacturing supply chains in their communities, many must engage outside consultants who have manufacturing expertise and can build and manage relationships with suppliers and OEMs. For example, the Ohio Department of Development contracted with the Great...
Lakes Wind Network to develop supplier scouting services for OEMs in the state’s wind industry. Steps that can be taken to assist local companies in overcoming their supply chain issues include:

- **Connect firms with Manufacturing Extension Partnership (MEP) Supplier Scouting Services**: MEPs work with small and mid-sized manufacturers on a daily basis, and as such, can offer local supplier scouting on a national basis through MEP’s national network. They have experience addressing the supply chain needs of manufacturers of all sizes, OEMs, and federal agencies. MEPs also help small manufacturers understand and adapt for supply chain opportunities, thereby further increasing the potential supplier base for OEMs. For instance, a number of MEP centers around the country have relationships with Procurement Technical Assistance Centers (PTACs) to help federal agencies, especially the Department of Defense, increase their supplier bases. The PTAC program was created by Congress to help businesses access government contracting opportunities, especially to address federal opportunities that entail a Buy American requirement. MEPs leverage their knowledge of local supplier capabilities with PTAC’s knowledge of government procurement needs and policies to identify the most promising suppliers. In addition to defense industries, several MEPs are also planning a pilot project to do supplier scouting for alternative energy industries.

- **Leverage supply chain networks**: The previous section discussed the importance of forming and leveraging supply chain networks. By developing and connecting to these supply chain networks, EDOs are in a better position to help local companies to find new suppliers.

- **Use BRE program to match supply chain needs with local firms**: A robust BRE program should have a systematic method of matching the supply chain needs of OEMs and top-tier manufacturers with the capacity of component manufacturers in the region. By using BRE surveys and interviews to elicit supply chain needs from final assembly firms and identify capacity from suppliers, EDOs can play a vital match-making function.

- **Target suppliers for attraction**: Another approach is to target existing companies’ suppliers and potential suppliers for business attraction efforts. Many manufacturers would benefit from having suppliers nearby, so they are often willing partners in marketing and recruitment efforts. Moreover, as OEMs and top-tier suppliers take an increasingly active role in managing their suppliers, many have the leverage to compel key suppliers to relocate closer to where final assembly is taking place. In some cases, EDOs have developed marketing materials specific to the supply chain in question that OEMs or tier 1 manufacturers can distribute to their suppliers.

- **Develop targeted supplier scouting program**: Where the need of local firms is sufficiently dramatic and the potential reward to the local economy sufficiently positive, it may be worth developing a sustained supplier scouting effort for the supply chain in question. Building on existing supplier networks, EDOs can...
take an even more active role in developing a sustained supplier scouting effort to address persistent supply chain issues. As noted above, the Manufacturing Extension Partnership offers these services at relatively modest expense, so EDOs need not conduct this effort completely in-house.

**Export Promotion**

According to the IEDC survey conducted for this project, export promotion ranked near the bottom of the list of BRE activities. That said, it is an area of growing importance. From the national level on down, EDOs are becoming engaged in export promotion.

**National Export Initiative (NEI)**

The Obama administration has made export promotion a central economic development priority. As part of that effort, the Department of Commerce is heading the NEI, an effort to encourage and support U.S. exports. Housed at [http://export.gov](http://export.gov), the National Export Initiative serves as a virtual one-stop shop for export promotion. Through this portal, EDOs and firms can access a variety of federal government services, including:

- Promising export opportunities
- Assistance with international sales and marketing
- Assistance with finance
- Assistance with licensing and regulations in foreign nations
- Assistance with trade problems

**Approaches to Enhancing Exports**

The economic development steps that lead to increased exports are, of course, context-specific. In some cases, companies need to be made aware of opportunities; sometimes they need help negotiating foreign regulatory systems; sometimes the challenge is financing. Because export promotion can cover so much ground, EDOs need a well-developed strategy to direct their efforts in this arena. Important tips include:

- **Target foreign markets carefully:** Export promotion must be grounded in a realistic appraisal of the local manufacturing base and rigorous analysis of foreign market opportunities.
- **Develop relationships with economic development networks in targeted countries:** It is critical to develop an understanding of, and connections to, the economic development delivery systems in the countries targeted for export promotion.
- **Understand the regulatory challenges in target countries:** Regulatory and licensing issues can be a major stumbling block for manufacturers, particularly small and medium-sized firms. The U.S. International Trade Administration (ITA) can provide expert guidance on overcoming regulatory barriers to foreign markets (for more on ITA technical assistance programs, see Chapter 10). World Trade Centers can also be a valuable partner in helping companies understand and comply with foreign regulatory requirements.
- **Help to forge private-sector relationships:** Particularly in manufacturing, where exporting often involves fitting into an international supply chain, companies need time to get to know each other. EDOs can help to forge these relationships in a variety of ways, including involving local firms in trade missions, scouting international trade...
events, and directly contacting foreign firms that are looking to expand production.

- **Blend export promotion and investment attraction:** While we often think of export promotion and foreign direct investment (FDI) attraction as two separate challenges, both are fundamentally a question of breaking down informational barriers and building relationships. Knowledge or partnerships that help a local company to start supplying to foreign markets often generate new attraction leads. FDI attraction is discussed in a later section, but the two objectives should be as coordinated as possible.

- **Engage World Trade Centers (WTCs):** Hundreds of WTCs around the globe and dozens in the United States work to promote free trade. WTCs can assist firms that are looking to expand exports in a variety of ways, including providing market analysis, screening potential business partners, setting up meetings with foreign firms, and working with foreign governments. For information on WTCs in your region, contact the World Trade Centers Association (www.wtcaonline.com/cms_wtca/).

**Connect Local BRE Programs with Corporate Headquarters**

Global site location decisions are rarely made by branch plant managers. Plant managers may have some input given their deep knowledge of local assets and weaknesses, but as companies seek to position themselves within dynamic global supply chains, the fate of individual plants is tied to the broad strategic direction set by corporate headquarters.

This means that BRE programs need to reach beyond the local plant manager and engage corporate decision-makers. Although it remains important to stay in touch with local plant managers – and often plant managers will be the key to developing strong relationships with the corporate headquarters – EDOs need to understand the corporation’s broader strategy to ensure that their community is part of the manufacturer’s long-term plan. Successful strategies include:

- **Go straight to the top:** Develop relationships directly with corporate headquarters. Taking the time to meet with corporate decision-makers can be essential to understanding threats to, and opportunities for, your community. It is often important to identify and develop relationships with the specific corporate decision-makers who oversee plants in your community.

- **Do tailored market research:** Research the market forces operating within the specific industry sub-sector(s) that the local plant works within. Understanding global market forces is often essential to understanding what it will require to keep a local plant competitive.

- **Leverage relationships with local plant managers:** Utilize existing relationships with plant managers to develop relationships with key executives in corporate headquarters. As the representatives of the corporation in the local community, plant managers can be very resourceful in connecting economic developers with the corporate staff.
**Layoff Aversion**

A layoff aversion program must accomplish two fundamental tasks: First, identify manufacturers that are at risk of downsizing or relocating, and second, do something about it. Both challenges require EDOs to act as convener, networker, and organizer. Saving a troubled manufacturer requires many moving parts to work together. This is why the most effective examples are established programs that are constantly working to organize resources to be ready when a local manufacturer runs into trouble. Key components of an effective layoff aversion program are discussed below.

**Identifying At-Risk Manufacturers:**

**Early Warning Networks**

Layoff aversion programs must have the capacity to identify firms that are struggling and in danger of substantial downsizing, moving production elsewhere, or closing altogether. Often, companies that are facing serious challenges will not seek out economic development organizations for assistance, so it is necessary to proactively seek out intelligence on the health of manufacturers in your local community.

It often falls to the EDO to establish systems for gathering information from diverse sources and organizing a database of information on local manufacturers.

A variety of hard data sources can provide signals that a local manufacturer may be headed for trouble, such as:

- **Worker Adjustment & Retraining Notifications:** The Worker Adjustment and Retraining Notification Act of 1988 (WARN) offers protection to employees by requiring employers to give 60 days’ notice ahead of impending plant closings and mass layoffs.

- **Trade Adjustment Assistance for Workers:** The Trade Adjustment Assistance (TAA) program, operated by the U.S. Department of Labor, is a federal program that provides aid (which may include training, job search and relocation allowances, income support and other services) to workers who lose their jobs or whose hours of work and wages are reduced as a result of increased imports. Applications to the TAA or TAAF programs can signal that a company’s export markets are under threat.

- **Trade Adjustment Assistance for Firms:** The Department of Commerce operates the Trade Adjustment Assistance for Firms Program (TAAF). TAAF helps firms that are experiencing significant pressure from foreign competition to improve their competitive standing. Like TAA, applications to TAAF can indicate that a manufacturer is in danger.

- **Unemployment claims:** State or federal unemployment data can also help to identify firms that are under greater duress than their peers.
Proprietary market data: It may prove worthwhile the investment to purchase private-sector data and intelligence on the health of local manufacturing establishments. For example, Dunn and Bradstreet (D&B) publish “financial stress scores” for individual companies. D&B’s financial stress scores are designed to help predict a business’s potential failure and the likelihood that a company will obtain legal relief from creditors or stop operations without fully paying creditors within a year of closing.

In addition to hard data sources, news of trouble brewing can be gathered from a variety of community stakeholders. Groups that can often raise the alarm when mass layoffs are imminent include:

- **Manufacturing Extension Partnership Centers**: MEP centers often contact manufacturers that need to make changes to survive, making them vital partners in an early warning network.
- **Small Business Development Centers**: Also interact with companies experiencing serious challenges.
- **Local banks**: Can identify companies that need financial assistance to avoid layoffs.
- **Local unions**: Keep close tabs on employers’ prospects and will often know of potential layoffs.
- **Other local manufacturers**: Manufacturers that share market conditions can often identify troubled firms, particularly if they share a supply chain with the firm experiencing difficulty.

For more detail on how to organize an early warning network, please see the Tool Box chapter. A tool is provided that outlines the most likely data resources available and the
important stakeholders to engage in the network.

**Delivering Rapid Technical Assistance to Struggling Firms**

The second component of the layoff aversion program, usually the more challenging part, is working with at-risk businesses that have been identified through the early warning network to address their specific challenges in order to prevent mass layoffs. Manufacturers may need support with financial restructuring, improvements to their business models, production line improvements, workforce development support, ownership transition, technology acceleration, supply chain development, and more. Each firm is unique and will need a unique mixture of assistance to turn things around. A variety of steps can streamline the process of connecting a troubled manufacturer with the technical expertise it needs:

- **Systematically map existing assets in the community or region:** Since EDOs cannot afford to house all of the diverse technical expertise that is required to revive a struggling manufacturer, an effective layoff aversion program must pull together available resources to help the firm in question. Manufacturing Extension Partnership Centers, Small Business Development Centers, local banks, and labor unions often have deep knowledge about what it takes to run a viable manufacturing operation.

- **Work to fill technical assistance gaps:** In addition to tapping existing resources in the community, EDOs should actively work on building new partnerships in order to expand the network of services and programs to support businesses.

- **Hire staff to deliver technical assistance:** In some cases, it may be necessary to have staff on hand that can assist manufacturers on a moment’s notice.

The specific expertise required will depend on local manufacturers’ specific needs and the resources already available.

The Toolbox chapter provides additional guidance on mapping and organizing technical assistance capacity.

Putting all of these different parts together into an early warning and rapid response program takes time and resources, but the effort can bring substantial rewards. As seen in the case study on the program developed by the Steel Valley Authority, a robust layoff aversion program can bring companies back from the brink, avoiding the problems that can come when major manufacturing layoffs occur.

**Attraction and Marketing**

While many EDOs are reallocating resources away from attraction and marketing, these efforts remain central to the economic growth strategies in many communities. However, the new market realities discussed in Chapter 2 are changing the site selection process in a variety of ways. This section details some of the emerging attraction strategies economic developers are using in the modern business climate.

In the survey conducted for this project, IEDC sought to identify how marketing and

---

72 For more information on this survey, see the Data Appendix.
attraction strategies targeted at manufacturing firms have changed in recent years. Respondents were asked to indicate whether a number of possible changes applied to their organization’s effort to market to and attract manufacturing firms.

Table 6: Changes to Marketing and Attraction Strategy Over Last Five Years

<table>
<thead>
<tr>
<th>Type of Change</th>
<th>% Saying Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working more to market workforce assets</td>
<td>87%</td>
</tr>
<tr>
<td>More carefully targeting specific sectors/industries for attraction</td>
<td>82%</td>
</tr>
<tr>
<td>Focused more on regional collaboration</td>
<td>81%</td>
</tr>
<tr>
<td>Working more to market transportation and logistical assets</td>
<td>78%</td>
</tr>
<tr>
<td>Working more to market innovation capacity</td>
<td>73%</td>
</tr>
<tr>
<td>Working more to market business/industrial parks</td>
<td>68%</td>
</tr>
<tr>
<td>Working more on attracting foreign direct investment</td>
<td>62%</td>
</tr>
</tbody>
</table>

A few key findings, contained in 6 include:

- **Workforce emerging**: Just as with BRE programs, workforce development has become an essential component of an effective marketing and attraction program. This result mirrors surveys of manufacturing executives and the reports of site selection consultants. On all fronts, it is clear that today’s manufacturers place a premium on the availability of skilled workers and that EDOs must understand the strengths and weaknesses of their local labor market if they hope to be effective in attracting manufacturing firms.

- **Strategies becoming more targeted**: As the manufacturing marketplace becomes more complex, with more specialist niches and more connections between different firms, attraction and marketing appeals need to be more carefully targeted at specific industries or sub-sectors within industries. Companies and site selection consultants are increasingly sophisticated in how they evaluate the strengths and weaknesses of possible sites. Moreover, as flexible specialization becomes more prevalent, the drivers of site selection are becoming increasingly unique to the business model that a particular firm is pursuing. All of this means that broad based appeals are less and less successful. Companies know what they want, and it is up to EDOs to target their efforts at firms that are looking for what the community has to offer.

- **Regional collaboration increasing**: The trend toward more regional collaboration is present even in the attraction and marketing game. This is encouraging, given that attraction is one of the most challenging endeavors to coordinate on a regional scale. This survey provides further evidence that EDOs are trying to escape the strictly zero-sum attraction game and work instead to build competitive regional economies. As regional collaboration becomes more important and prevalent, firms and site selection consultants often explicitly evaluate communities based on whether they are party to effective regional planning and development collaborations.
The remainder of this section outlines strategies and best practices in seeking to attract manufacturing firms. While it does not cover every possible topic, this section seeks to shed more light on how marketing and attraction programs can be strengthened to fit the contemporary manufacturing landscape.

The Fast-Paced Site Selection World
As companies seek to respond more quickly to changing market forces, the pace of site selection has accelerated substantially.

Firms and site selection consultants have also become much more sophisticated in using data to identify communities that are possible sites for a given project. As a consequence, local economic developers often do not hear about an attraction possibility until the company or consultant has already narrowed in on a short list of possible locations.

Several ways in which the accelerated and sophisticated nature of modern site selection has changed the attraction game deserve particular mention here.

Know How Your Community Is Being Evaluated
Given that much of the narrowing down is now conducted before communities are ever contacted, it is vital to understand how your community is being evaluated. As site selectors become more sophisticated in their use of data and incorporate a wider range of selection criteria, EDOs need to understand their communities' strengths and weaknesses with the same level of granularity.

Maintain a Useful Website
With the expansion of the Internet, companies and site selection consultants do more of their screening online. This means that EDOs’ websites must provide useful data and leave the impression that the community and the EDO have their economic development house in order. An EDO’s website often makes the first impression, and if the impression is not good, an EDO will lose attraction candidates without ever knowing it.

The vital information that a website must contain varies by community and industry. However, information commonly expected to be available on EDOs’ websites includes:

- Economic and demographic information
- Communication, transportation, and logistics infrastructure
- Labor availability
- Targeted or leading industry sectors
- Research and development assets
- Labor rates
- Utility rates
- Maps of available sites, preferably with information on specific properties
- Links to local, state, and regional development resources (e.g. government programs, associations, economic development partnerships, etc.)
- Community’s long-range investment and planning priorities

Beyond the types of information provided, other attributes can make a website a more effective tool in the modern site selection world, including:

- Be sure information is up to date: Old information can be a bad sign to a
company that is looking to move fast. Out of date information on an EDO’s website can be taken as an indication that the community is not ready to move at the speed that modern manufacturers demand.

- **Invest in website usability:** Just as with obsolete information, a poorly designed website can signal that a community is not staying current with the evolution of business technology and communication. Given the pace of the process, site selectors will often move on if a website makes it difficult to access the needed information, costing communities opportunities that they didn’t even know they missed.

- **Provide unique data:** Where possible, it is important to provide hard data that cannot be gathered from other sources. Site selectors used to rely on local EDOs for baseline community data, but now they can get most of this information through other sources. A community can still distinguish itself by providing detailed data (e.g. workforce availability) than cannot be found elsewhere.

- **Summarize existing studies:** EDOs’ websites should also summarize and, where possible, provide links to detailed profiles of the local economic climate. Doing so indicates a rigorous approach to self-evaluation and provides site selectors with additional background information on the community.

- **Pre-screen potential sites:** One of the first requests often made of local EDOs is for a list of potential sites. Again, taking too long to compile such a list can send the wrong message, so it is valuable to maintain a list of available sites with detailed information on each.

The next section outlines key types of data that manufacturers are likely to need. In each case, local EDOs need to at least understand how they are being evaluated and, where possible, provide deeper information that site selectors cannot find elsewhere.

**Workforce**

While many EDOs provide basic information on average local wages and educational attainment, modern site selectors are looking for much more detailed information on the skills and experience of workers in candidate communities. Furthermore, the skills required by modern manufacturers are not generic graduate attributes, but rather technical and industry-relevant abilities, depending on the processes and machinery they use. From a business perspective, a community is attractive either because it has a labor pool with the desired skill sets or has the institutions and programs in place that can quickly train potential workers in those skills.

The next chapter offers more detailed guidance on how workforce data can be collected, analyzed, and marketed, but a few key action steps include:

- **Provide detailed data on workforce capacity:** Companies want a high level of certainty that they can meet their technical workforce needs, so the specific documentation of workforce capacity can be a major draw. It can be particularly
useful to provide data that site selectors cannot obtain from another source. Use workforce data analysis to shape your attraction strategy: Detailed and systematic workforce data analyses can be used to target attraction efforts at manufacturing sectors that need the skills your community has to offer. In the Toolbox chapter, we will review new methods of collecting and analyzing workforce data so that economic developers can effectively identify sectors that would be a good fit for the community.

Innovation Capacity

Just as innovation capacity is critical to the long-term vitality of existing manufacturers, it is becoming an ever more salient consideration in site selection decisions. Innovation capacity is the collective ability of public and private actors in a community to effectively produce new products and processes. As innovation often requires a range of public and private actors working in concert, innovation capacity captures both the raw availability of research assets (private expertise, public labs, etc.), but also the extent to which these assets are connected through effective networks between all of the relevant actors.

While the next chapter will offer more detail on how economic developers can support increased innovation capacity, a few key action steps include:

- **Market innovation capacity:** Advanced manufacturing firms are looking for locations with a density of innovation assets and the systems for coordinating efforts across innovation players. Therefore, marketing efforts often need to show what innovation assets are available. As collaborative innovation become more the norm, it is also important to highlight efforts and organizations that help different players work together to effectively bring new products and processes to market.

- **Use OEMs and Tier 1 suppliers to identify promising attraction candidates:** As manufacturers at the top of supply chains work to integrate the research and development activities of their suppliers, they can be valuable attraction assets. EDOs should solicit top-level manufacturers for leads on companies that they would like to see have a local presence. To that end, existing manufacturers can use their own connections to market the research and development amenities of your community.

- **Know your public and private research institutions:** Knowing the specific research strengths of local companies and public research institutions can help EDOs to target, and market to, manufacturing firms. As innovation capacity and expertise tends to be very specific, it is essential to know what is being developed in your community.

- **Think regionally:** Even if your community lacks an advanced research park, research university, or public lab, there may still be innovation assets in the broader region that are relevant to manufacturers’ site selection choices. As such, it is critical to identify innovation assets in the region that can be used in attraction appeals.

---

73 Jerry Szatan, “Phone Interview with Jerry Szatan, Szatan and Associates”, February 15, 2011.
Transportation and Logistics

Transportation and logistics is one of the most important site selection drivers in today’s manufacturing marketplace. Globalized supply chains, accelerated delivery timetables, and increasing fuel costs are all driving manufacturers to treat transportation and logistics as a top-level priority in choosing where to locate. All of this means that EDOs must understand how their community fits into the national and international transportation and logistics system and which manufacturing sectors are looking for the types of assets that the community has to offer.

Everything Is Relative

A community’s transportation assets must be evaluated in relative terms. The strengths and weaknesses of a community’s place in the global transportation system depend on a number of comparative factors, including:

- **Destination market**: The advantages of a specific community are largely dependent on a manufacturer’s target market. Particularly as on-demand delivery becomes more common, manufacturers choose sites based on the ability to speed goods to specific destination markets.

- **Manufacturing sector**: A community’s attractiveness is deeply dependent on what is being shipped and how fast it needs to get to its destination. For example, the importance of rail usually depends on the weight, bulk, and volume of what is being shipped, so a community without rail access may still be a viable option for manufacturers that do not move large and heavy objects in bulk.

- **Competitor communities**: Proximity and capacity must be evaluated in comparison to other communities. While a community may have rail and highway access, close proximity to a destination market, intermodal hubs and more, it can still lose out to a community that is modestly better situated.

While there is a tendency for economic development websites to list a community’s transportation assets in absolute terms, this is not how modern site selectors and manufacturing firms are conducting their location searches. Therefore, assessing transportation assets and weaknesses must always be done relative to specific destination markets, sectors, and peer communities.

Think Regionally

Facilities need not exist within the strict boundaries of a community to be considered relevant parts of its transportation and logistics system. Rail lines, ports, airports, highways and intermodal hubs in neighboring communities are often close enough to serve manufacturers’ needs. As such, economic developers should cast a broad net when identifying the transportation and logistics assets that a community has to offer.

What Is in Your Warehouses?

One way of evaluating the types of manufacturing companies that are viable attraction candidates is to visit the warehouses in your community. Ample warehouse space is an important logistical asset in itself, but what’s inside those warehouses can be telling as well. Warehouses provide a snapshot of the types of goods that are moving through a
community, which provides vital intelligence about the manufacturing sectors and destination markets that a community can competitively serve. Of course, other factors (e.g., workforce suitability) can prevent competitive production of goods in a given community, but if products are moving through a community, the transportation and logistics system in that community has some strategic advantage.

Self-Assessment Tool
Chapter 9 contains a self-assessment tool that communities can use to evaluate their strengths and weaknesses from a transportation and logistics point of view.

Sustainable Business Assets
Many OEMs and retailers have become extremely concerned about the environmental sustainability of their supply chains. Twenty years ago, few manufacturers rigorously measured their ecological footprints. Today, many of the world’s largest OEMs, and the largest retailer (Wal-Mart), are actively working to “green” their supply chains from top to bottom. According to Eliza Eubank, Assistant Vice President at Citigroup, sustainable business models are becoming increasingly mainstream: “It is not just something that do-gooder environmentalists care about…it is something that is on the priority list of CEOs”\(^\text{74}\).

Customer demand for sustainable goods remains one of the key forces behind this trend, but many of the emerging market forces detailed in Chapter 2 make sustainability a key market advantage. As sustainable manufacturing becomes more commonplace, communities need to understand the bottom-line criteria that manufacturers use when evaluating where to establish facilities. Communities that offer a variety of assets that support green manufacturing practices will be at an advantage in attracting modern manufacturing businesses.

Renewable Energy Capacity
Renewable energy load capacity is becoming an increasingly important community asset. For companies that are trying to minimize their carbon footprint or insulate themselves from the volatility of energy prices, access to renewable energy is a site selection criterion of growing importance. Many of the site selectors interviewed for this project indicated that, while not industry standard yet, the importance of renewable energy is on the rise\(^\text{75}\). Moses Lake, a small community in Washington, successfully attracted carbon fiber manufacturer SGL because of its ability to provide renewable energy.

As more OEMs and retailers work to green their supply chains, communities without access to cost-effective renewable energy may be increasingly disadvantaged in the attraction process.

---

\(^\text{74}\) Knowledge@Wharton, “Fashion or Strategy? Why Firms are Jumping on the Sustainability Bandwagon”, January 19, 2011.

\(^\text{75}\) Donovan, “Telephone Interview with Dennis Donovan, Principle, Wadley Donovan Gutshaw Consulting”; Tim Monger, “Telephone Interview with Tim Monger, Senior Vice President, Cassidy Turley”, February 9, 2011; Michael Mullis, “Telephone Interview with Michael Mullis, President and CEO, JM Mullis Inc”, February 2011; Mark Sweeney, “Telephone Interview with Mark Sweeney, Senior Principle, McCallum-Sweeney Consulting”, February 2011.
Energy-Efficient Buildings

Companies are placing increasing importance on the energy efficiency of the buildings they operate. This is a clear example of how satisfying customer demand for green products and lowering operating costs can be complementary. One survey conducted in 2008 found that over half of business respondents expected to see most of their projects going into energy-efficient buildings by 2013. The number of LEED-certified buildings has increased markedly over the last 10 years, from fewer than 100 in 2002 to over 2,000 in 2008. As this trend continues, it will become increasingly important for economic developers to market the energy-efficient buildings in their communities to attraction candidates.

Mass Transit

Recognizing that building location impacts the energy used by commuting employees, the 2009 LEED standards reward projects that are located within walking distance of existing or planned commuter rail, light rail, or subway systems. As companies look to secure LEED certification for their facilities, this standard will provide incentive to locate near mass transit options. As such, communities with limited mass transit

Renewable Energy Nets Manufacturing Facility

Good news for Moses Lake, Washington, as carbon fiber manufacturer SGL and BMW announced a joint venture to produce carbon fibers for use in BMW’s new zero-emission electric vehicles. The $100 million plant is expected to employ 80 employees right away, with the potential for more.

BMW wants to satisfy market demand for vehicles that are sustainable from production to operation. As part of this effort, BMW stipulated that suppliers use renewable energy in their operations. When SGL began searching for where to locate a new production facility that would supply BMW’s new electric vehicles, it excluded any locations that did not have access to renewable energy load capacity.

Because producing carbon fiber is an extremely energy-intensive process, the search was effectively narrowed down to locations with access to hydro-electric power, which is how Moses Lake ended up on the short list of potential locations. Joerg Pohlman, Managing Director of SGL Automotive Carbon Fibers, said that “the decision to build the carbon fiber plant in Moses Lake was based primarily on the availability of renewable clean hydropower and competitive energy costs in the state of Washington.”


---


alternatives may find themselves at a disadvantage when vying for these projects. As companies work to make their operations more sustainable, expect to see them place more importance on their access to mass transit.

Large manufacturing establishments often require more space, at lower cost, than can be found near mass transit. As such, mass transit is often more important to smaller firms that supply to markets that put a premium on sustainable production.

**Investment-Oriented Incentive Deals**

Many communities are re-evaluating how they structure attraction incentive deals. Instead of providing tax relief or direct monetary inducements, incentive deals are increasingly being used to build assets that have lasting value for the entire community. This paradigm shift is part of a broader trend toward investment-oriented economic development, discussed later.

Past experience has shown that simply handing over large sums—whether in the form of direct payments or tax relief—to attraction candidates is risky business. First, overwhelming evidence shows that financial incentives do not usually have a substantial effect on where businesses locate or expand their operations (Peters & Fisher, 2004; Schwartz, Pelzman, & Keren, 2008; Gabe & Kraybill, 2002). Second, many communities have learned that incentivized companies do not always stick around. Even when clawback provisions are included, it can be difficult for communities to recover their full investment when a company fails to create the economic benefits promised. Finally, large financial incentives can be politically unpopular, and this is particularly true in lean fiscal times.

For all of these reasons, direct cash incentives should be treated as an option of last resort.

The Commonwealth Center for Advanced Manufacturing (CCAM) is an excellent example of investment-oriented attraction practice. CCAM was established as part of an effort to attract Rolls-Royce to Petersburg, Virginia. CCAM will serve the research and workforce development needs of Rolls-Royce, but will also help other manufacturers in the area address the same challenges. Instead of merely providing cash inducement to Rolls-Royce, CCAM is an example of how attraction deals can be structured to provide benefits to the broader community.

**For more information on this initiative, see the case study section.**

An investment-oriented approach to incentives hinges on finding the places where community and company needs intersect. Put another way, the challenge is to find where investments can be made that improve the competitiveness of both the company being courted and the broader community. Investments of this sort typically include:

- **Investing in human competitiveness:** Establishing a workforce training program that builds skills needed by the attraction candidate and the broader economy.
- **Investing in physical competitiveness:** Building physical infrastructure (roads, water systems, etc.) that serve the needs
of the attraction candidate while addressing broader community needs.

- **Investing in innovation competitiveness**: Creating or strengthening research facilities to anchor an innovation cluster that includes the attraction candidate.

- **Investing in sustainable competitiveness**: Provide low- or no-interest loans to cover upfront costs of sustainability improvements (e.g., power co-generation, water recycling, energy efficiency).

The specific needs of each community and manufacturer will differ, so this is not an exhaustive list of potential targets for investment. Regardless of unique circumstances, attraction resources are better directed towards investments that will bolster the economic prospects of the community at-large and endure locally even if the attraction candidate does not.

**Opportunities in Re-shoring**

Re-shoring has become a buzz word in the manufacturing sector in recent years. While off-shoring has been the major trend of the past few decades, there is evidence that many manufacturers have become wary of relying on fractured and globalized supply chains. As the costs of off-shoring become more apparent, many firms are looking to move production closer to their customers.

**Risk Management and “Near-Shoring”**

Many manufacturers have come to realize that outsourcing, and a reliance on complex global supply chains, can be risky. Much of the outsourcing that took place over the last few decades was driven by the promise of lower wages and tax burdens. While it is easy to measure these types of cost savings, companies have become much more sophisticated in how they assess the risks of disaggregating their supply chains.

A recent survey found that 68 percent of global executives expect supply chain risk to increase in the next five years. Several of the site consultants interviewed for this project reported that more manufacturing firms are looking to expand operations in the United States in order to minimize the risk of supply chain interruptions.

The new wisdom holds that locating manufacturing operations near to the ultimate market helps to shield manufacturers from unforeseen events.

**On-Demand Manufacturing**

One trend that often makes it more appealing to produce in the United States is the increasing importance of on-demand manufacturing. On-demand manufacturing is the practice of waiting until a specific order arrives before actually producing the item ordered. On-demand manufacturing aims to produce just-in-time goods—tailored to the needs of a specific client—on a rapid schedule. Rather than focusing on making as many identical items as possible, on-demand manufacturing seeks to reduce waste and serve the needs of specific customers. One of the primary challenges with this model of manufacturing is determining how to fill each order in the least amount of time. In this case, physical proximity to the customer can be an

---


80 Donovan, “Telephone Interview with Dennis Donovan, Principle, Wadley Donovan Gutshaw Consulting”; Mullis, “Telephone Interview with Michael Mullis, President and CEO, JM Mullis Inc”; Sweeney, “Telephone Interview with Mark Sweeney, Senior Principle, McCallum-Sweeney Consulting.”
excellent way of reducing the time it takes to fill orders. As on-demand manufacturing becomes more mainstream, there is reason to expect more production to locate within the United States.

What is “Near-Shoring?”

Near-shoring is seen as a hedge against a variety of contingencies. First, currency fluctuations can undermine business models that are based on a particular set of exchange rates. By locating within the nation that will ultimately consume its products, manufacturers can remove this source of uncertainty. Second, building a supply chain strategy that assumes a particular pattern of trade relationships exposes companies to political forces that may be beyond their control. Again, producing goods within the country that will consume them can remove, or at least minimize, the risk of revised trade arrangements.

Third, political instability can have a profound impact on global markets. As recently demonstrated in the Middle East, seemingly stable regimes can collapse overnight and, in the process, reshape global market conditions. Fourth, the volatility of energy prices can undermine business models that rely on a particular range of energy costs. By moving operations closer to their ultimate market, manufacturers can limit their exposure to the risk of increased fuel prices.

Companies that rely on a particular status quo for their competitive edge will, sooner or later, find that the ground beneath their feet has moved. Although there is no business strategy that is immune to the types of risks outlined here, many companies see near-shoring as a good way to minimize their risk exposure.

Rising Fuel Costs Driving Re-shoring

Before the economy tanked in 2008, a growing number of observers predicted that increasing fuel prices would set off a wave of re-shoring as companies sought to minimize their transportation costs.

The concern over transportation costs was postponed somewhat when the Great Recession drove down the price of oil globally. However, as the economy recovers, the price of oil is increasing once again. The U.S. Department of Energy projects that the price of oil is heading toward historic highs within the next decade. By 2025, a barrel of imported low-sulfur crude oil is expected to cost more than $125. These trends bring both problems and opportunities for manufacturers in the United States. Rising fuel prices will necessitate investments in efficiency and alternative fuels, but high prices will also make serving the domestic market more competitive for North American manufacturers. As the cost of transportation increases, the competitive advantages of chasing low wages abroad will erode. This

---

expectation was borne out in conversations with site selectors who believe that rising fuel prices are already pushing manufacturers to produce goods closer to their ultimate market and who see this trend continuing into the foreseeable future.  

Identifying Opportunities in Re-Shoring  
While there is no single way to take advantage of opportunities in re-shoring, some specific strategies include:

- **Target sectors with high transportation costs**: The more that transportation costs factor into a product’s final cost, the greater pressure on manufacturers to locate near the customer. For example, industrial machinery is heavy and costly to ship, which is part of why many manufacturers seek to locate production near prospective customers.

- **Target on-demand sectors**: The move to on-demand production is not equally distributed across manufacturing sectors. Therefore, firms that serve on-demand markets, or are part of on-demand supply chains, are likely to be more interested in locating near their customers as a method of reducing delivery times and interruptions.

- **Understand best practices in risk management**: Businesses and consultants are developing extremely detailed techniques of examining dynamic risk factors and the results of this analysis are increasingly important to global location choices. As risk management becomes increasingly important to manufacturers’ business models, economic developers need a better grasp of the considerations that factor into this type of analysis.

- **Track trends in re-shoring**: At this stage, it is too early to know just how far the re-shoring trend will go, or where it will be most concentrated. As such, tracking industry reports, site selection announcements, what local manufacturers are saying, and trends in public and proprietary data is required to identify the opportunities that re-shoring creates.

---

82 Donovan, “Telephone Interview with Dennis Donovan, Principle, Wadley Donovan Gutshaw Consulting”; Joan Herron, “Telephone Interview with Joan Herron, President, Herron Consulting”, February 21, 2011; Monger, “Telephone Interview with Tim Monger, Senior Vice President, Cassidy Turley”; Mullis, “Telephone Interview with Michael Mullis, President and CEO, JM Mullis Inc.”

83 FDI Intelligence, “FDI Markets: Crossborder Investment Monitor.”
Opportunities in Foreign Direct Investment

More and more foreign manufacturing companies are investing in the United States. There are a host of causes for this trend and, as will be seen below, it is not equally pronounced across all sectors, but the increase in foreign investment in manufacturing is an encouraging sign.

FDI is Growing

FDI into the United States has grown significantly over the past decade, as Figure 15 shows.

Since 2005, the number of manufacturing foreign direct investment deals in the United States has more than doubled. Before 2006, the number of yearly FDI deals ran between 150 and 180 for all manufacturing sectors combined. In 2009, FDI manufacturing activity surpassed 250 deals for the first time, and in 2010, the deal total topped 350. This trend is all the more striking given the recent condition of the global economy. Even while the Great Recession was forcing manufacturers in the United States to scale back operations and lay off workers, the amount of foreign investment activity in the U.S. manufacturing sector increased.

Emerging vs. Traditional Manufacturing Sectors

The overall trend seen above does not mean that FDI has been growing across all manufacturing sectors. Much of the growth in FDI is concentrated in emerging manufacturing sectors, while several of the traditionally significant sectors have struggled to keep pace. This section examines trends in FDI within the eight sectors tracked by FDI Intelligence.

Figure 16: Incoming Investment in Traditional FDI Powerhouse Sectors in Manufacturing (2003 – 2010)

Source:84

In 2003, the four manufacturing sectors that attracted the most FDI were (in order): Auto Components, Metals, Machinery, and Auto OEMs85. As can be seen in Figure 16, Auto Components was the undisputed heavyweight in manufacturing FDI, attracting more than three times the number of deals as the next largest sector. In the years since 2003, only Machinery has seen a major increase in FDI deals, while the other traditional sectors have struggled to hold ground. While FDI in Auto Components, Metals, and Auto OEMs was flat or declined during the Great Recession (2007 to 2009), FDI in Machinery went from fewer than 30 deals yearly to over 100.

84 Ibid.

85 FDI Intelligence, “fDi Intelligence — Your source for foreign direct investment information - fDiIntelligence.com”, 2011,
While most of the traditional target sectors for FDI have struggled over the last few years, a group of emerging manufacturing sectors have seen significant growth in FDI activity, as can be seen in Figure 17. In 2003, the Aerospace, Alternative Energy, Biotech, and Medical sectors all attracted fewer than 10 FDI deals. Since then, all of these sectors have seen significant gains in FDI activity, with a few now rivaling the traditional powerhouses discussed above.

Figure 17: Incoming Investment in Emerging FDI Manufacturing Sectors (2003 – 2010)

Alternative Energy has seen the most pronounced growth among the four emerging FDI sectors shown above. Before 2006, Alternative Energy had never attracted more than five FDI deals a year, but between 2008 and 2010, the sector recorded more than 35 deals a year. While the growth in Alternative Energy has outstripped the other three sectors detailed above, Aerospace, Biotech, and Medical manufacturing have also made substantial gains in FDI activity.

Finally, it is worth examining proportional growth in FDI deals in recent years. Figure 18 shows the percentage change in FDI deals, comparing 2007 through 2010 to the preceding four years (2003-2006). These data clearly show that, in proportional terms, the FDI market in Alternative Energy expanded more than any other sector. The 2007-2010 period averaged nearly 400 percent more Alternative Energy deals than the 2003-2006 period. No other sector surpassed 140 percent growth.

While FDI in Alternative Energy expanded more rapidly than any other sector, all but one sector saw more FDI deals each year in 2007-2010 compared to 2003-2006. Machinery came in second proportionally with over 130 percent growth, going from a 2003-2006 average of 35 deals yearly to an average of 81 deals for 2007-2010. Emerging sectors Aerospace and Medical manufacturing both grew by nearly 90 percent in the same period. Auto OEMs, Biotech, and Metals all grew, but at a less marked pace (42 percent, 35 percent, and 32 percent, respectively). Auto Components was the only sector to average fewer FDI deals in 2007-2010 than it did during 2003-2006, going from an average of 57 to 53 deals per year.

---

86 FDI Intelligence, “fDi Markets: Crossborder Investment Monitor.”
Building the Networks to Land FDI

Attracting FDI poses a range of unique challenges. Lack of information, cultural differences, experience with different economic systems, and plain old distrust often stand in the way of FDI deals. While there are many opportunities in FDI, it usually takes time to build the relationships that lead to foreign direct investment.

This section outlines some of the ways that EDOs can build and strengthen the relationships needed to generate foreign direct investment.

- **Target markets carefully:** Targeting specific markets is particularly critical to attracting FDI. The needs of specific manufacturing sectors differ substantially, so marketing efforts must be targeted at, and tailored to, the sectors that are most interested in what a community has to offer.

- **Build relationships with your national consulate in targeted countries:** When a foreign company starts to think about investing in your country, they will often call your national consulate to gather more information and see what kinds of assistance are available. This makes whoever takes that call a valuable partner in identifying and cultivating FDI opportunities.

- **Connect to foreign economic development networks:** Economic development counterparts in other countries can be a vital source of information on FDI.

- **Leverage international connections within the manufacturing community:** Firms often lead the way in identifying foreign partnerships that can give rise to FDI. Companies that rely on international supply chains can be a vital source of information on, and advocate for, attracting FDI.

- **Align FDI and export promotion strategies:** As noted previously, FDI attraction and export promotion should be aligned as much as possible. Developing supply chain relationships between local manufacturers and foreign firms can serve both ends.

---

Source: Ibd.
CHAPTER 5
Emerging Strategies to Support Manufacturing

The previous chapter discussed how traditional economic development programming must be adjusted to work effectively in the emerging manufacturing marketplace. This chapter addresses a number of ways that leading economic development practice is moving into new territory. To ensure a future for manufacturing in their communities, economic developers across the United States are building creative programs that often part ways with traditional economic development practice.

Many communities that rely on manufacturing are part of a trend toward investment-oriented economic development. Instead of focusing largely on marketing and outbidding their neighbors for attraction projects, many economic development organizations are looking to invest in their communities’ long-term competitiveness through the investment-oriented deals discussed earlier.

The first reality driving this trend is that there simply are not as many attraction prospects in manufacturing as there once were. Between 2001 and 2009, the United States manufacturing sector lost nearly 50,000 establishments. Many of the site selectors that were interviewed for this project reported a decline in the number of available attraction projects and expected this trend to continue into the foreseeable future. With more plants shuttering than opening, it should come as no surprise that economic developers in manufacturing communities are expanding their efforts beyond attraction.

Second, new programmatic directions are often born of hard lessons and hard times. Many communities that rely on manufacturing are at the leading edge of economic development practice because they were fighting to survive long before the financial crisis of 2008. Having effectively been in recovery mode for years, many communities have been forced to experiment with new programs and investments.

The combination of scarce game and hard times has focused economic development attention to the structural factors that drive long-term growth. How can communities stimulate innovation so that new technologies can create new jobs? What kinds of skills do companies and workers need to be competitive? What can we do to support local entrepreneurs? How can we help manufacturers find new markets for their goods? How can we work with our neighbors more effectively? As will be seen throughout this chapter, meeting the dynamic challenges...

---

88 Kate McEnroe, “Telephone Interview with Kate McEnroe, Kate McEnroe Consulting”, February 11, 2011; Monger, “Telephone Interview with Tim Monger, Senior Vice President, Cassidy Turley”; Mullis, “Telephone Interview with Michael Mullis, President and CEO, JM Mullis Inc.”
of the future requires investment in community assets.

Workforce Development

The importance of local workforce assets to the competitiveness of a community is now a well-documented fact. Virtually every site selection consultant that was interviewed for this project reported that today’s manufacturers are extremely concerned about filling their workforce needs. In the past, many economic development organizations have not concentrated on workforce issues, and many workforce development bodies have not engaged sufficiently with economic development. The divisions between workforce development and economic development are starting to break down, and many manufacturing communities are leading the way.

Economic Development Organizations’ Workforce Efforts

In the IEDC survey conducted for this project, economic developers were asked to identify the workforce development functions that their organizations perform. Responses indicate that workforce issues are essential to protecting and growing a manufacturing presence.

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>% Saying Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Act as liaison between manufacturers and workforce training providers</td>
<td>92%</td>
</tr>
<tr>
<td>Provide workforce information to expanding manufacturers</td>
<td>92%</td>
</tr>
<tr>
<td>Educate elected leaders on needed workforce investments</td>
<td>84%</td>
</tr>
<tr>
<td>Market workforce assets to attraction candidates</td>
<td>81%</td>
</tr>
<tr>
<td>Gather workforce information through BRE surveys &amp; meetings</td>
<td>77%</td>
</tr>
<tr>
<td>Measure and track workforce assets and needs</td>
<td>63%</td>
</tr>
<tr>
<td>Represent manufacturers’ needs of Workforce Investment Boards</td>
<td>57%</td>
</tr>
<tr>
<td>Provide workforce training</td>
<td>36%</td>
</tr>
<tr>
<td>Recruit manufacturing workers</td>
<td>27%</td>
</tr>
</tbody>
</table>

Key findings pertaining to workforce development activities, presented in Table 7, include:

- **Workforce is a key area of economic development work in the manufacturing space:** Fully 89 percent of survey respondents indicated that they help manufacturers to address their workforce needs. This shows that economic developers who work with manufacturers understand that workforce development is essential to a vibrant sector.

- **EDOs serve as a key linkage between manufacturers and training providers:** The most common workforce activity reported...
by responding economic developers was acting as a liaison between manufacturers and workforce training providers. As will be discussed throughout this section, there are a variety of vital roles that EDOs can play to ensure that workforce training systems are effectively addressing the needs of manufacturing companies.

- **Workforce is a key asset to business attraction, retention, and expansion:** While workforce development has often been viewed as outside the purview of economic development, more and more EDOs are realizing that addressing workforce needs is vital to the health of existing firms and indispensable to attracting new companies.

- **Rigorous data analysis is expected:** A majority of respondents indicated that their organization has systems in place to measure and track workforce needs and assets. As discussed throughout this report, systematic data collection and analysis is vital to the effective blending of workforce and economic development.

- **A sizable minority of EDOs provides training:** Although not a standard practice yet, many of the survey respondents indicated that their organization actually provides workforce training programs. Given the resources needed to operate training programs and the hands-off approach that many EDOs have taken to workforce development, it is striking that so many respondents indicate that their organizations are now serving in that role.

---

### 79/Seventy Manufacturing Certification Program

The Career and Technology Education Center (C-TEC) provides workforce training and development services for Licking County, Ohio, and the surrounding communities. The 79/Seventy program connects workforce development with the manufacturing sector’s self-identified needs. With the local port authority channeling manufacturing clients like Goodrich and Boeing into C-TEC’s education program, participating students receive the benefits of a targeted curriculum, instruction from industry professionals, and possible career opportunities with participating manufacturers.

*For more information, see the case study section of this report.*

---

### Streamline Workforce Delivery Pipelines

Economic developers can often play an invaluable role by strengthening the connections between training programs and manufacturers. The capacity to train workers already often exists in Workforce Investment Boards, community colleges, universities, and professional organizations. Often less developed are systems to ensure that training courses provide the skills that manufacturers need and ways to channel trained graduates to the companies that can hire them. In both cases, economic developers can take steps to bridge the gaps between manufacturers and workforce development systems.

On the front end, economic development organizations are well positioned to engage manufacturers in designing and providing training curriculum. Through business retention
and expansion programs, economic developers should strive to identify the workforce gaps that are most pressing for local manufacturers. With this information in hand, economic developers can assist training providers in developing courses that address the key workforce needs of local manufacturers. Going one step further, economic developers can also help workforce training institutions to identify and engage manufacturers that are interested in guiding the development of course curriculum.

Economic developers can also add value by building networks that channel training graduates to firms that are looking to hire. One of the perennial challenges of workforce development is helping graduates find employers that want the skills they have just acquired. With their networks in the manufacturing community, economic developers are in an ideal position to bridge this gap. In some cases, this can go as far as establishing groups of manufacturers that agree to interview graduates of specified training courses.

Understand the Labor Market in Your Community: Skillshed Analysis
Skillshed analysis focuses on the specific skills, training, and experience that are needed in a local labor market, rather than just occupation level or employment by NAICS code.

The core purposes of skillshed analysis are to:

- Identify promising occupations and occupations that are in decline within the local labor market.
- Identify the essential training, skills, experience, and wages associated with each occupation studied.
- Identify gaps between the skills that exist and the skills that are needed, and where workers in declining occupations can use their skills in growing professions.

To deliver this level of specificity, skillshed analysis leverages several types of workforce data within a single analytical framework. The tool is designed to work using available public data, but it can also be augmented with data collected in communities.

In many cases, EDOs may need to work with state workforce development agencies to collect data for, conduct, and interpret skillshed analyses. That said, once familiarity with the tool and its uses is developed, it can be done more in house.

Outputs of Skillshed Analysis
Skillshed analysis produces a variety of types of valuable economic development information. Because a “how-to” guide for skillshed analysis already exists (see resources below), this section will not delve into the details of how the procedure functions, but focus instead on the essential types of output that are produced.

Promising and Declining Occupations
The skillshed tool helps identify the occupations that represent the best opportunities for good jobs in the local economy. The purpose is to identify the occupations that are both high-paying and show good promise for job growth. To accomplish this, skillshed analysis combines data on expected growth within the local labor market by occupation with the local
median wage of each occupation. By combining these data sources, skillshed analysis automatically identifies the occupations that are vigorously growing and that pay more than the regional or statewide median. Where appropriate, the user can relax the rule that sorts for high-paying jobs, thereby producing an output ranked by occupational growth alone.

**Occupational Profiling**
Skillshed analysis produces useful snapshots of each occupation included in the analysis. Each occupational profile outlines the current employment level, projected employment growth, median wage, training level required, work activities, and tasks performed, and related occupations.

These data can be put to a variety of uses depending on the circumstances. If the occupation is in decline, these summaries can help to identify the transferable skills that workers are likely to have and to identify skill gaps that need to be filled for them to move into new careers. If an occupation is booming, these data can guide training efforts to ensure that employers can secure the talent they need.

**Occupational Grouping and Gap Analysis**
Skillshed analysis automatically identifies related occupations for each of the occupations studied. By leveraging data on the knowledge requirements, work activities, and core tasks for each occupation, skillshed analysis can identify occupations that, while categorized differently, share many of the same requirements.

Skillshed analysis uses the knowledge requirements and work activities provided in the Occupational Profile to identify occupations that make many of the same demands on the worker. This can be particularly useful information when developing programs and delivering assistance to address occupations that are declining. In the example included above, electricians that are looking to enter a growing field would do well to look into becoming avionics technicians.

**Incorporating Skillshed Analysis into Economic Development Programming**
This section outlines some of the ways that skillshed analysis can support a variety of economic development programmatic areas. While the potential usefulness of skillshed analysis goes well beyond what is mentioned here, some of the likely uses include;

- **Strategic Planning:** By identifying the occupations that are growing and shrinking locally, skillshed analysis can help EDOs map their current condition and future prospects. Occupations that pay good wages and have the best prospects for growth can be targeted, while strategies can be adjusted for those identified as declining. By going one level deeper into the specific skills and training possessed by local workers, skillshed analysis can help EDOs identify ways to diversify into new sectors. Skillshed analysis allows the practitioner to identify related occupations that would make good use of existing workforce skills, and where emerging sectors may struggle to find the needed workers.
• **Business Retention and Expansion:** Skillshed analysis can also help EDOs to identify the emerging workforce needs of existing companies and sectors. Skillshed Analysis can aid BRE efforts by systematically identifying where the need for workers is becoming an issue. The technique can also help existing companies identify sectors that are potential sources of labor.

• **Business Attraction:** Skillshed Analysis provides rigorous and detailed documentation of the skills and experience that exist in the local labor force. In addition, by identifying occupations that are declining locally, Skillshed Analysis can pinpoint excess labor capacity that may be appealing to potential attraction candidates.

Partnering with Training Institutions: Skillshed Analysis can help EDOs document and communicate the skills, credentials, and training that are in highest demand locally. In addition, it can help EDOs and training institutions chart career ladders for local workers by identifying the skill gaps that prevent them from moving into more promising careers.

**Skillshed Resources**
The resources listed below provide additional information on implementing Skillshed Analysis.

**Skillshed How-to Guide**

**Sample Skillshed Analysis**

**Diversification in Newton Iowa:** After Newton, Iowa’s Maytag appliance plant closed, local economic developers collaborated with state officials to survey workers who were losing their jobs. Results were used to identify and market to industrial sectors that would be interested in the available workforce assets. In a remarkably short time, several new employers were lured to Newton, in large part because they could be assured of finding the skilled workers they needed.

*For more information on the use of displaced worker surveys in Newton, see Chapter 8.*

**Recovering from Mass Layoffs: Conducting and Using Dislocated Worker Surveys**
One of the inherent hazards for manufacturing-dependent communities is the threat of mass layoffs. Particularly in communities that are anchored by a few major manufacturing firms, a shift in global market conditions can wreak havoc on the local economy and society. Given the many challenges communities face when major layoffs occur, it is important to have a plan of action for when these events unfold. In this context, administering dislocated worker surveys before the layoffs occur can help economic developers to design and implement a recovery plan.
Dislocated Worker Surveys can serve a variety of vital recovery and stabilization functions, including:

- **Attract Replacement Employers**: Given the increased need for skilled workers in manufacturing today, having a detailed dossier on available workforce talent can be an invaluable aid in attracting firms to replace the jobs that have been lost through plant closure or downsizing. As will be seen below, displaced worker surveys allow economic developers to present attraction candidates with detailed information on available local skills. By capturing displaced workers’ place of residence, willingness to commute, and method of transportation, displaced worker surveys can also help local economic developers guide a new company to the best place to set up shop in order to access available workers.

- **Identify Potential Entrepreneurs**: One hope with a plant closure or downsizing is that newly unemployed workers will take the opportunity to open their own businesses. Dislocated worker surveys can be used to identify workers who are thinking about opening a business so they can be connected to resources that support entrepreneurship. Workers are often unaware of the services that exist to support entrepreneurs; it is critical to identify interest so that information and support can be provided. This is often particularly important in manufacturing because many highly skilled engineers, scientists, and managers have deep knowledge about specific aspects of their industry, but do not have experience developing a business plan, securing investment capital, hiring workers, or the host of other skills needed to open a successful small business. As such, displaced worker surveys can be a great tool for identifying potential entrepreneurs that need support to explore the option of starting their own enterprises.

- **Identify Needed Skill Upgrades**: Dislocated worker surveys can guide the effort to transition newly unemployed workers into more promising careers. Major layoffs can reflect the decline of previously robust economic sectors, so impacted workers often need to find new lines of work. When this challenge arises, displaced worker surveys can help economic and workforce development professionals to design training programs that address the needs of the workers who have lost their jobs.

- **Demonstrate Funding Needs**: Particularly when it comes to applying for federal and state recovery and revitalization aid, it is critical to be able to justify the need with hard data. Dislocated worker surveys provide the information needed to demonstrate what kinds of worker training, economic development programming, and social services are most needed to help the community recover from major layoffs.

For additional detail on implementing a Dislocated Worker Survey, see the Toolbox chapter. A sample survey is provided, along with notes for administering the survey and presenting the results.

**Reach Future Workers before College**

Many manufacturing experts believe that our education system does not highlight the good opportunities available in manufacturing or
deliver the technical training that will prepare students for careers in the industry. Where other countries have vocational training tracks that students enter in their early teens, there are relatively few comparable examples in the United States. On a related front, the lack of quality science, technology, engineering, and math training in many school systems has been identified as a threat to the long-term viability of American manufacturing.

Economic developers can play an important role by developing networks to advocate for and deliver the training that young people will need once they enter the manufacturing workforce. For example, Austin Polytechnical Academy in Chicago provides its students with the modern curriculum, hands-on training, and career guidance needed for a successful future in advanced manufacturing. With help from public and private funding, this charter high school affords students opportunities to interact with manufacturing industry professionals, to obtain technical training, and to take targeted vocational classes, with the goal of enhancing students' job prospects and cultivating a workforce that meets the progressing needs of modern manufacturing. Efforts of this sort are still the exception to the norm, but there is increasing realization that new educational models are needed. Economic developers should be at the forefront of this movement by helping organize support for and implementing these kinds of innovative educational efforts.

Economic developers can also play a role in developing internship and apprenticeship opportunities for young people in their communities. During the course of normal business retention and expansion activities, economic developers can solicit interest in offering internships or apprenticeships and connect those firms with programs that already exist in the community. Where manufacturing internship and apprenticeship programs are not already in place, it may be important for economic developers to push for the creation of these types of opportunities.

**Build Sustainable Workforce Training Capacity**

As manufacturers take the challenges of sustainable operation more and more seriously, it becomes increasingly important to cultivate training programs that can provide the skills and knowledge that workers need. Economic developers will need to have in-depth knowledge of the green workforce training capacity in their communities and, where necessary, help to cultivate new training opportunities.

EDOs need not provide the training themselves, but they can play an important role by identifying and building interest within the manufacturing community. Many manufacturers that could realize cost savings and shore up their long-term market viability by becoming more sustainable simply may not be aware of the opportunities and threats that exist. In these cases, economic developers can help firms that need to become more sustainable connect with the training options that exist in the region.

**Building Innovation Capacity**

Innovation is increasingly essential to the viability of manufacturing firms. As such, many communities are exploring strategies to enhance innovation capacity within their
public and private sectors and to facilitate more exchange between the two.

In the modern research and development world, innovation emerges more from dynamic knowledge networks than from single large institutions. Gone is the time when large companies drove most of the research and development in-house; even the largest corporations are moving toward open innovation strategies. The move to engage with open innovation networks is most pronounced among high-tech firms91.

Innovation networks take time to develop and often need institutional support to flourish, but they also represent some of the only opportunities for genuinely game-changing economic opportunities.

**Sustainable Skills Training:** The Energy Efficiency and Sustainability program, a workforce training initiative created by the Purdue Technical Assistance Program and the Society of Manufacturing Engineers, is helping manufacturers to make their operations more sustainable by training workers to identify opportunities to cut pollution and costs. The program curriculum, which incorporates classes ranging from “generalist” to “specialist” levels, helps train manufacturers to apply green techniques on the job, and also helps interested participants prepare for a Green Manufacturing Specialist certification exam.

For more information on this program, see the case study section of the report.

In the survey conducted for this project, IEDC asked respondents what they do to accelerate innovation and technology commercialization92. The survey results are presented in Table 8 below.

**Table 8: Activities Performed by EDOs that are Active in Innovation Acceleration and Technology Commercialization**

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>% Saying Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect manufacturers to institutions of higher learning</td>
<td>97%</td>
</tr>
<tr>
<td>Build networks between firms with complementary R&amp;D needs</td>
<td>90%</td>
</tr>
<tr>
<td>Connect manufacturers to Manufacturing Extension Partnership Centers</td>
<td>83%</td>
</tr>
<tr>
<td>Provide technical assistance with innovation</td>
<td>63%</td>
</tr>
<tr>
<td>Build research alliances with communities or firms in other countries</td>
<td>48%</td>
</tr>
<tr>
<td>Operate business incubator to support manufacturing start-ups</td>
<td>34%</td>
</tr>
<tr>
<td>Operate research park</td>
<td>13%</td>
</tr>
</tbody>
</table>

A few core conclusions can be drawn from the responses to this survey, including:

- **Many EDOs still are not active in innovation and technology acceleration:** Only 51 percent of all survey respondents say they are actively involved in innovation and technology acceleration.

---

91 Darrene Hackler, *High-Technology and Regions in an Era of Open Innovation* (George Mason University - Department of Public and International Affairs, May 2009).

92 For more information on this survey, see the Data Appendix.
respondents reported that they worked in this area.

- **Institutions of higher learning are key partners:** Nearly every respondent indicated that they work to connect manufacturers with resources available at colleges and universities.

- **Facilitating networked innovation an ascending priority:** This survey also pointed to the importance of building networks between firms that have complementary R&D needs. Throughout this report, it is argued that innovation increasingly emerges from networks, a claim that appears to be reflected in these data.

The remainder of this section discusses strategies and best practices in accelerating manufacturing innovation and technology commercialization.

**Engaging Universities and Colleges**

Institutions of higher learning are increasingly critical to a robust U.S. manufacturing sector, especially as it becomes more technologically advanced and reliant on perpetual innovation. While many public land-grant institutions have been actively engaged in community development since their founding, many other universities and colleges are increasing their efforts to support economic growth and prosperity.

Universities and colleges also serve as anchor institutions for regional innovation networks. The intellectual capital of such institutions often represents the best-developed foundation for aggregating regional actors into a cohesive innovation network. Silicon Valley and the Greater Boston area are both excellent examples of the power of institutions of higher learning to drive innovation and contribute to the economic vitality of a region. In fact, the United States ranked first in the world in university engagement in R&D for 201093.

**Demystifying and Mapping Higher Ed**

Universities and colleges can be difficult to navigate. They are complex institutions with many internal divisions, diverse missions, and varying degrees of experience with economic development. As such, it comes as no surprise that community members and business owners often find it difficult to work effectively with colleges and universities. This issue cannot be immediately overcome. It takes time to identify all of the assets that each university or college possesses and form productive relationships. Below are some tips for doing so.

- **Identify top-level university leaders with responsibility for economic development:** Getting colleges and universities to build serious economic development outreach capacity requires top-level leadership from within the school. EDOs should be sure to identify any administrative leaders tasked with economic development.

- **Contact your Manufacturing Extension Partnership (MEP):** Many MEP centers are partners with, or actually housed within universities. The national MEP is working to build national networks between its centers and to connect the system with public universities even more extensively. For all of these reasons, MEPs can be an invaluable partner in creating networks between universities and manufacturers.

---

Connect University Assets to Specific Private-Sector Needs
Economic development organizations can add value by connecting universities to firms. Many private companies, particularly small and medium-sized firms, do not have the time to actively discover all that universities have to offer. On the other hand, many members of the academy lack a clear understanding of how their work can be used to drive economic growth.

- **Solicit needs from firms and scout for relevant university expertise:** Whenever interacting with local manufacturers, economic developers should gather information about their innovation goals and challenges. This information can then be used to target searches for relevant university research specialties, faculty, or labs.

- **Take a map of university assets to manufacturing firms:** It is often necessary to proactively educate manufacturers about the research and development opportunities to be found in working with universities. As such, economic developers can play an important role by making manufacturers aware of specific opportunities to partner with universities.

- **Get university and private players acquainted:** It may sound simple, but network partners need to get to know each other before they can work together effectively. This is often particularly true when breaking down the barriers between higher education and the private sector. Many examples of where colleges and universities successfully stimulated economic growth started with regular meetings between school officials and private-sector representatives. It can take some time before the two sides clearly see all of the areas for fruitful collaboration, so it is often helpful to begin these conversations before a particular project is on the table.

Build Systems to Streamline Patent and Licensing Issues
At some point in forging innovation partnerships between universities and private firms, intellectual property rights must be addressed. Legal challenges and financial ramifications can be significant, so it is important to build legal frameworks that streamline research and commercialization.

- **Provide technical assistance with licensing agreements:** Whether run through a university or housed in a separate organization (EDO, Manufacturing Extension Partnership, etc.), it is vital to have systems in place to streamline the licensing of research that involves university partners. This is one of the major stumbling blocks in connecting manufacturers and university researchers, so any structures to reduce or streamline this challenge can help to foster more university engagement.

- **Public-private partnerships:** One of the emerging models for university engagement is through participation in public-private entities specifically created to conduct research, development, and commercialization. As discussed above, the master agreements that found advanced research and manufacturing centers can specifically resolve intellectual property issues, streamlining the process for all parties.
Getting Off Campus
One emerging principle in effective university engagement is to locate university assets in or near the communities that can benefit the most. Rather than setting up a centralized business park or an on-campus facility, there is a trend toward off-campus centers located where manufacturing is already occurring. This trend benefits communities that do not have institutions of higher learning. State-funded universities are leading this trend by searching throughout their states to identify areas where they can support economic growth.

The Rise of Collaborative Research and Development
As discussed earlier, bringing new products and processes to market increasingly requires multiple partners with complementary specialties to collaborate throughout the research and development process. While collaborative research is rarely simple or straightforward, and often requires overcoming outmoded business models and ways of thinking about market capture, collaborative innovation is increasingly the way that new ideas are translated into marketable products.

It is difficult to overstate the importance of manufacturing firms in collaborative research efforts. There is a tendency to view research and development as something that happens in research labs, separated from the shop floors where new products are actually produced. As innovation accelerates and product life-cycles shrink, it is less and less accurate to see research and production as two separate enterprises.

To make matters even more complex, successful innovation often requires companies up and down supply chains to work together. New final products often require new component parts, new materials, and building to more exacting specifications. Moreover, as the accelerating pace of innovation makes it more vital to increase speed to market, firms must coordinate their research and development efforts more effectively.

Collaborative innovation poses new challenges for economic developers. Supporting innovation requires getting a host of public and private entities to work together every day. This section addresses some of the leading strategies that are being used to spur collaborative innovation.

Contract Manufacturers Key to Collaborative Innovation in Silicon Valley

“Manufacturing plays a critical role in the Silicon Valley innovation economy. Time to market is critical, and contract manufacturers play an increasingly important role by offering processing solutions, tool design, engineering and manufacturing expertise for new product introduction. Contract manufacturers help translate what one VP called entrepreneurs’ ‘imaginary design’ into actual products.”

- Kim Walesh, Director of Economic Development, City of San Jose, Calif.
Building Spaces for Cooperative Innovation: Advanced Manufacturing Parks

In today’s complex innovation world, it is often critical to create research organizations that are specifically designed to facilitate cooperative innovation. Advanced manufacturing parks have emerged as one of the leading models for driving cooperative research and development. Drawing on the knowledge and resources of firms that share interest in specific lines of research and usually engaging the expertise of public research institutions (e.g., universities), advanced manufacturing parks address a variety of the coordination and funding issues that stand in the way of effective collaborative research and development.

While advanced manufacturing parks come in many shapes and sizes, several core features are common to many of the leading examples. The following subsections describe several of the core functions that advanced manufacturing parks can serve and how that influences their structure.

Germany’s Research and Development Organizations with International Reach

Germany’s manufacturing sector benefits enormously from the depth and global reach of its research and development infrastructure. Two organizations in particular help to make Germany one of world’s leading research, development, and advanced manufacturing nations.

Basic Research: Born in 1948, the Max Plank Society of Advancement of Science is an independent non-profit organization devoted to basic research. The society operates 80 connected research institutes, which collectively churn out over 13,000 academic publications per year. More than 80 percent of the Society’s $1.4 billion 2011 budget is provided by the public sector.

The Max Plank Society actively pursues transnational research collaborations and works to bring the best and brightest minds to its facilities in Germany. Recognizing that Germany does not produce enough research scientists to fulfill domestic demand, the Max Plank Society actively recruits Ph.D. students from many countries into its research institutes. The Society also supports a number of research groups and research schools that are housed at leading universities around the world. As research and development requires increasing interdisciplinary work, the Max Plank Society also aims to foster work that crosses traditional scientific boundaries. Max Plank institutes are involved in more than 2,000 cooperative research projects which engage over 6,000 partners in more than 100 countries.

Applied Research: The Fraunhofer Society is Europe’s largest organization devoted to applied research. Fraunhofer operates 60 institutes across Germany that each specialize in specific areas of applied research. Roughly 70 percent of Fraunhofer’s annual research budget derives from contract work, largely for the private sector.
For the last several decades, Fraunhofer has stood as the best European model for science park development and fostering collaborations between private and public R&D actors. Fraunhofer works on products and processes up until they reach technical or commercial maturity. Many research and development practitioners see Fraunhofer as the optimal model for driving capital-intensive technology development that leads to new products and commercially viable intellectual property. Like the Max Plank Society, Fraunhofer is a global research player with research centers in the United States, Asia, and the Middle East. The network of Fraunhofer research centers also collaborates on projects that cannot be addressed through one center alone.

Together, these two organizations create a pathway from basic research to commercial product. Where individual research institutes and universities often struggle to leverage the range of scientific and engineering expertise needed to develop a product from basic research through commercial maturity, these two organizations provide a blueprint for building the research capacity needed to keep manufacturers on the cutting edge.

Sharing Resources and Managing Risk

Advanced manufacturing parks are an excellent way to pool resources and manage risk. Investing in research — particularly basic research that is far removed from commercialized product — is a huge risk for an individual company to accept. Collaborative innovation is becoming more common, in part, because long-term risk management has become a larger concern for modern manufacturing firms.

Advanced manufacturing parks address this issue by pooling funding from a variety of private and public entities that that would benefit from a particular line of R&D. Successfully establishing mechanisms to share risk usually involves the following steps:

- **Identify a core strategic focus:** Many of the leading advanced manufacturing parks are designed to serve a particular supply chain, or to conduct research in areas where the needs of different supply chains overlap. Identifying the core area(s) of research that will be addressed provides a rallying point for manufacturers that may want to be involved. It also helps in identifying firms that may benefit from the research to be conducted and, as such, may be interested in participating. For example, the Commonwealth Center for Advanced Manufacturing in Virginia focuses on advanced surface engineering, which is critical to the aerospace sector, but also has applicability in other sectors.

- **Create a fee structure:** Private-sector funding often comes in the form of regular dues that fund research, or in-kind contributions of equipment or personnel. For more details on how this was accomplished in a specific example, see the case study on the Commonwealth Center for Advanced Manufacturing, where a two-tiered structure was used to engage manufacturers with different levels of capacity to support and leverage the research and development being conducted.

- **Create mechanisms for combining public and private funds:** Because many advanced manufacturing parks are
supported by both public and private funding, it is often advisable to incorporate the organization as a public-private, non-profit partnership. Alternatively, some advanced manufacturing parks are hosted by universities with mechanisms for gathering and using private-sector funds.

- **Secure shared research space and equipment**: Another economy of scale can be realized through sharing research space and equipment. Sharing the costs of research facilities is another means of reducing the risks inherent in companies conducting research entirely in-house.

**Orchestrate a Research and Development Agenda**

Advanced manufacturing parks also create a structure for identifying and prosecuting promising lines of research. Rather than have each company conduct its own research, which inevitably creates redundancy and investment based on incomplete information, the advanced manufacturing park model allows firms to pool knowledge to identify the avenues of research and development that have the greatest potential to benefit all parties involved.

While there are a variety of possible mechanisms for orchestrating a research and development agenda, a few steps are critical to success:

- **Identify core strategic focus**: It is essential to strategically chart a research agenda. Like any company, collaborative research enterprises need to know where they are going, and what needs to be discovered.
- **Leverage the knowledge of diverse members**: Identifying the lines of research that have the best chance of returning value for stakeholders requires extensive knowledge of the science, production, and market realities. As such, advanced manufacturing parks are important because they create the framework for continual conversation between companies and public-sector representatives with different expertise.

- **Identify overlapping opportunities**: Determining a collaborative research agenda can be one of the most effective means of identifying new cross-cutting opportunities. Bringing together manufacturers that traditionally have not been connected within the same supply chain can identify common research interests that otherwise would not have come to light.

**Engage Universities and Colleges**

Most of the leading advanced manufacturing parks in existence today are tied to public research institutions in some way or another. As was noted earlier, and will be revisited below, universities, colleges, and public research laboratories often bring incomparable expertise and capacity to research and development. In the case of advanced manufacturing parks, universities and public labs are valuable in a number of capacities. They:

- **Provide top-end research talent**: Research schools can provide much of the expertise needed. In many cases, advanced manufacturing parks are specifically designed around the research specialties of universities in the region. Leading faculty are often essential to identifying promising lines of investigation, designing research
programs, and overseeing the actual work.

- **Provide graduate student research staff:** Colleges and universities can also provide relatively low-cost research staff in the form of students. Engaging research faculty can be a great way of creating a pipeline of young research staff to sustain the research being conducted.

- **Provide parallel or complementary research facilities:** University and college partners can also bring lab space and equipment to the table. While most manufacturing parks have research space, it is often necessary to draw on resources that do not exist on site. For example, a line of research may require the use of a wind tunnel, but not often enough to justify building one. In these types of cases, research can be distributed to where the capacity exists on member universities’ campuses.

**Combine Basic Research with Product Development**

Another leading practice of advanced manufacturing parks is to ensure that basic scientific research is designed to address implementation and production issues. Often, the most time-consuming element of R&D is solving the practical challenges needed to move from invention to commercialized product. The key here is to anticipate and address as many production challenges as possible during the course of research and development. To that end, many advanced manufacturing parks take the following steps:

- **Get scientists and production engineers working together early:** Making sure that production engineers are involved throughout the research and development process is often critical to minimizing bottlenecks between scientific innovation and full-scale production. Production engineers can often anticipate challenges that would not occur to research scientists, making it less likely that unanticipated production issues will prevent the commercialization of innovations.

- **Build model production lines:** Going one step further, many advanced manufacturing parks include space for setting up model production lines. Where

---

**Collaborative Innovation in Action: Advanced Manufacturing Research Centre (AMRC), Sheffield, England**

The AMRC is a leading example of how to create the organizational foundation for collaborative innovation. The AMRC accelerates research and development in the aerospace sector by bringing private companies (including Boeing and Rolls Royce) and university research staff together into one facility to work on mutually beneficial research projects. According to Joe Anwyl of AED International and Global Innovation Partners, the AMRC works by fostering working relationships between private and public entities with shared research and development needs; “by drawing together into one research centre scientists, technicians and business people from the entirety of Boeing’s supply chain and focusing on in-market product improvement and near-to-market product development, huge production cost savings have been made while developing new technologies more rapidly.”
a new product or material will require novel production methods, working out the production line challenges is as essential as the basic science. Just as with shared research lab space, having space to iron out production issues can reduce costs and increase return on investment for all concerned.

Collectively Held Intellectual Property
Sharing of intellectual property rights is a critical feature of collaborative innovation. However, working out the details of shared ownership and licensing can be a difficult proposition and part of why collaborative innovation can be challenging. Advanced manufacturing parks can serve a vital role by streamlining the process of sharing intellectual property.

Establishing a structure for shared ownership of intellectual property can be accomplished through the agreement that members (both public and private) sign to join the park. When an advanced manufacturing park functions as a stand-alone non-profit, the sharing of intellectual property rights can be explicitly resolved through the organization’s documents of incorporation. By taking this step, many of the licensing headaches are removed, reducing cost and risk on the path from invention to commercialization. While the details of these types of agreements vary, a few key features should be noted:

- **Ownership should be shared among all member companies:** As most advanced manufacturing parks of the type discussed here are fee-based membership organizations, the intellectual property rights are generally shared among all members whose dues support the research and development being conducted. Providing access to all intellectual property being produced is one of the chief enticements for companies to join an advanced manufacturing park.

- **Eliminate issues arising from involvement of public universities:** An advanced manufacturing park’s founding agreement should remove any roadblocks to the commercialization of research done by university faculty. Many colleges and universities are taking an increasingly open approach to the intellectual property emerging from their research faculty. So long as faculty positions are funded, opportunities for students are created, and the status of the school increases, public universities and colleges are often willing to release any ownership claim in the research being conducted.

**Engaging Small and Medium-Sized Firms in Innovation**
Small firms are key drivers of innovation, often outperforming their larger counterparts in productivity and impact. First, small firms are often much more prolific in their innovation activity, given their size, than larger companies. Analysis of patenting in the late 1990s found that “small patenting firms produce 13-14 times more patents per employee as large patenting firms”\(^9^4\). Subsequent studies found small businesses accounted for an even greater percentage of highly innovative firms between 2000 and 2002\(^9^5\), and an even larger percentage


\(^9^5\) CHI Research, Small Firms and Technology: Acquisitions, Investor Movement, and Technology
between 2002 and 2006 \textsuperscript{96}. It should be noted that these studies were heavily weighted toward manufacturing firms, so these results can be safely taken as a good description of innovation within the manufacturing sector. All together, these studies indicate that small businesses are becoming more essential drivers of innovation within manufacturing and across the entire economy.

Small firms also tend to produce research that is more actively utilized by other companies. “Small firm patents are twice as likely as large firm patents to be among the 1 percent most-cited patents” \textsuperscript{97}. This implies that small firms are often the source of innovations that drive commercial activity for other firms in their innovation network. Where large firms may produce key innovations, the innovations emerging from large firms tend to bring less benefit to other companies operating in the same economic space.

Finally, small firms are more likely to be on the cutting edge. The same report on patenting activity found that “small firm innovation is twice as closely linked to scientific research as large firm innovation on average, and so substantially more high-tech or leading edge” \textsuperscript{98}. There is also evidence that small firms are more dependent on local innovation than large firms \textsuperscript{99}. Where large firms have the resources and global reach to leverage innovation happening globally, small firms are more deeply reliant on what is happening locally.

For these reasons and others discussed earlier in this document, economic developers must support small business innovation. Some ways in which this can be accomplished include:

\textbf{Technology Scouting: National Innovation Marketplace}

The National Innovation Marketplace (NIM) is an online technology clearinghouse that addresses supply chain challenges in technology deployment. Developed by the National Institute of Standards and Technology’s Manufacturing Extension Partnership, NIM is a free service that is propelled by MEP’s extensive manufacturing network. NIM helps OEMs overcome their technology challenges by allowing them to put forward innovation requests to potential suppliers and to search NIM’s database of innovations. NIM also accelerates technology commercialization by helping innovators market their ideas to potential customers and investors. The online forum is uniquely positioned to advance technology deployment because it facilitates dialogue between technology players across the board – innovators, manufacturers, venture capitalists, R&D labs, corporations of all sizes and universities.

NIM’s core services target two groups: technology providers and technology requestors. NIM assists innovators in translating sometimes complex patents and technologies into marketable products. This greatly reduces the search costs for technology requestors. OEMs seeking innovation business opportunities can access critical information in NIM’s database, which assesses each technology’s market valuation and readiness by providing independent sales forecasts, development statuses and proprietary (patent) statuses.
• **Actively engaging the small business community:** Small business owners are less likely to solicit support from EDOs (beyond financing). Yet there are numerous ways in which EDOs can support small business innovation through technical assistance, professional development, and networking. Educating small businesses about the assets and programs available in the community is the first step. Over time, EDOs can also work on building programs and policies that specifically support local small businesses.

• **Developing and offering programs that address their needs:** Given the unique challenges that small businesses face, they need programs and services that are specifically designed to help them. Programs designed for large businesses are not likely to attract small business interest. SBDCs, chambers of commerce, local community colleges and others can help EDOs develop and expand existing resources in the community, as well as tailor new programs to meet small business needs.

• **Connect small businesses with the regional innovation ecosystem:** One of the most important ways to support small business innovation is by connecting them to the large players in the community, such as universities, federal labs, and large corporations. As discussed above, small businesses are more likely to utilize research conducted by large institutions to bring an innovative product to market. Many institutions also have mandates for providing a certain percentage of their contracts to local or regional small businesses. By connecting the small business community with the regional innovation ecosystem, economic developers can assist small businesses in expanding their reach, bringing new products to market, and improving the overall performance of the innovation ecosystem.

### Supporting Manufacturing Entrepreneurship

While entrepreneurship was not a common economic development focus 20 years ago, it is increasingly important to the field. There is evidence that a majority of new jobs opportunities created in the United States over the last 25 years were in young entrepreneurial companies\(^{100}\). As these facts sink in, more and more economic development effort is directed toward supporting entrepreneurs. Among economic developers interviewed for this project, “entrepreneurship and small business support” ranked as the most common types of business retention and expansion activity. This section outlines some of the important roles that EDOs can play in making it easier for new manufacturing firms to form and survive.

### Permitting and Incorporation

The regulatory impediments to starting a business often stop potential entrepreneurs from going through with it. People with deep technical expertise or an innovation that could form the basis of a new company often struggle to navigate the regulations needed to start a new business. Many EDOs already

---

spend much of their time helping companies solve local, state, and federal permitting issues, so it’s largely a question of finding the entrepreneurs who need the help.

**Financing**

One of the perennial needs of entrepreneurs is for capital, whether that is seed capital to get an idea off the ground, capital to purchase raw materials, expansion capital to move into the next phase, or operating capital to survive a rough spell. The challenges that need to be addressed and the sources of financing that will be useful change as the firm grows from seed stage to maturity. To simplify matters somewhat, Table 9 shows the likely sources of financing for companies at different stages of entrepreneurial development.

While the first requirement is to connect entrepreneurs with the resources that already exist, EDOs also have lead the way in addressing gaps in their local financing landscape. The next chapter addresses each of these financing sources in more detail and highlights programs that communities have developed to provide more financing opportunities for entrepreneurs.

### Table 9: Funding Sources by Stage of Entrepreneurial Development

<table>
<thead>
<tr>
<th></th>
<th>Pre-Startup and Startup</th>
<th>Early Stage</th>
<th>Expansion</th>
<th>Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Debt</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banks</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CDFIs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Microfinance Organizations</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank CDCs</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Equity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venture Capital</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed and Pre-Seed Funding</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angel Investment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Both</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universities</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government &amp; Gov.-backed providers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Source: [101]

---

Technical Assistance

Fostering successful entrepreneurs goes well beyond financing and filling out permits. Depending on the business in question, manufacturing entrepreneurs are likely to need support with a wide range of technical issues, including:

- Business plan development
- Marketing
- Finding workers
- Site selection
- Transportation and logistics
- Production efficiency
- Supply chain development

At the very least, EDOs must know where manufacturing entrepreneurs can go to get help with their unique challenges. While some EDOs hire staff and provide direct technical assistance, they rarely have the resources to assist with every type of issue that manufacturing entrepreneurs encounter. Likely sources of information or technical assistance for entrepreneurs include:

- **Manufacturing Extension Partnership Centers (MEP):** The MEP is designed to help small manufacturers to survive and grow. Many centers can help with every issue outlined above, so MEP is an important first stop for manufacturing entrepreneurs in need of technical assistance.
- **Small Business Development Centers (SBDCs):** While less focused on manufacturing in particular, SBDCs also provide a wide range of technical assistance to entrepreneurs. For more detail on working with SBDCs, see Chapter 10.

- **Incubators:** Many communities have invested in organizations that provide space and expertise to budding companies. In some cases, incubators are specifically designed to support small manufacturing firms.
- **Educational institutions:** Many colleges and universities have offices designed to leverage the resources of the school to support entrepreneurs. Educational institutions can also provide pipelines of talent, access to research capacity, and solutions to specific technical needs. In mapping the assets of educational institutions in your region, it is important to identify specific resources that entrepreneurs can access.

Of course, these are not the only partners that can provide technical assistance. Supporting entrepreneurship requires a significant amount of coordination among diverse organizations and agencies, so it is often important for EDOs to take an active role in putting the pieces together.

Entrepreneurial Culture

While some people are born entrepreneurs, many require a supportive culture in order to take the leap. Entrepreneurial culture is a somewhat vague term, but it is essentially the collection of experience and expectation that makes some communities more open to starting new businesses than others. When people grow up in a community where their neighbors, friends, and family operate their own businesses, it becomes an understood life path. Moreover, when someone starts thinking about opening a business, he or she is already part of a network of knowledge about how to make it happen.
But culture is not built overnight; it is the result of long-term, collective experience. “Culture is the last mile. It’s the most important part of an entrepreneurial economy – and the hardest to achieve”\(^{102}\). In spite of its challenges, EDOs should do their part to create an entrepreneurial culture in their community.

- **Highlight success stories:** EDOs should leverage their various communication channels to raise the profile of successful entrepreneurs. This can be particularly important for communities or groups that have not seen significant entrepreneurial success before. It is vital for people to see others like them taking the risk and having their work pay off.

- **Introduce students to entrepreneurs:** Young people are actively developing their understanding of what is and is not possible. As such, it is important for young people to hear about entrepreneurs’ paths.

- **Help foster entrepreneurial networks:** Active networks of entrepreneurs develop a cultural weight of their own beyond the technical knowledge being shared.

By engaging potential entrepreneurs, providing the business knowledge needed, connecting seasoned entrepreneurs to novice peers and highlighting success stories, EDOs can gradually build the cultural foundation that can galvanize the next generation of entrepreneurs.

---

CHAPTER 6
Financing Manufacturing

Overview

The Great Recession has tightened debt and equity markets significantly, making access to capital a major issue for many manufacturing firms. It is in this environment that we approach this chapter on financing manufacturing. At every stage of business, manufacturers need working capital to facilitate day-to-day expenses. Fixed assets like plant, property and equipment require large infusions of capital usually financed over the long-term.

Importance of Different Types of Financing

In the survey conducted for this project, respondents were asked to rank the importance of different sources of financing for manufacturers\textsuperscript{103}. Their responses produced three general levels of importance, listed here from highest to lowest:

- **Private debt and public financing**: 77 percent of respondents indicated that these sources are “very important” or “absolutely essential” for financing for manufacturing firms.
- **Self-financing**: 65 percent of respondents indicated high levels of importance.
- **Private equity and customer/supplier financing**: 47 percent of respondents indicated they were very important or critical. Private equity and supplier/customer financing are vital to many manufacturers, but simply ranked behind the other sources of financing addressed.

Finance Programs Operated by EDOs

EDOs operate or administer a range of financing programs that can be vital to manufacturing firms. Table 10 shows the percentage of survey respondents who work at organizations that provide each type of financing mechanism.

<table>
<thead>
<tr>
<th>Type of Program</th>
<th>% Saying Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial development revenue bonds</td>
<td>37%</td>
</tr>
<tr>
<td>Revolving loan funds</td>
<td>34%</td>
</tr>
<tr>
<td>Tax increment financing</td>
<td>32%</td>
</tr>
<tr>
<td>Direct lending</td>
<td>25%</td>
</tr>
<tr>
<td>Community development loans</td>
<td>22%</td>
</tr>
<tr>
<td>Microloan programs</td>
<td>21%</td>
</tr>
<tr>
<td>General obligation bonds</td>
<td>19%</td>
</tr>
<tr>
<td>Public loan guarantee programs</td>
<td>17%</td>
</tr>
<tr>
<td>Energy efficiency loans</td>
<td>6%</td>
</tr>
</tbody>
</table>

While many EDOs do not directly provide financing through one of these mechanisms,
most do connect manufacturers with institutions that do.

Table 11 shows the proportion of all survey respondents who indicated that their organization does not operate the type of program in question, but does connect manufacturers with programs that are available through other institutions.

It is clear that, even when not the direct source of financing, EDOs are vital to connecting manufacturing firms to the programs that do exist.

The rest of this chapter provides an overview of the different types of financing that manufacturers are likely to need. The relative importance of each, and the roles that EDOs are called upon to perform vary by community, so this chapter seeks to cover a great deal of ground. Table 12 breaks down the financing landscape by types and sources of financing, and outlines the structure for the remainder of this chapter.

Table 11: EDOs Directing Firms to Financing Services

<table>
<thead>
<tr>
<th>Type of Program</th>
<th>% Saying Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy efficiency loans</td>
<td>69%</td>
</tr>
<tr>
<td>Public loan guarantee programs</td>
<td>65%</td>
</tr>
<tr>
<td>Direct lending</td>
<td>62%</td>
</tr>
<tr>
<td>Microloan programs</td>
<td>57%</td>
</tr>
<tr>
<td>Revolving loan funds</td>
<td>48%</td>
</tr>
<tr>
<td>General obligation bonds</td>
<td>47%</td>
</tr>
<tr>
<td>Community development loan funds</td>
<td>47%</td>
</tr>
<tr>
<td>Economically targeted investment</td>
<td>44%</td>
</tr>
<tr>
<td>Industrial development revenue bonds</td>
<td>44%</td>
</tr>
<tr>
<td>Tax increment financing</td>
<td>42%</td>
</tr>
</tbody>
</table>

Table 12: Typology and Sources of Business Financing

<table>
<thead>
<tr>
<th>Internal Cash Management Practices</th>
<th>Grants/Tax Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account Management Practices</td>
<td>Federal</td>
</tr>
<tr>
<td>Vendor/Supplier Financing</td>
<td>State/Local</td>
</tr>
<tr>
<td>Customer Financing</td>
<td>Competitions</td>
</tr>
<tr>
<td>Inventory Financing</td>
<td></td>
</tr>
<tr>
<td>Factoring Accounts Receivable</td>
<td></td>
</tr>
<tr>
<td>Export Credit Insurance</td>
<td></td>
</tr>
<tr>
<td>Renting/Leasing Equipment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Debt Financing</th>
<th>Equity Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Sources</td>
<td>Public Sources</td>
</tr>
<tr>
<td>U.S. Small Business Administration</td>
<td>Federal</td>
</tr>
<tr>
<td>Other Federal Sources</td>
<td>State/Local</td>
</tr>
<tr>
<td>State/Local Sources</td>
<td></td>
</tr>
<tr>
<td>Private Sources</td>
<td>Private Sources</td>
</tr>
<tr>
<td>Commercial Banks</td>
<td>Angel Investors</td>
</tr>
<tr>
<td>Commercial Finance Companies</td>
<td>Strategic Investors/Investment groups</td>
</tr>
<tr>
<td></td>
<td>Investment Bankers</td>
</tr>
<tr>
<td></td>
<td>Stock Offerings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy Financing</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Sources</td>
<td></td>
</tr>
<tr>
<td>Federal</td>
<td></td>
</tr>
<tr>
<td>State/Local</td>
<td></td>
</tr>
<tr>
<td>State/Local Sources</td>
<td></td>
</tr>
<tr>
<td>Private Sources</td>
<td></td>
</tr>
<tr>
<td>Angel Investors</td>
<td></td>
</tr>
<tr>
<td>Strategic Investors/Investment groups</td>
<td></td>
</tr>
<tr>
<td>Investment Bankers</td>
<td></td>
</tr>
<tr>
<td>Stock Offerings</td>
<td></td>
</tr>
</tbody>
</table>
Equity Financing

Equity financing refers to investments made in exchange for an ownership stake in a business. Equity investors reap the benefits of their ownership stake as it appreciates in value if the business becomes profitable. This type of financing is especially crucial to the survival of early-stage, high-risk companies; it is essentially what makes startups possible. Although mature manufacturing industries have the luxury of relying on proven technology and previous financial track records to leverage financing for new investments, nascent and high-tech industries can involve a grueling research and development process and require investors that have much more appetite for risk. Take, for instance, the biotechnology industry. A novel therapy requires an average of 10 years and $1 billion to bring to market, and countless drugs fail in the development process. This type of business model cannot be supported by debt financing alone, in which lenders expect repayment of the loan plus interest regardless of the success of the project. Equity financing presents a unique opportunity because investors are paid only if the project returns a profit.

Companies typically pursue a mix of debt and equity financing. Indeed, some level of equity financing is usually required to secure debt financing – the rule of thumb is that a dollar of early-stage equity can leverage a dollar of debt, if there is security to back up the debt. However, too much equity financing will dilute control of the company and erode its profits.

A variety of equity financing tools can uniquely address manufacturing firms’ capital needs at each stage of business. Seed capital is used in the very early stages of a company to conduct market research and product development. It often comes from the owner’s personal funds or investments made by family and friends. Angel investors are outside investors who invest their own money and often bridge the gap between seed financing and venture capital. Venture capital (VC) consists of pooled investment funds managed by professional venture capitalists or VC firms, with the typical VC investment reaching several million dollars. Venture capitalists are repaid when an expanding or mature company sells equity to the public by issuing an initial public offering (IPO). IPOs have the potential to raise massive amounts of capital by allowing myriad investors each to make modest investments.

Figure 19 below highlights the differences between debt and equity in further detail.

---


**Figure 19: Differences between Debt and Equity Financing**

<table>
<thead>
<tr>
<th>Debt</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must be repaid or refinanced.</td>
<td>Can usually be kept permanently.</td>
</tr>
<tr>
<td>Requires regular interest payments; company must generate cash flow.</td>
<td>No payment requirements. May provide dividends, but only out of retained earnings.</td>
</tr>
<tr>
<td>Collateral assets must usually be available.</td>
<td>No collateral required.</td>
</tr>
<tr>
<td>Debt providers are conservative. They cannot share any upside or profits, and wish to eliminate all possible loss or risks.</td>
<td>Equity investors are aggressive. They can accept downside risk because they fully share in upside as well.</td>
</tr>
<tr>
<td>Interest payments are tax deductible.</td>
<td>Dividend payments are not tax deductible.</td>
</tr>
<tr>
<td>Debt covenants may impose some restrictions on some decisions made by existing management.</td>
<td>Shared equity may lead to shared control and management over the day-to-day operations of the company.</td>
</tr>
<tr>
<td>Debt allows leverage of equity.</td>
<td>Equity holders share the company profits.</td>
</tr>
<tr>
<td>May impose restrictions on the compensation of owners and officers as terms of loan.</td>
<td>Investors are consulted or can determine compensation of owners and officers.</td>
</tr>
<tr>
<td>Restrictions on the sale of assets that have been used as collateral for a loan, or taking on of additional debt to finance the purchase of assets.</td>
<td>Investors share in ownership of all assets.</td>
</tr>
<tr>
<td>Regular timely reporting of financial results to lenders.</td>
<td>Investors usually have access to financial results at any time.</td>
</tr>
<tr>
<td>Restrictions on transfer of ownership.</td>
<td>As either majority or minority owners, investors participate in all ownership issues.</td>
</tr>
</tbody>
</table>

Source: \(^{106}\)

Figure 20 presents the typical chronological order in which firms seek equity financing. Equity investors typically dedicate themselves to specific industries and investment levels. The majority of equity investments are made by private investors – individuals or groups of investors who invest private equity funds. Investors in this arena typically choose a portfolio of industries in which they have technical or management expertise. In the face of recent market uncertainty, however, public equity funds have been on the rise. Public equity funds are funds established by federal and state governments to invest in companies that grow within their jurisdiction. These programs are not typically designed to supplant private investors; rather, they hope to entice private investment by promising to share some of the investment risk.

Figure 20: Equity Sources by Stage of Company Development

Source: Steven J. Back, President, Indiana Venture Center, Inc.; *adjusted by IEDC

Source: 107

Public Sources of Equity

State and Local Sources
Since the inception of the venture capital industry, state and local governments and economic development organizations have been players on some level. Early public equity funds were also administered by government, but over time, governments handed control of investment decisions over to private investment firms. Public equity funds differ from private ones in that public funds strive for the dual goals of return on investment and job creation. Some public funds target specific industries like renewable energy, biotechnology and information technology, while others encompass a wide range of industries. The National Association of Seed and Venture Funds operates a list of state-supported venture capital programs, available on the NASVF website, http://www.nasvf.org/pdfs/VCFundsReport.pdf. Examples of these funds include the Ohio Energy Gateway Fund and Invest Maryland (see case studies).

States, in a rush to manifest economic development aspirations, spend millions and even billions of public dollars getting risky ventures off the ground and often expect immediate, dramatic results. This mindset doesn't account for the long, winding road that some products take to get to market. Understanding the nature of the industry is crucial to setting realistic measures for the success of a public equity program. In addition, public equity funds can look to the best practices of private equity funds for how to receive the most return on investment.

Lessons learned from public equity funds (both domestic and international) have confirmed several guiding principles:

- **Choose industries wisely:** Public venture funds get the most “bang for the buck” if they focus on their community or state’s areas of expertise, rather than on speculative proficiencies. Niche industries already have the infrastructure, technical know-how and management experience necessary to make a venture successful. This is not to say that economic developers shouldn’t develop fledgling industries, but it does mean other needs should be addressed before putting public equity money on the table. Limited resources should be spread across a highly selective slate of industries. A broad but shallow investment approach won’t create significant results in any industry.

- **Invest at the right amount:** Once the niche industries have been identified, states should take a long, hard look at how much money they are willing to put in the game. Equity financing, especially at later business stages, is an engine that takes a lot of fuel. States that underinvest in their public equity funds will struggle to create any significant job growth. It is especially difficult to dedicate sufficient funds as states cut programs in attempts to balance budgets. On the other end, overinvestment of public equity funds will crowd out private investment. The Canadian Labor Fund Program invested so much money into Canada’s small and medium-sized businesses that it competed with private investors rather than
supporting them, all the while making average returns. 

- **Don't rush to distribute funds:** Government administrations change every two or four years, and it is sometimes difficult to carry over programs across administrations. However, states should not rush to spend funds for fear of losing them. States that invest too quickly without sufficient due diligence don't support the most promising companies. Venture capital is a slow game, with the highest returns going to patient and prudent investors. With that said, EDOs can help legislatures understand the importance of public equity programs by pointing to success stories of startups that have matured into job growth engines with the help of public money.

- **Leverage the expertise of existing investors:** When creating a public equity fund, private investors are invaluable partners on two fronts: expertise and funds. Public support can stimulate private investment by helping private investors make their dollars go further and lessen the investment risk of each dollar. Economic developers may know how to support businesses, but they are rarely equipped to pick the winners and the losers. Several public equity funds, such as the Ohio Energy Gateway Fund (see case study), are managed by private investors who contribute matching funds. This “fund of funds” approach essentially puts public money into the hands of private investors. Private investors can also help states set up program benchmarks by advising on the risks, associated timelines, job creation and investment needs of their niche industry. When engaging private investors, economic developers should:

---

**In-Q-Tel**

Chartered in 1999, In-Q-Tel is a nonprofit equity fund operated by the Central Intelligence Agency to invest in private-sector defense and intelligence technologies. The CIA noted that the rapid progress of the private sector in intelligence-related technologies necessitated federal investment. In-Q-Tel actively seeks out entrepreneurs and companies with relevant technologies, and it also accepts business plan proposals. The fund has invested in over 100 companies and 10 universities or research labs, each at an average of $1 to $3 million (In-Q-Tel 2010). In-Q-Tel invested in 3-D mapping software that was acquired by Google and eventually integrated into Google Earth. Currently, In-Q-Tel’s solicitations focus on information and communication technologies and physical and biological technologies.

---

- **Know who the private investors are:** Personally get to know the private investors in your community or region and find out about their investing preferences (industries, size of investment, desired degree of control, etc.).

- **Engage investor input:** When dealing with investment issues in your community, facilitating a local or

---

A regional angel or VC network can help close some of the information gaps.

- **Leverage their knowledge and expertise:** Private investor expertise can be engaged by investing public equity funds through private funds, engaging private investors as advisors or contractors, or by hiring staff with venture expertise on the specific sectors being targeted for investment.

**Federal Sources**

While state equity funds are taking off, there are far fewer public equity opportunities on the federal level. Equity investments are typically made into high-risk, high-growth companies. The majority of dedicated federal support for financing manufacturing comes from Small Business Administration loan guarantees, which are explored in the debt financing section of this report. There is a handful of federal equity financing programs, however, which include the Central Intelligence Agency’s In-Q-Tel (see text box).

**Private Sources of Equity**

**Angel Investors**

Angel investors are high-net-worth individuals who have previous records of managing successful startups. They invest their own money into industries for which they have expertise, allowing them to offer valuable strategic direction to firms as well. Each angel investment ranges from $20,000 to $150,000 and can be a crucial stepping stone for very early-stage firms seeking venture capital investment. Although most angels act independently, many join formal or informal angel networks to share information and co-invest. The Angel Capital Education Foundation and the National Association of Seed and Venture Funds are two such groups. The SBA operates an angel network, Active Capital, which helps businesses connect with angels.

**Resource Spotlight: Community Development Venture Capital Alliance (CDVCA)**

CDVCA is a network of managers of community development venture capital (CDVC) funds. CDVC funds target businesses in areas that are not traditional VC hubs and in industries that may not receive as much VC focus, such as manufacturing and service industries. Many CDVC funds are also certified by the Treasury Department as community development financial institutions (see debt financing section).

CDVCA provides a forum for CDVC fund managers to share best practices in a relatively new field. The alliance also offers training and consulting assistance, as well as advocacy and research services. CDVCA operates a $6 million fund of its own, the Central Fund, which invests in CDVC member funds and co-invests with other funds in businesses that serve community development purposes.

For an interactive map of CDVC funds across the U.S., refer to the Alliance’s website: [www.cdvca.org](http://www.cdvca.org).

---


**Venture Capitalists**

Venture capitalists provide equity to help businesses gain access to capital for expansion or to complete acquisition or ownership transitions. Some venture capitalists specialize in mezzanine financing, a loan that the lender can convert to equity if it is not repaid on time and in full. Venture capital is especially crucial to capital-intensive manufacturing industries and high-risk startups. VC firms exchange capital for a hand in the company’s strategic direction, while leaving company owners to handle their daily operations. Venture capitalists are usually involved in a project for five to seven years, typically receiving back six to ten times their initial investment when they exit. While some investment firms specialize by industry and stage of business, others invest in a variety of industries. Businesses can connect with an investment firm through banks, brokerage firms, professional advisors, or other networks. The National Association of Small Business Investment Companies operates a list of venture capitalists focused on investing in small businesses (refer to www.nasbic.org).

**Public Stock Offerings**

Companies first make their stock available to the public by issuing an initial public offering (IPO). Most IPOs are issued by small companies seeking expansion capital, but some are issued by large companies that want to become publicly traded. Funds raised from an IPO can range from hundreds of thousands to billions depending on the company size. An IPO issues common stock – essentially an equity buy-in to the company. Common stock does not pay dividends if the company is unprofitable, but often pays better than preferred stock if the company is. Common stockholders often have the ability to vote on the company’s corporate strategies. Preferred stock, which is technically a debt instrument, ensures the stockholder fixed dividends each year. Preferred stock is usually issued on a temporary basis when other debt instruments or common stock issuance isn’t possible.

EDOs can engage in a number of activities that make their communities more attractive for private investment.

- **Attract management talent:** Top-notch researchers invent new products, but the follow-on companies will locate where there is top management. Startups that are acquired by an out-of-state company are typically relocated closer to the parent company. However, if there is sound management already in place, there is less incentive to call for an expensive relocation. For example, Michigan’s $1 million Entrepreneur-in-Residence/CEO Placement program offers matching loans to VC firms to attract experienced entrepreneurs. The VC firms use the money to recruit an entrepreneur-in-residence to advise on its deal flow, and when the firm makes an investment, the entrepreneur becomes the new venture’s permanent CEO. The CEO Placement program has helped Michigan build an active VC and startup community around seasoned entrepreneurial talent.

- **Identify Firms in Need of Financing:** EDOs should leverage their partnerships to best identify who their customers are. Most EDOs operate business retention and expansion programs and thus are familiar with their existing businesses. EDOs with connections to technology
incubators, university tech transfer offices or small business development centers can connect with startups in their region. Manufacturing Extension Partnerships, which work directly with manufacturers, can point to firms that need financial help. On the investor side, the Private Equity Growth Council operates a national map that lists private equity investors in each state (refer to www.pegcc.org). The NASVF membership list is also a great resource of the major players in equity financing (refer to www.nasvf.org).

- **Connect investors with businesses:** Once EDOs identify their customers, they can work to bring investors and businesses together. Tech-based EDOs such as Ben Franklin Technology Partners in Pennsylvania form networks of entrepreneurs, angel investors, venture capitalists, incubators, labs, business assistance and other economic development organizations. Some EDOs go a step further. The Investor Circle of York (ICY), operated by the York County Economic Development Corporation in Pennsylvania, screens local startups and connects them with a local angel network. This networking serves a second function by rallying investors around common projects. In later stages, companies need large rounds of financing that may require multiple investors to pool their funds. A disconnected VC community won’t be able to support large rounds of financing, leaving companies to look elsewhere to fund later stages of growth.

- **Give investors a break:** Angel investor tax credits reward investment made in early stage companies and have helped states like Wisconsin grow a vibrant angel community. The National Association of Seed and Venture Funds (NASVF) recommends that such a policy be based on three key considerations: immediate behavioral reward, venture eligibility and investment eligibility\(^\text{110}\). In order to induce immediate investment, the tax credit should be around 25-30 percent and have an expiration date. States can define what industries qualify for the tax credits but should also ensure that the credits are helping to grow primary jobs. In addition, NASVF advises that eligible investments be capped at $2 million per year. In a time when states are cutting back programs, EDOs can help state and local governments understand that angel investment creates jobs.

**Venture Capital: A Brief History and Recent Trends**

The U.S. venture capital industry began in the 1970s, when private capital firms began to invest in the technology companies that would eventually make up Silicon Valley. 1978 was a landmark year, with venture capital investment reaching $780 million\(^\text{111}\). It was around this time when state governments began to set up quasi-public corporations to make public equity investments into companies. However, over time, states began to change their strategy, becoming partners to private venture capital firms rather than making investment decisions themselves.


Over the next two decades, the venture capital industry went through a series of boom and bust cycles, culminating in the burst of the dot-com bubble in 2000. From 2003 to 2007 VC investment rose slowly from $4.1 billion to $7.9 billion\textsuperscript{112}. The 2008 recession caused VC investment to fall again to $3.5 billion in the first quarter of 2009.

Because of a focus on high-growth companies, venture capitalists fund just 3,500 of the existing 22 million small businesses in the U.S.\textsuperscript{113}. Venture capitalists work in a variety of spaces, but activity is still strongest in advanced technology sectors like biotechnology, software, and industrial/energy. Cleantech investment, which accounts for a large part of the industrial/energy figure, has grown over the years and is directly correlated with rising oil prices\textsuperscript{114}.

Many states have increased efforts to attract venture capital investment. For example, Michigan focused on attracting capital and management talent to grow startups in the life sciences, information technology, alternative energy and advanced manufacturing. The Venture Michigan Fund was established by the state in 2004 as a fund of funds – a pot of money that would invest in venture capital firms that were investing in Michigan companies themselves. The fund, managed by third party Credit Suisse, launched with $90 million raised through capital markets backed by tax vouchers, and just finished a second round of funding at $120 million.

Michigan’s 21\textsuperscript{st} Century Program was funded in 2006 with tobacco settlement money and supports the state’s entrepreneurial infrastructure – the activities of EDOs, entrepreneurial organizations and the Michigan Venture Capital Association. The 21\textsuperscript{st} Century Fund is also a fund of funds that is investing $100 million into VC firms. These funds of funds are additional leverage to an existing Michigan law that allows 7 percent of public pension funds to be directed to private venture capital investments. These entrepreneurial support activities have left a distinct mark on the state’s VC environment. Today, Michigan claims 26 VC offices and over 80 venture-backed companies.

\textbf{Debt Financing}

Debt financing requires guaranteed repayment of credit plus interest. Debt includes loans, in which a borrower works with a single lender, and bonds, in which the debt is distributed among many lenders.

The majority of debt financing comes from loans. Loans can help a manufacturer meet both its short- and long-term financing needs. Short-term loans are used for working capital needs (e.g., purchasing inventory, payroll, and accounts payable). Short-term loans are sometimes secured by collateral, inventory or other short-term assets, although

\begin{itemize}
\end{itemize}
they can also be unsecured if the borrower has insufficient collateral but can demonstrate creditworthiness otherwise.

Long-term loans, on the other hand, must be secured and are used to fund facilities and capital purchases. In addition to collateral, other borrower attributes that lenders look for include credit history, cash flow coverage, character, financial statements, and financial projections.

Bonds are debt instruments used by firms and governments to raise long-term capital. Bonds are sold at a discount off face value, with the difference making up the interest rate. Bondholders receive an interest payment twice a year (called a coupon) and the principal when the bond matures, typically 10 to 40 years.

Commercial banks have traditionally been the primary lender to small businesses, especially for short-term loans. Commercial finance companies, which are less regulated than banks, can accommodate riskier loans but also tend to charge higher interest rates. The federal government also offers significant aid through the loan guarantee programs of the U.S. Small Business Administration. State and local governments and EDOs can provide a slate of debt instruments, including some highly creative ways to address financing gaps, but these programs do not cover the majority of financing needs in manufacturing. However, with the stress placed on many manufacturers by the Great Recession, there are a number of governmental efforts (at all levels) to address manufacturers’ financing challenges.

**Public Sources of Debt**

**U.S. Small Business Administration (SBA)**

The U.S. Small Business Administration operates a number of loan guarantee programs. Loan guarantees are designed to increase private lending by mitigating the risk to private lenders. By doing so, these programs allow private lenders to extend loans when they otherwise would not be willing to incur the risk, thereby allowing manufacturers to access debt capital. SBA loan applications are filed through participating private lenders, or SBA-designated Certified Development Companies (CDCs), which assist borrowers with the dual loan package.

The SBA provides financing through two central programs:

- **7(a)** is SBA’s most popular loan guarantee program. 7a loans can be used to address operating or expansion capital needs.
- **504** loan guarantees tend to be used for long-term loans needed to finance business expansion (e.g., real estate purchases, building construction, major equipment purchases) for small businesses that are retaining or creating jobs.

Assisting small manufacturers is explicitly identified as one of the community development goals of the 504 program. To that end, SBA has adjusted some of the program requirements to make it easier for manufacturing firms to qualify. These adjustments include:

- **Relaxed job creation requirements:** 504 loans usually carry a cap of $50,000 per job created. This limit is increased to $100,000 per job for manufacturing firms.
• **Increased maximum loan size:** Small manufacturers may access $5.5 million in 504 guarantees, instead of the $5 million maximum for non-manufacturing firms.

• **Maximum is applied per project instead of per company:** In the most significant adjustment, SBA considers loan maximums for manufacturing firms on a per-project basis. For non-manufacturing companies, the $5 million cap applies to all projects, but manufacturers can access up to $5.5 million in loan guarantees for each project that needs financing.

SBA loan guarantees also support the lending activities of Small Business Investment Companies (SBICs). SBICs are SBA-designated private investment firms that manage their own funds as well as funds obtained through SBA guaranties. SBICs offer higher-risk debt funding as well as equity financing packages. Most SBIC financing goes toward operating capital and acquisition capital.

**State and Local Public Sources of Debt Financing**

**Direct Lending**

EDOs can set up direct lending programs to offer gap financing in the absence of private financing or to leverage private funds. A direct loan program can be funded by a variety of resources, such as federal/state grants, tax revenues, bonds, and public pension funds. Direct lending programs by EDOs include revolving loan funds and microloan programs.

Revolving loan funds (RLFs) are pooled monies used to provide low-interest loans that are eventually repaid to the fund for new loans. RLFs receive funding from both public and private sources, including the Economic Development Administration, the U.S. Department of Agriculture, state governments, economic development organizations, and more. RLF loans are usually used for long-term expansion needs.

Microloan programs offer very small, typically short-term loans to start ups or high-risk small business borrowers. Many microloan funds provide up to $50,000 for each loan and typically target disadvantaged groups such as minorities and women.
PRACTITIONER TIPS FOR OPERATING PUBLIC BUSINESS LOAN FUNDS

1. Create a clearly stated mission and purpose for the loan fund program, including methods for linking investments with regional and local economic development strategies and priorities.

2. Establish professional relationships and partnerships with regional and local banks and other lending institutions.

3. Set up and maintain a knowledgeable and active business loan fund committee to assist in marketing, business development, application review and due diligence, and program oversight and accountability. This includes tapping into networks of retired and active bankers, economic developers and other business experts from the region.

4. Avoid relying on the organization’s policy board of local elected officials as the business loan fund committee.

5. Maintain a professional loan fund staff with the experience, background and skills required to operate a successful business loan fund. If necessary, establish partnerships with another organization to assist with back office, accounting, credit analysis, deal packaging, marketing or other operational support.

6. Require a single-purpose, independent audit of loan funds by an outside auditor on an annual basis.

7. Engage in peer reviews with other public business loan fund operators and intermediaries across the nation or within a multi-state region to explore trends, noteworthy practices and program innovations.

8. Pursue opportunities to diversify your portfolio of business lending and technical assistance tools and services, including potential partnerships and opportunities with nontraditional lending and investment resources.

Reprinted from “Public Sector Business Loan Funds,” a joint report of the National Association of Development Organizations and the Development District Association of Appalachia
Catalyst Connection is a nonprofit manufacturing consulting group serving manufacturers in southwestern Pennsylvania. In addition to providing strategy consulting services, Catalyst Connection operates several direct loan funds that help manufacturers secure working capital or upgrade equipment and technology. The Manufacturing Growth Cooperative Fund is a partnership between Catalyst Connection and Bridgeway Capital, a nonprofit lender, and provides working capital loans of $35,000 to $250,000. The Manufacturing Technology Loan Fund is Catalyst Connection’s private fund that makes loans of up to $200,000 to help manufacturers make technology upgrades. Manufacturers can also apply for a Pollution Prevention Assistance loan for up to $100,000 to purchase equipment and make process changes that reduce energy consumption or waste production.

**Loan Guarantees**

Although loan guarantees can cover up to 100 percent of a loan, they usually insure at about 25 percent. Because guaranteed loans carry less risk to private lenders, they often make it possible to secure financing when private lenders would be otherwise unwilling.

Loan guarantees are a relatively low-cost, high-impact financing tool that has been widely implemented on the federal level, but with mixed results on the state level. Five policy “levers” can be adjusted to design an effective guarantee program:

- **Targeting policy:** Defines the types of firms and projects that are eligible to receive a guarantee. This is shaped by the issuing organization’s economic development goals, the specific gaps in capital availability and program scale.
  1. A guarantee program intended to retain or help manufacturers expand may focus on financing needs for real estate or equipment/technology upgrades. An effective program should not duplicate areas already served by existing guarantee programs, such as SBA loans.
  2. With this in mind, there are some critical gaps that SBA loans do not address, such as small loans, firms with specialized collateral, firms in emerging and risky industries, and real estate projects in weak markets.
  3. The guarantee program should have a scope wide enough to elicit lender interest and participation, and have enough funds to cover any possible losses over the short term.

- **Financing policy:** Defines guarantee terms such as the risks covered, the loss coverage provided, maturity period, and fees.
- **How the guarantee is secured:** Defines how the guarantor will meet its obligations. There are three forms of guarantee security:
  1. General obligation pledge: Issued on credit based on the strong financial standing of the guarantor (how SBA loans are issued).

---

In the wake of the Great Recession, many manufacturers struggle to find the collateral needed to secure financing. As the recession depressed demand for manufactured goods worldwide, many lending institutions have down-valued industrial equipment and facilities, two of the chief sources of collateral for manufacturers. As a result, manufacturers who are otherwise ready to expand operations as demand returns cannot provide sufficient collateral to secure expansion financing.

To address this challenge, the U.S. Treasury launched the State Small Business Credit Initiative. This grant program is distributing $1.5 billion to states and municipalities to support credit access for small businesses. The grants can be used to fund collateral support programs, capital access programs and loan guarantee programs. States and municipalities must demonstrate that they will leverage $1 of new private investment for each dollar of public investment. For an example of how states are using these funds, see the case study on the Michigan Business Growth Fund.

Capital Access Programs (CAP)
A capital access program is a partnership between a lender and an economic development organization (typically a state) in which each party contributes a percentage of a loan into a reserve fund held at the lender’s bank. This encourages private lenders to lend more freely, since some of the risk is insured by the EDO’s contribution. States have used CAPs since 1986, when Michigan first implemented it, and the program is growing in popularity due to its efficiency and the funding support of the U.S. Treasury (see box on Small Business Credit Initiative.)

Resource Spotlight: State Small Business Credit Initiative
In the wake of the Great Recession, many manufacturers struggle to find the collateral needed to secure financing. As the recession depressed demand for manufactured goods worldwide, many lending institutions have down-valued industrial equipment and facilities, two of the chief sources of collateral for manufacturers. As a result, manufacturers who are otherwise ready to expand operations as demand returns cannot provide sufficient collateral to secure expansion financing.

To address this challenge, the U.S. Treasury launched the State Small Business Credit Initiative. This grant program is distributing $1.5 billion to states and municipalities to support credit access for small businesses. The grants can be used to fund collateral support programs, capital access programs and loan guarantee programs. States and municipalities must demonstrate that they will leverage $1 of new private investment for each dollar of public investment. For an example of how states are using these funds, see the case study on the Michigan Business Growth Fund.

Community Development Financial Institutions (CDFI)
Community development financial institutions (CDFIs) are certified by the U.S. Department of the Treasury and funded through the Treasury’s CDFI Fund. CDFIs are private, non-
governmental financial institutions that focus on community development in distressed urban or rural areas, or that emphasize women- and minority-owned businesses.

Institutionally, CDFIs can take a number of forms (e.g., banks, credit unions, non-profit organizations, and venture capital firms). The public investment allows CDFIs to make debt and equity investments in businesses and to leverage private dollars as well. Businesses that receive an investment also are given technical assistance. The CDFI designation grants special tax credits to participating institutions.

CDFIs most commonly take the model of a community development loan fund (CDLF). CDLFs are unregulated financial organizations (unless they are banks or credit unions) that typically provide funding to businesses, developers and other nonprofit organizations. CDLFs are similar to revolving loan funds in that they provide gap financing in the form of loans and use repayments to fund operating costs. However, RLFs are managed by governments, while CDLFs are nonprofit entities using borrowed money or federal grant funding. A CDLF’s nonprofit status allows it to be a funnel for a variety of social investors interested in economic development. Individuals, religious organizations, foundations and financial institutions all lend money to CDLFs, in addition to CDFI funds from the Treasury.

This reliance on borrowed funds means that CDLFs must perform better than RLFs in order to pay off lenders. This affects the structure of CDLFs in a number of ways:

- **Greater assets:** They must be large enough to cover expected losses and interest payments to investors. On average, CDLFs must have 60 percent more assets than grant-funded institutions such as RLFs.

  - **Medium-risk:** CDLFs are medium-risk, medium-term lenders. CDLFs handle more risk than banks, but not as much as RLFs.
  
  - **Larger scale:** CDLFs draw from a variety of funding sources and thus can operate on a larger scale than RLFs, which are limited to government grants.
  
  - **More flexible:** CDLFs are much more nimble than community development banks and credit unions because they do not need to engage in costly activities required to obtain a federal banking charter and are not subject to regulatory measures as banks.

The Cascadia Loan Fund is a CDFI that specializes in small business lending. The fund targets small businesses in Washington and Oregon that have difficulty securing traditional bank financing. The fund is financed through individual donations and investments, with operating costs covered by loan interest and fees. Businesses can use the loans to cover qualified expenses such as equipment and inventory purchases, working capital, building expenses, and debt refinancing. The fund is highly successful (less than a 1 percent default rate) because it offers ongoing technical assistance to borrowers.

---

116 Ibid.
GUIDING PRINCIPLES FOR ENERGY EFFICIENCY FUNDING PROGRAMS

The National Renewable Energy Laboratory recommends no single tax policy or funding program for all states and markets. However, it does provide some core guiding principles for energy efficiency funding programs:

**Match Tools to Available Resources:** The financing tools need to reflect available financial and administrative resources, the administrative complexity of the tool, and the skills of fund personnel internal to the program. For example, if program funding is limited or not recurring, an extensive set of rebates might not be appropriate. Loan programs can be effectively administered only if the fund has the underwriting and administrative capabilities or is willing to contract program administration to a private company.

**Use Tools to Fill Financing Gaps:** If the goal of the program is to leverage private dollars, then financing tools could be targeted to mitigate credit and technology risks that the private sector is unable or unwilling to fill. For many projects, access to long-term financing could be more valuable than direct subsidies.

**Align Tools with Program Goals:** If the primary goal is to maximize greenhouse gas emission reductions per dollar invested, then credit enhancement tools (e.g., loan guarantees and interest rate buy-downs) could be more effective than direct incentives because of the manner in which they leverage private capital markets. If the goal is to maximize near-term energy savings, then broad energy efficiency incentives could be preferable to renewable energy support. Note that programs can have multiple goals and that optimizing design for certain goals can subordinate others, so program design will need to reflect overall priorities.

**Loan Programs Preserve Program Capital:** Loan and credit enhancement programs reduce dependency on recurrent funding and can provide critical financing at favorable terms, particularly in an environment in which private lenders are reluctant to underwrite energy efficiency projects.

**No Financing Tools Achieve All Program Goals:** Each financing tool has limitations. These limitations prevent programs from optimizing on all goals—greenhouse gas reductions, energy savings, financial leverage, job creation, market transformation, and others. Those designing and evaluating programs need to recognize these trade-offs. Energy efficiency program managers seeking to achieve multiple goals might want to consider offering a portfolio of tools.

Energy Efficiency
A rising number of states are providing loans, subsidies or tax credits to help manufacturers achieve more energy-efficient operations. The funds can be used for upgrades to existing equipment or for purchasing new equipment as part of an expansion. The Alliance to Save Energy maintains an online database of energy efficiency programs that offer both debt and equity financing opportunities (refer to www.ase.org). The Database of State Incentives for Renewables and Efficiency (DSIRE) operates a comprehensive database of both renewable energy and energy efficiency incentives (refer to www.dsire.org).

States offers several types of energy efficiency programs and tax policies that can provide financing for manufacturers: rebates, grants, loans, income tax deductions, and exemptions or reductions on sales tax charged on eligible expenses. Many state programs are administered through energy offices and departments of revenue. For example, the Oregon Energy Office operates the State Energy Loan Program, a direct loan program focused on energy-efficient improvements by commercial, industrial and government clients. The program has made $420 million in energy efficiency and renewable energy loans since its inception in 1980. It is financed by tax-exempt bonds backed by the state of Oregon. The Energy Office aptly administers the loans since it also has expertise in energy efficiency technologies.

Bond Financing
Bond financing allows a community to finance large, expensive projects by paying back the debt over time. Public-use bonds are issued for public infrastructure projects (such as schools, highways and parks) that benefit the community but that may not generate revenue themselves. Although public-use bonds may have relatively low interest rates, the bonds are exempt from federal income taxes and have very low risk of default.

General obligation (GO) bonds are a type of public-use bond backed by the full faith and credit of the public entity that issues them, making them particularly low-risk. GO bondholders are repaid from general revenue funds, borrowing, or any income collected on the project. Funds for GO bonds are limited and are usually built into long-term municipal budgets.

Industrial development bonds (IDBs) are the most popular form of private-use bonds. Unlike GO bonds, industrial development bondholders are repaid through the revenue generated by the financed project. IDBs can be used to finance equipment and real estate purchases, but not working capital and inventory. Buyers of bonds earn tax-exempt interest, while the proceeds from the bond sale are loaned to manufacturers at a low interest rate. While IDBs are used to finance a variety of private ventures, many of these programs are specifically targeted at manufacturing firms.

Economically Targeted Investment (ETI)
Economically targeted investment refers to investment portfolios that “generate specific social, economic and environmental benefits along with the necessary financial returns” (Croft 2011). ETI is also referred to as “responsible investment” or “triple bottom line investment.” Instead of seeking only to maximize financial return for investors, ETI is explicitly geared to generate economic activity that benefits the broader community.
ETI comes in many different forms, depending on the specific objectives of the investment strategy. That said, most ETI is designed to achieve three interrelated objectives:

- **Rate of return**: ETI must still generate return on investment for fund participants.
- **Fill capital gaps**: ETI funds often target specific sectors (such as manufacturing or housing) and seek to fill capital gaps that limit growth in those sectors.
- **Create collateral benefits**: ETI is often used to generate broader social, economic, and environmental benefits. Goals may include:
  - Increasing the availability of affordable housing
  - Supporting small and medium-sized enterprises
  - Community revitalization
  - Rural economic development
  - Growth of underserved markets (including emerging and developing country markets)
  - Growth in non-traditional industries (such as renewable energy)

For example, the Union Labor Life Insurance Company (ULLICO), one of the largest insurers and investment managers focused on the unionized marketplace in the U.S., operates a program called “J is for Jobs” that targets investments in “worker-friendly, job-producing construction projects and industries.” These investments are often targeted at manufacturing projects while ensuring that union workers are treated well. From 1995 to the end of third quarter 2006, the fund invested $16.1 billion in 219 projects, creating a total of 162,000 jobs. See the case studies chapter for details.

**Action Steps for Creating Public Lending Programs**

Public lending programs have been in place for quite some time, but they must evolve as industries and financing evolve. EDOs should conduct due diligence on existing and potential programs to ensure that they match the greatest needs of the business community and are not duplicative.

**Explore the Need for Public Assistance**

EDOs should establish relationships with private lenders, local developers and businesses to assess the private lending sources that are in place and determine where the gaps are. Bringing together state and local governments with these groups will help open up communication and solidify understanding about businesses’ needs, as well as the availability of public resources. EDOs can also survey businesses to determine what types of financing needs linger in order to craft a targeted program.

**Identify the Appropriate Program for the Need**

EDOs should identify what their objectives are, whether they are assisting startups, small businesses, or mature firms with working or expansion capital. In addition, EDOs may want to craft programs that promote additional economic development goals, such as sustainability. EDOs should also keep in mind what programs they can reasonably implement with the available resources. Loan guarantees, for example, allow the lender more liquidity than do direct loans.
Assess the Efficacy of Public Programs
EDOs should do a regular review of existing programs to make sure resources are being used in the most effective way possible. Interviewing past clients will reveal not only the gaps that linger, but success stories that can support the case for renewing or increasing the program’s funding. For new programs, EDOs can contact other organizations for their experience, as well as study the cases presented in this report.

Simplify Applications and Provide Assistance
The application processes for public programs can be daunting. EDOs should strongly consider offering technical assistance with applications, especially for municipal and state programs. For example, the Economic Development Corporation of Oxnard (EDCO), in California, offers assistance with applications to the local industrial development revenue bond program. However, many firms still did not apply for IDR Bs because the application process was complex and time-consuming. Despite this obstacle, interest in IDR Bs began to rise after the recession. Many companies were reducing expenses and stockpiling cash in response to reduced demand. These cash-rich companies were now more willing to wait on cheaper sources of financing that may require a longer application process. The EDCO bonds are issued through a local authority, which typically is able to respond to local companies more quickly than state bond authorities. EDCO capitalized on this relationship by helping manufacturers navigate the forms to secure the bond financing they needed.

Private Sources of Debt

Commercial Banks
Commercial banks are the primary source of private debt financing for small businesses. Although they may be more conservative than other lenders, they are the go-to for short-term loans. Commercial banks value the likelihood of a company being profitable and consider collateral secondarily. Because of this preference, they tend to finance more established businesses. They evaluate businesses on the basis of:

- **Management ability:** Banks review the qualifications of senior management and also may conduct interviews.
- **Repayment ability:** A firm’s ability to repay a loan is reflected in its cash flow. Banks evaluate a number of ratios based on a firm’s income statement.
- **Collateral:** Banks typically look for a one-to-one ratio of loan dollars to collateral value.
- **Equity:** Firms are hardly ever financed by debt alone. A critical mass of equity investment is an indicator that a venture is likely to make a profit. The ratio of debt to equity is known as the debt-to-worth ratio. The required debt-to-worth ratio varies depending on the sector and company in question.

Commercial Finance Companies
Commercial finance companies are more aggressive than commercial banks, but also may charge higher interest rates. They highly value collateral – equipment, inventory, and accounts receivable. Commercial finance companies typically make loans that support inventory or equipment purchases and can craft more flexible loan terms than commercial banks.
**Action Steps for Supporting Private Lending**

**Educate Lenders on the Needs of the Manufacturing Industry**

Banks that do not have extensive experience working with manufacturers often are not familiar with the capital requirements and production timelines for such firms. To address this, the University of Tennessee Center for Industrial Services (CIS) provided training to Pathway Lending, a CDFI focused on supporting businesses in low- and middle-income communities in Tennessee. Pathway Lending administers a $50 million energy efficiency loan program created by the state of Tennessee, the U.S. Department of Energy, the U.S. Economic Development Administration, Pinnacle Financial Partners and the Tennessee Valley Authority. CIS trained Pathway Lending staff on energy efficiency technologies and associated costs, which helped guide Pathway lenders in administering the loans. CIS also conducted energy audits as part of due diligence on the loans.

Although CIS had general manufacturing know-how and existing relationships with manufacturers, it lacked in-house expertise on renewable energy technologies. CIS’s Sustainability Team then hired an engineer, who in turn worked with the Tennessee Solar Institute and Tennessee Tech University faculty. The Tennessee Solar Institute is a partnership on solar energy technologies, policy and economic development between the University of Tennessee and Oak Ridge National Laboratory. Having these players at the table helped CIS provide technical assistance to manufacturers on energy efficiency improvements and make more informed recommendations on how Pathway’s energy efficiency loans should be structured.

**Guaranteeing Loans in an Environment of Caution**

Many companies, especially in nascent industries such as renewable energy, found their private loans (and corresponding expansion plans) stalled by the recession. In many cases, loan guarantees from the SBA and state governments provided the critical push needed to secure the loan. EDOs should follow several best practices for operating loan guarantee programs:\(^{117}\):

- **Ensure widespread lender participation:** This is critical to building a solid base of creditors and developing a large enough portfolio to reduce risks. Economic developers can engage lenders early on in the process of forming the program, and once the guarantee program is established, market heavily to lenders, firms and business assistance organizations.

- **Establish confidence in the guarantee’s quality:** A cash reserve fund helps to establish creditworthiness. In addition, the guarantor can set program limits low early on and expand them as it develops a good track record.

- **Minimize incentives for bad loans and insufficient monitoring:** In this case, the SBA 7(a) program is a good model. It limits the percentage of the loan guaranteed so that the lender has incentive to conduct due diligence. Also, programs should set market-rate fees that reflect expected losses, and differentiate fees according to a loan’s level of risk. This helps to ensure that only

\(^{117}\) Ibid.
the firms that cannot independently secure private loans will apply for a loan guarantee.

- **Streamline the process**: The SBA helps minimize paperwork by reusing the lender’s underwriting and monitoring reviews. Established programs can simply the process further by delegating the authority to grant guarantees to select lenders.

**Grants and Tax Credits**

Grants and tax credits are a priority source of financing because they are essentially “free money.” Grant programs such as the federal Small Business Innovation Research program can provide a significant funding boost if companies are willing to put in time navigating the application process. Companies with taxable income can reduce their tax burden significantly for qualified expenses in any given year, and in some cases, the tax credits can be applied retroactively. More and more states are promoting sustainability by offering energy efficiency tax credits to manufacturers that make energy-efficient improvements to their operations. Research and development tax credits help to advance the technological capacity (and thus the competitiveness) of businesses. Some grants, such as those through business competitions, target the most promising ventures, while other programs, such as enterprise and empowerment zones, focus on business development in underserved localities. This financing category is broad and reflects the ingenuity of economic developers in addressing a variety of financing challenges.

**Federal Sources of Grants and Tax Credits**

**Small Business Innovation Research/Small Business Technology Transfer Grants**

Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) are programs of the Small Business Administration in which federal agencies with large research and development budgets set aside a portion of this money for competitive grants to businesses with 500 or fewer employees. SBIR and STTR have significant financing implications on two fronts: first, they provide sizable funds that are crucial to the expansion plans of high-tech manufacturers, and second, the robust SBIR/STTR selection process is a signal to private investors on what investments are most worthwhile.

Each year, federal agencies solicit research projects that address a non-negotiable list of technical topics, depending on the agency’s current interests. Solicitations in recent years have included cutting-edge technologies in energy efficiency, biofuels, and nanotechnology, among others. SBIR/STTR grants target innovative research that may be too risky for traditional sources of financing. In contrast to SBIR, STTR projects must have at least 30 percent collaboration between the business and a nonprofit research institution.

Eleven federal agencies currently participate in SBIR or STTR. Each agency sets aside 2.5 percent of its research budget for SBIR and 0.3 percent for STTR. Projects are divided into Phase I and Phase II for funding eligibility. Phase I projects explore the feasibility of the technology with grants of up to $150,000 for SBIR and $100,000 for
STTR, depending on the agency. Phase II awards are only eligible for Phase I winners and help further develop the technology over a two-year period. Phase II awards range up to $1 million for SBIR and $750,000 for STTR.

Technology Innovation Program (TIP) Grants
The Technology Innovation Program of the National Institutes of Standards and Technology makes competitive grants into high-risk, high-reward research efforts of national interest. Example priorities include advanced robotics, intelligent automation, civil infrastructure, energy, healthcare, and manufacturing. Solicitation topics are adjusted each year to reflect federal priorities. The FY 2011 bill allotted $44.8 million for ongoing TIP-funded projects, with no additional funding for new projects.

Research and Development Tax Credits
Businesses can claim the federal research and development (R&D) tax credit for any investment that improves processes, products, performance, reliability, quality or costs. The R&D tax credit policy was revised in 2003 to encompass a wide range of qualified R&D expenses. Assessing the costs that qualify and applying for the tax credit can be a convoluted process, but there are number of organizations that can assist with the process. Trade associations such as the Society of the Plastics Industry may be familiar with the types of industry-specific R&D activities that qualify. Accounting firms also may have R&D tax credit specialists on staff.

The R&D tax credit was instituted in 1981 and has been renewed 14 times since then. The R&D Tax Credit Coalition is a lobbying group that supports and provides regular updates on relevant legislation (refer to www.investinamericasfuture.org).

Energy Efficiency Tax Deductions
A federal tax deduction of $1.80 per square foot is available to commercial buildings that reduce energy consumption. Buildings that do not qualify can apply for a separate $0.60 per square foot deduction for energy improvements on building structures, lighting and heating or cooling systems. A tax deduction is a reduction in adjusted gross income, whereas a tax credit is a direct reduction in the amount of tax paid. In this sense, a tax credit is worth more than a tax deduction.

Applicants must use Department of Energy software to calculate the energy and power savings (refer to http://www1.eere.energy.gov/buildings/qualified_software.html).

Enterprise and Empowerment Zones (EZs)
Empowerment zones are federally designated blighted neighborhoods with special incentives for redevelopment. Incentives for EZs can include federal contracting opportunities, income tax credits, job creation tax credits, and sales and use tax exclusions. Many states also offer direct loans, property tax relief, investment tax credit, tax increment financing, and improvements on state infrastructure in connection with EZs.

State and Local Grants and Tax Credits
Research and Development Tax Credits
State R&D tax credits are modeled after federal R&D tax credits, with the exception that companies must calculate their how much R&D they do within a particular state, as well as their state income taxes. Some states,
such as Pennsylvania, New Jersey and North Dakota, allow the credits to be transferred between firms. The tax credits can be differentiated according to industry, size of business, and geography, depending on the state's economic development objectives.

**Energy Efficiency Grants and Tax Credits**
State and local energy efficiency grants and tax credits are among the fastest-growing incentives across the nation. See the energy efficiency description in the Public Debt Financing Section for more information.

**Tax Increment Financing (TIF)**
Tax increment financing uses future gains on property taxes from a proposed real estate project to help fund the project in present time. For example, Oklahoma City created a TIF district for construction of Devon Energy’s new headquarters building downtown. Of the TIF funding created, $115 million was directed to Project 180, a massive public improvement project to renovate downtown streets, parks, sidewalks and plazas.

**Property Tax Abatements**
Similar to TIF, property tax abatements freeze the tax value of a site under development according to its pre-developed value, or assess the new development at a discount.

**Freeport Exemptions**
Some states allow property tax exemptions on inventory that is temporarily stored in the state. The exemption may apply to raw materials, intermediary goods, or finished goods that are exported out of the state within a specified time period (such as 12 months).

**Tax Credits for Jobs or Investment**
Many states offer a tax credit for new jobs or retained jobs, as well as qualified investment. Tax credits for jobs may be based on number of jobs or wages. For example, Oklahoma’s Quality Jobs Tax Credit provides cash payments of up to 5 percent of new payroll for up to 10 years. Companies must pay an average wage greater than the county average. The tax credit qualifies for firms in manufacturing, R&D related to manufacturing, corporate services and data centers, and can be combined with Oklahoma’s other job/investment tax credits.

**Utilize Expertise of MEPs, and SBDCs**
While EDOs may be familiar with state and local incentives, Small Business Development Centers (SBDCs) and Manufacturing Extension Partnerships often have more experience working directly with businesses on a variety of financing fronts. Small businesses typically need more help identifying and securing financing, and SBDCs can fill this gap. SBDCs have particular knowledge of SBA programs and can provide assistance with SBA loan applications. Manufacturing Extension Partnerships (MEPs) understand the financing requirements of manufacturing industries and can provide advisory services to manufacturers for various types of financing.

**Competitions as a Source of Grants**
Business plan competitions typically focus on breakthrough technologies, with many geared toward postsecondary students. Many major research universities have business plan competitions that judge entries for both technological novelty and
entrepreneurial skill. However, some competitions, such as the St. Louis Regional Business Plan Competition (organized by the St. Louis County Economic Council), target all new and early-stage private companies (refer to http://www.slcec.com/business-plan-competition.html).

BizPlanCompetitions.com operates a calendar of business plan competitions across the nation (refer to http://www.bizplancompetitions.com/).

For a more in-depth look at a business plan competition, see the case study on the CleanTech Open.

**Internal Financing**

Manufacturers that practice efficient internal cash management will discover sources of funding right under their noses. This involves leveraging existing relationships with vendors, suppliers and customers to improve internal cash flow. A more efficient cash flow may reduce the need to secure outside financing, or if outside financing is needed, it can help a company secure more desirable terms.

**Account Management Practices**

Cash flow statements supplement income statements and balance sheets by also recording future projected incoming and outgoing cash. Companies should use accounting practices that accurately measure the company’s present and future financial situation.

**Vendor/Supplier Financing**

Vendors and suppliers often provide “prompt-pay” discounts for companies that pay early and charge interest for late payments. Depending on the discount and market interest rates, a company may even want to borrow money to take advantage of this option. Some vendors may also negotiate an extension of the payment deadline. Companies can take advantage of these options to support their cash flow needs.

**Customer Financing**

Companies can sometimes secure advance payments from customers to help support preparation costs. Special orders often require a deposit to cover any of the company’s sunk costs in case the customer does not pay.

**Inventory Financing**

Inventory financing is a bank line of credit secured by inventory as collateral. Lenders typically discount retail inventory at an average of 60-80 percent and component parts at 30 percent. The devaluing of collateral due to the recession has made inventory financing more difficult (see text box on the Small Business Credit Initiative).

**Factoring Accounts Receivable**

Factoring is the sale of accounts receivable so that a company receives a one-time cash infusion while another entity assumes responsibility for collecting payment. Factoring can be done two ways. With recourse factoring, the company still maintains responsibility for non-paying accounts. With non-recourse factoring, a factor examines the company’s customers for creditworthiness and assumes responsibility for bad debts. The factor charges a corresponding fee and pays the company a discount on the invoice.

**Export Credit Insurance**

Export credit insurance protects an exporter’s foreign accounts receivable
against nonpayment. This can help a company secure other loans by using the accounts receivable as collateral. Export credit insurance is offered by the Ex-Im Bank and commercial risk insurance companies.

**Renting/Leasing Equipment**
Renting or leasing equipment is advantageous for companies with limited capital or a need to frequently update equipment. Although companies can deduct equipment depreciation from their taxes, leasing equipment may provide tax benefits that outweigh depreciation. For more information on internal financing mechanisms, see NIST’s “Quick Reference Guide to Growth Financing” (see [http://www.nist.gov/mep/upload/Finance-Guide-05-11-11a.pdf](http://www.nist.gov/mep/upload/Finance-Guide-05-11-11a.pdf)).

---

CHAPTER 7
Lessons Learned

This chapter summarizes some of the key lessons learned through this project.

Grow from Within

It is often cheaper to save a manufacturing job than to attract one. Particularly with tight public budgets and so many manufacturing firms and workers struggling to emerge from the recession, supporting existing manufacturers is often a better use of resources that chasing after the next attraction deal.

Economic developers can literally save manufacturing companies from heading offshore or into bankruptcy. This report has highlighted several cases in which business retention strategies retained livelihoods that otherwise would have been lost. Economic developers can play an indispensible role by simply connecting firms in need with available resources. Often, EDOs need to lead the way in mapping and coordinating the resources available to help troubled firms stabilize and rebound. Business retention may not bring the same kinds of headlines as a large attraction deal, but the work often is of greater value to the community over the long-haul.

This report also reviewed a range of economic development functions that are critical to helping manufacturing firms grow and expand. Paradoxically, the small and medium-sized manufacturers that often represent the best opportunity for manufacturing job growth also are likely to need the most economic development assistance. As part of a robust business retention and expansion program, it is essential to support small and medium-sized manufacturers both when they run into trouble and when they are looking to expand.

Retention efforts are often the most effective when focused on these smaller manufacturers. Large, international manufacturers make location decisions at corporate headquarters, so it is much easier for local economic developers to access the decision-makers at a local firm. Small and medium-sized firms also tend to operate on thinner margins or are more concentrated in specific industrial sectors, making them more vulnerable to macro-economic changes. Finally, small and medium-sized firms often have the most to gain from business, financial, or production technical assistance.

Small and medium-sized manufacturers also need help overcoming hurdles to diversifying, expanding, or exploiting new markets. Economic development efforts have successfully helped small and medium-sized companies to secure financing, develop new supply chain relationships, commercialize new technologies, access foreign markets, and find new workers.

Key recommendations to strengthen and grow existing manufacturers include:
• Build systems to identify firms that are in danger of relocating or major downsizing.
• Identify existing capacity to assist troubled firms and where capacity is lacking.
• Pay particular attention to the challenges to, opportunities for, and needs of small and medium-sized manufacturers.
• Assist manufacturers, particularly small and medium-sized firms, with navigating government procurement opportunities and requirements.
• Connect manufacturers to resources available to help them to improve their business and financial models.
• Connect manufacturers to resources available to help them to improve their innovation capacity.
• Connect manufacturers to resources available to help them to develop new markets, such as through exporting.
• Foster networks between manufacturing firms to strengthen supply chain relationships, enhance innovation, and exploit new market opportunities.

In the research and interviews done for this project, concerns about the future of the manufacturing workforce emerged again and again. Site selectors, business leaders, manufacturing managers, and economic developers saw no future for manufacturing without a skilled and constantly improving labor force. From the lab to the shop floor, modern manufacturing demands a level of skill and training that was virtually unheard of a few decades ago.

Unfortunately, the workforce development and economic development systems in the United States are far from perfectly aligned. Driven by different incentives, funding streams and professional backgrounds, economic and workforce development professionals often talk past one another or worse, don’t talk at all. Happily, there are many signs that this is changing.

Often at the prompting of manufacturers themselves, economic developers are taking a more active role in addressing workforce issues. Economic developers are stepping in to coordinate between manufacturing firms and training programs, helping ensure that workers receive the training that the labor market demands. More and more attraction deals devote funds to training programs or research institutions. Economic developers have used workforce data to lure new manufacturers to replace those that had left. Economic development organizations are working on graduation initiatives and introducing young people to opportunities in manufacturing. All of these signs point to a growing realization that higher-skilled workers are essential to economic prosperity.

Workforce Development is Vital

When it comes to manufacturing, economic and workforce development are increasingly bound together. Manufacturers in developed countries cannot compete on wage rates, and surviving on productivity and innovation requires skilled workers. Even in developing countries, the skill requirements for manufacturing are on the rise. Staying on the cutting edge makes continual learning the norm for both companies and employees, a reality that raises a host of new challenges.
Specific steps that economic developers can take to ensure that manufacturers' workforce needs are met include:

- Rigorously assess existing workforce strengths and weaknesses.
- Assess emerging workforce needs.
- Collect and publicize rigorous data on existing workforce strengths and weaknesses.
- Track workforce needs as part of business retention and expansion efforts.
- Regularly convene manufacturers and workforce training providers to ensure that course offerings meet the needs of local employers.
- Perform dislocated worker surveys when needed.
- Stay up-to-date on existing workforce training capacity and identify critical areas for improvement.
- Develop internship and apprenticeship opportunities.
- Advocate for adequate support of workforce training.

**Invest in Innovation**

One of the most fundamental transformations in the manufacturing sector discussed in this report is the accelerating pace of technological innovation. Localities that cannot compete on the price of labor can work to do so on the basis of new product offerings and productivity improvements.

This report highlights a number of ways that economic developers can help manufacturers become more innovative and productive. This does not mean that every EDO needs to start hiring manufacturing engineers and scientists, but is does mean that EDOs must play an active role in connecting manufacturers to the innovation resources that are available. For example, many manufacturers don’t have the time to develop networks within research institutions to connect to the new ideas, technologies, or practices that would help them grow. On the other hand, many researchers do not have deep networks in the business community, so they are often unaware of companies that may be interested in commercializing their work. In situations such as these, EDOs are perfectly suited to building networks that bridge the gaps between research institutions and local manufacturers.

Specific steps that economic developers can take to improve the capacity of local manufacturers to innovate include:

- Assess innovation assets and needs of local manufacturers.
- Help manufacturers leverage the research and development being conducted at publically funded research institutions.
- Create innovation networks that help manufacturers collaborate on research and innovation.
- Establish collaborative research and development centers to pool resources and talent\(^{119}\).
- Explore global supply chain partnerships that can accelerate the innovation capacity of local firms.

\(^{119}\) DI Intelligence, “fDi Markets: Crossborder Investment Monitor.”
Invest in Sustainability

The importance of sustainable manufacturing practices has become much more pronounced in the past several years, a trend that many predict will only continue. On the demand side, more and more customers base their purchasing decisions on the sustainability of the products they buy. As this continues, manufacturers that cannot deliver sustainable products will be at an increasing disadvantage. Moreover, many sustainable practices (e.g., energy use management) are directly tied to cost savings. As more and more manufacturers discover ways to decrease the amount of raw materials they use, those who don’t will be at an increasing price disadvantage. Therefore, it is critical that economic developers assist manufacturers in their communities to improve the environmental performance of their operations.

- Identify firms that are at risk of falling behind, or are leading the development of sustainability practices in their industry.
- Connect firms to resources available to help them decrease energy usage, explore more sustainable materials, decrease solid waste, and minimize water usage.
- Connect firms to training opportunities to improve the sustainability expertise of their workers.

Specific steps that economic developers can take to help manufacturers to become more sustainable include:

Conclusion

The importance of each of these issues will vary by community. Only by sustained attention to manufacturers’ needs and opportunities can economic development organizations correctly identify the key strategies and action steps that will have the greatest impact on the vitality of their communities’ manufacturers.
SECTION 3
Supplementary Materials
CHAPTER 8
Case Studies

Benjamin Franklin
Technology Partners of
Pennsylvania: Creating
Networks to Grow
Advanced Manufacturing

The Benjamin Franklin Technology Partners (BFTP) program is designed to accelerate technology development and commercialization in Pennsylvania’s high-tech economy. As manufacturing has become more high-tech and traditional manufacturing powerhouse sectors in the state struggled, BFTP has helped manufacturers in the state move into more advanced and promising markets.

BFTP delivers financing and technical assistance to entrepreneurs, start-ups, and established companies that are looking to expand into high-tech markets. The programs are intended to eliminate obstacles to starting and expanding businesses. These programs provide access to three resources that BFTP believes to be crucial to the success of any business: capital, knowledge, and networks.

An initiative of the Pennsylvania Department of Community and Economic Development, BFTP is funded primarily through the state-run Ben Franklin Technology Development Authority, though it also receives some support from the federal government and private donors. BFTP operates through four independent, nonprofit organizations, each responsible for providing services to its geographical area. The services that each provides vary depending on the economic landscape of its region (e.g., unique industry clusters, etc.).

**BFTP Collaborators**

BFTP works with companies in many different technology-related sectors, such as alternative energy, information technology, powder metals, plastics, nanotechnology, life sciences, optoelectronics, micro-electronics, robotics, advanced manufacturing, and environmental technology. The common thread is a basis in cutting-edge fields in science and technology. BFTP works with businesses at all stages of development, including individual entrepreneurs, start-up companies, and established businesses that are seeking help to expand.

In addition to working directly with firms and entrepreneurs, BFTP actively partners with economic development organizations throughout the state. EDOs at the local and regional level play a vital role in connecting individual businesses and entrepreneurs with the services that BFTP offers. In some circumstances, BFTP will collaborate with regional EDOs in creating a financing package for a business or entrepreneur. Local EDOs have also helped BFTP knit together a statewide network of firms that
are working in cutting-edge markets, a critical foundation for the technical assistance that is provided to individual firms. Thus, communication between EDOs dealing with businesses in the field and BFTP is of the utmost importance to the initiative’s success. In addition to working with EDOs and the business community, BFTP is actively engaged with investors and institutions of higher education and research.

Services
BFTP provides services through four main avenues: seed investment, business mentoring, technology commercialization services, and incubators and accelerators. Businesses and entrepreneurs can take advantage of any or all the services as needed.

Seed Investment
BFTP operates a seed investment program to provide direct financial assistance to start-up or expanding firms. Investment is made after an extensive vetting and application process designed to ensure both the soundness of the investment and the business model. The vetting process is three-fold. A company or entrepreneur, often brought to BFTP through a local or regional EDO, will submit an application. The application is then vetted by the regional manager at the appropriate BFTP regional office. If the application is deemed to have merit, it proceeds to an advisory board that determines if the application should move to the next stage of analysis or needs to be revised. If the application passes through the advisory board, it is sent to an investment committee that assesses the needs of the business (based on the application and outside research) and determines an appropriate investment plan. After each step in the process, applicants are allowed to revise and change their applications to reflect the input of evaluators.

Applicants that make it through the process and receive an initial offer of investment are eligible to receive further investment if they meet certain pre-determined development milestones. Companies that receive BFTP funding can often leverage additional private investment because many private investors know the vetting process used and see investment by BFTP as a kind of stamp of approval signifying the quality of the business and acceptable risk of the investment. BFTP-approved businesses therefore often see an increase in private investment once they make it through the vetting process.

Mentorship & Business Development Services
Of all the services that BFTP provides to businesses and individuals, mentorship programs and business development services draw the majority of the institution’s time and resources. BFTP works to bring subject and sector expertise to companies to help them both grow their businesses and attract private investment. Experts at BFTP regional offices help by providing business plan reviews, technology assessments, intellectual property counseling, marketing advice, and operations and fundraising strategies. All businesses are eligible to participate in these programs, not just those receiving investment capital from BFTP. There is an application process; however, it is far less intense than the process of applying for seed investment, and most businesses that apply are eligible to receive some sort of assistance. BFTP also provides access to its ‘Solutions Network,’ comprising over 100 professionals with
expertise in fields that could be helpful for start-up businesses. It includes professionals with experience in law, accounting, banking, insurance, and many other fields. The goal of BFTP is to match start-ups with the professionals that can be helpful in guiding the business through its unique set of challenges.

Technology Commercialization
BFTP also aids individuals and groups in technology commercialization. This assistance is given prior to the establishment of a company and can help researchers and inventors to identify, protect, and license their intellectual property. Researchers bring their innovations to BFTP, which can help chart a course for commercializing the new technology and potentially starting a business based around it.

Incubators & Accelerators
Finally, BFTP establishes and manages a number of business incubators and seed-stage accelerators throughout the state. These incubators and accelerators are free to use and available to start-ups and entrepreneurs involved with broad range of technology-based innovation. The facilities provide a wide assortment of modern technology and lab equipment, and spaces vary in size to accommodate as wide an array of uses and business sizes as possible. As with the other business services that BFTP provides, acquiring space in one of these facilities requires submitting an application and business plan, which BFTP can help to put together.

Results
BFTP has had a significant impact on the Pennsylvania economy. Since 1983, BFTP has invested in over 3,000 companies, many of which were in a nascent stage of development. The overall impact from 1989 through 2006 was an increase in gross state product of more than $17 billion\(^{120}\). The report found that since 1989, BFTP had helped add 125,827 new job-years to the Pennsylvania economy (one job year equals one year of full-time work for one employee). Between 2002-2006, the state of Pennsylvania invested $140 million in BFTP, but increased economic activity arising from BFTP’s work boosted state tax revenues by more than $517 million, a return on investment of 3.5-to-1\(^{121}\).

\(^{120}\) Pennsylvania Economy League, A Continuing Record of AchievementThe Economic Impact of Ben Franklin Technology Partners 2002-2006, 2009.

\(^{121}\) Ibid.
Great Lakes Wind Network: Supply Chain and New Market Cultivation

The Great Lakes Wind Network was created to develop the supply chain needed to launch the offshore wind industry in the upper Midwest. The effort is driven by a need to reduce the cost of producing wind power and the hope of regional leaders to capture the manufacturing jobs that are expected to come from the development of wind energy on the Great Lakes. This case study is organized into a series of steps that can be taken to assist manufacturers in identifying and exploiting new supply chain opportunities.

Step 1: Identify Supply Chain Opportunities and Needs

Ohio has several key complementary resources for wind manufacturing that otherwise would have been difficult or impossible to develop. It has a wealth of capacity in the steel and mining industries that could be retooled for wind manufacturing. The state’s location in the Great Lakes region means it also has a variety of transportation modes to suit the transport needs of bulky wind components. The proximity of the Great Lakes presented an opportunity for offshore wind development down the road. Favorable energy policy – the other crucial factor for wind manufacturers – could be developed following these existing strengths.

A supply chain analysis reveals exactly what existing capacities in the steel and mining industries could suit wind manufacturing. Figure 21 provided below is a sample listing by NAICS code for the wind turbine manufacturing supply chain122. Stars indicate current global supply bottlenecks, which includes bearings123.

Step 2: Identify Local Industry Strengths within Targeted Supply Chain

Location quotient (LQ) analysis was conducted to identify existing manufacturing strengths that could be leveraged to develop a wind industry supply chain. For example, fabricated metal manufacturing in Ohio carries an LQ of 2.21, indicating that Ohio has more than double the national average concentration in this subsector. As was identified in step 1, this sector is a critical need for windmill manufacturing, implying that many companies in Ohio may be able to move into the wind energy manufacturing market.

Step 3: Identify Specific Local Firms Within Identified NAICS Codes

Ohio’s higher concentration of bearings manufacturers indicates it has at least one strong supply chain linkage to support wind manufacturing. The Ohio Department of Development (DOD) initiated a $1.3 million joint project with the Great Lakes Wind Network (GLWN), a Cleveland-based wind advisory group, to identify Ohio companies that have the potential to supply to the wind industry.


industry. GLWN and the Ohio DOD created the Ohio Wind Supply Chain Database, which includes over 1,000 potential suppliers, for its “matchmaking” service with wind OEMs (visit http://www.ohiowind.org/PDFs/WindSupply_Brochure.pdf for more information). The database provides a comprehensive supply chain tool that sorts suppliers by 86 wind specialties and 76 component and system categories. GLWN’s GIS software provides an added layer of consideration by mapping suppliers relative to transportation modes – roads, rails and harbors.

Step 4: Facilitate Supply Chain Development

The database serves as a launching point for GLWN’s supply chain development activities. For OEMs, GLWN can address their sourcing needs with customized lists of qualified suppliers and can arrange one-on-one meetings between OEMs and promising companies. For potential suppliers, GLWN can provide a wind capabilities profile that pinpoints a firm’s fit into the global wind supply chain. GLWN also offers technical assistance for firms that want to move forward, helping them adapt to the production and quality requirements for the wind industry. State and local agencies, EDOs, and Manufacturing Extension Partnerships alike refer manufacturers to GLWN. In addition, GLWN participates in wind conferences and workshops in Ohio and beyond, presenting supply chain opportunities to hosts of manufacturers and helping them conduct initial self-evaluations.

GLWN’s unique partnership with the state of Ohio has had a transformational impact on its core industries. Ohio manufacturers are among the leaders in castings, machining, bearings and other wind turbine components. Ohio is now the second fastest-growing state in wind energy manufacturing jobs\textsuperscript{124}.

### Figure 21: Example Analysis of Supply Chain Opportunities

<table>
<thead>
<tr>
<th>Component</th>
<th>Sub component</th>
<th>NAICS 6-digit</th>
<th>Code description</th>
<th>NAICS 10-digit</th>
<th>Code description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Blade</td>
<td>326199</td>
<td>All other Plastics Products</td>
<td>A141</td>
<td>Other fabricated fiberglass and reinforced products</td>
</tr>
<tr>
<td></td>
<td>Blade Extender</td>
<td>331511</td>
<td>Iron Foundries</td>
<td>1116</td>
<td>Ductile iron fittings 14 in. or more</td>
</tr>
<tr>
<td>Hub</td>
<td></td>
<td>331511</td>
<td>Iron Foundries</td>
<td>3221</td>
<td>Other ductile iron casting for all other uses</td>
</tr>
<tr>
<td></td>
<td>Pitch Drive</td>
<td>335312</td>
<td>Motors and Generators</td>
<td>50</td>
<td>Integral horsepower motors and generators other than for land transportation equip. (746 watts or more)</td>
</tr>
<tr>
<td>Nacelle and Controls</td>
<td>Anemometer</td>
<td>334519</td>
<td>Measuring and Controlling Devices</td>
<td>7025</td>
<td>Other meteorological instruments and parts</td>
</tr>
<tr>
<td></td>
<td>Brakes</td>
<td>333613</td>
<td>Power Transmission Equip.</td>
<td>3111</td>
<td>Friction-type Clutches and Brakes</td>
</tr>
<tr>
<td></td>
<td>Controller</td>
<td>334418</td>
<td>Printed circuits and electronics assemblies</td>
<td>A013</td>
<td>Industrial process control board assemblies</td>
</tr>
<tr>
<td></td>
<td>Cooling Fan</td>
<td>333412</td>
<td>Industrial and Commercial fans and blowers</td>
<td>04</td>
<td>Axial fans</td>
</tr>
<tr>
<td></td>
<td>Nacelle Case</td>
<td>326199</td>
<td>All other Plastics Products</td>
<td>A141</td>
<td>Other fabricated fiberglass and reinforced products</td>
</tr>
<tr>
<td></td>
<td>Nacelle Frame</td>
<td>331511</td>
<td>Iron Foundries</td>
<td>3221</td>
<td>Other ductile iron casting for all other uses</td>
</tr>
<tr>
<td></td>
<td>Sensors</td>
<td>334519</td>
<td>Measuring and Controlling Devices</td>
<td>7</td>
<td>Commercial, Meteorological, Geophysical, and General Purpose Instruments</td>
</tr>
<tr>
<td></td>
<td>Yaw Drive</td>
<td>335312</td>
<td>Motors and Generators</td>
<td>50</td>
<td>Integral horsepower motors and generators other than for land transportation equip. (746 watts or more)</td>
</tr>
<tr>
<td>Gearbox and Drive Train</td>
<td>Bearings</td>
<td>332991</td>
<td>Ball and Roller Bearings</td>
<td>3032</td>
<td>Tapered roller bearings (including cups and cones), unmounted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1023</td>
<td>Complete ball bearings, unmounted, similar, including self-aligning, ground or precision, angular contact, precision</td>
</tr>
<tr>
<td></td>
<td>Coupling</td>
<td>333613</td>
<td>Power Transmission Equip.</td>
<td>3329</td>
<td>Non-gear-type flexible couplings</td>
</tr>
<tr>
<td></td>
<td>Gearbox</td>
<td>333612</td>
<td>Speed Change, Industrial</td>
<td>7428</td>
<td>Enclosed concentric and parallel (Planetary) center distance 6 in. or more</td>
</tr>
<tr>
<td></td>
<td>High and low speed shafts</td>
<td>333613</td>
<td>Power Transmission Equip.</td>
<td>3792</td>
<td>Mechanical power transmission equipment, NEC, except parts</td>
</tr>
<tr>
<td>Generator and Power Electronics</td>
<td>Generator</td>
<td>333611</td>
<td>Turbines, and Turbine Generators, and Turbine Generator Sets</td>
<td>0871</td>
<td>Turbine generators</td>
</tr>
<tr>
<td></td>
<td>Power Electronics</td>
<td>335999</td>
<td>Electronic Equipment and Components, NEC</td>
<td>3219</td>
<td>Other rectifying(power conversion) apparatus, except for electronic circuitry</td>
</tr>
<tr>
<td>Tower</td>
<td>Tower</td>
<td>332312</td>
<td>Fabricated Structural Metal</td>
<td>5106</td>
<td>Fabricated structural iron and steel for transmission towers, radio antennas, and supporting structures</td>
</tr>
<tr>
<td></td>
<td>Tower Flange</td>
<td>331511</td>
<td>Iron Foundries</td>
<td>116</td>
<td>Ductile iron fittings 14 in. or more</td>
</tr>
</tbody>
</table>

**Source:**

125 Sterzinger and Srvcak, *Wind Turbine Development: Location of Manufacturing Activity.*
Austin Polytechnical Academy: Enhancing Pre-College Manufacturing Education

Austin Polytechnical Academy (APA) is a charter high school in Chicago with a curriculum focused on manufacturing and engineering. While most manufacturing training programs are designed for students who are already out of high school, APA is part of growing cohort of programs designed to expose high school students to, and prepare them for, careers in advanced manufacturing.

The Chicago Manufacturing Renaissance Council (CMRC) founded APA in 2007 to educate the “next generation of leaders in advanced manufacturing”\(^\text{126}\). Located on Chicago’s west side, APA prepares students for careers in areas such as skilled production and engineering, management and company ownership and related occupations like intellectual property law. APA operates as a public-private partnership, funded through the Chicago Public Schools and over 60 private-sector backers\(^\text{127}\).

Purpose

First, APA was created to address the increasing scarcity of skilled manufacturing workers. As the manufacturing sector becomes increasingly high-tech, many industry experts see a worker shortage looming in the industry. Therefore, APA was designed to focus on the scientific, technological, engineering, mathematical, and mechanical skills needed in modern manufacturing. Second, APA was envisioned to improve student achievement and job opportunities for residents of a neighborhood that had been hit hard by factory closings over the past couple of decades. Over the past 25 years, the number of manufacturing jobs in the Austin neighborhood on Chicago’s west side has plunged to about 15 percent (from roughly 20,000 to 3,000) of what it once was\(^\text{128}\).

APA still offers college preparatory education and a liberal arts curriculum available to everyone in the neighborhood, but its students also take vocational classes that encourage careers in manufacturing and engineering. APA’s staff also reflects the school’s science, technology, engineering and math (STEM) and manufacturing focus. Based on the faculty descriptions on the APA website, over 50 percent of APA faculty fall into STEM subject areas\(^\text{129}\).

Career Program

APA works with its 60-plus committed industry partners to provide students with mentoring, field trips, work experience and

---


\(^{129}\) Austin Polytechnical Academy, “Austin Polytechnical Academy | Faculty & Staff,” Austin Polytechnical Academy, 2011, http://austinpolytech.org/faculty-staff.
other enrichment opportunities. APA hosts a career program run by the Center for Labor and Community Research, in partnership with Chicago Public Schools and local manufacturers, to prepare students for college and manufacturing-related careers.\footnote{130}

The center plans field trips and after-school programs (e.g., a patent law course wherein students participate in mock trials) and focuses on integrating the career program into the actual coursework students pursue. One such program, appropriately titled the “After School Matters” program, taught students about the ownership and operational demands of running a manufacturing company by partnering with Goose Island Brewery to produce a soda from beginning to final product.\footnote{131}

The center has also helped to fund a Manufacturing and Technology Center with the goal of teaching students to operate manual and digital milling machines.\footnote{132} Additionally, APA’s industrial partners agreed to pool their collective expertise into a formalized Manufacturing Advisory Committee, whose ultimate goal is to bestow its shared experiences and expertise onto APA’s students.

To date, 73 APA students have already completed certifications offered by the National Institute for Metalworking Skills (NIMS) in metal-forming and machine maintenance, service and repair.\footnote{133} This certification is considered an entry-level credential by the manufacturing industry and effectively illustrates that these APA students have the basic skills in operations, machining, inspection and safety necessary for eventual employment in the manufacturing industry.

\section*{Early Praise and Progress}

APA has been featured by several nationally prominent news organizations, including the \textit{Wall Street Journal}\footnote{134} and the \textit{New York Times}\footnote{135} for its early efforts and achievements, as well as the novelty of being the nation’s first manufacturing-focused high school. The school has even received prominent support from President Barack Obama, who has championed similar types of schools and academies across the U.S.\footnote{136}

\begin{thebibliography}{99}
\footnotetext[131]{Center for Labor & Community Research, “Center for Labor & Community Research Program Update” (Center for Labor & Community Research (CLCR), Fall 2008), \url{http://www.clcr.org/publications/pdf/Fall%202008%20Program%20Update.pdf}.}
\footnotetext[132]{Cancino, “Setting Career Gears in Motion: Center Helps Prepare Students for Jobs in Manufacturing and Technology.”}
\footnotetext[136]{Center for Labor & Community Research, “Center for Labor & Community Research Program Update.”}
\end{thebibliography}
APA’s early success has been integral in helping jumpstart other ventures with similar missions and objectives. The Center for Polytechnical Education, is a not-for-profit organization attempting to duplicate and further develop APA’s model\(^ {137}\). The Chicago Public Schools has also given the go-ahead to the Chicago Academy for Advanced Technology to train students for information technology jobs and careers\(^ {138}\). APA has also inspired a similar school in development in San Francisco\(^ {139}\).

While there are high hopes for Austin Polytechnical Academy, it is too soon to accurately assess the success of the effort. The first graduating class is just starting to hit the adult workforce, so it remains to be seen how much the training they received will help them and their future employers. Nevertheless, the increasingly technical nature of modern manufacturing work makes programs of this kind ever more important to the long-term viability of manufacturing in the United States.

\(^{137}\) Gonçalves, “A Renaissance for Chicago’s West Side: Austin Polytechnical Academy Builds Community Support for Advanced Manufacturing.”

\(^{138}\) Center for Labor & Community Research, “Center for Labor & Community Research Program Update.”

\(^{139}\) Chambers, “Chicago High School Will Graduate First Class Trained for High-Tech Manufacturing.”
Brooklyn Navy Yard
Industrial Park: Creating
Space for Sustainable and
Collaborative Manufacturing

Once a military location, the Brooklyn Navy Yard has grown into a center for large- and small-scale manufacturing, job growth, and sustainable economic development. This industry center, which occupies 300 acres, continues to grow through the efforts of the Brooklyn Navy Yard Development Corporation, a non-profit which coordinates the Yard’s development, renovation projects, and occupancy.\(^{140}\)

After New York City bought the majority of the Yard in the late 1960s\(^{141}\), the Yard was entirely devoted to maritime industrial activity such as shipbuilding and maintenance companies.\(^{142}\) However, after a dropoff in federal funding caused these large tenants to go into decline, the Yard redirected its efforts to secure jobs by providing more space for small-scale manufacturing and non-industrial uses.\(^{143}\) Like many large industrial sites from the 20\(^{th}\) century, Brooklyn Navy Yard was reborn as a mixed-use, mixed-tenant property. Last year, the Yard rented space to 15 small companies that will create almost 70 new jobs.\(^{144}\)

The Navy Yard also provides a unique work environment that facilitates tenant interaction. Navy Yard tenant John DeVore describes how he capitalizes on the skills of other tenants in his building, having a furniture-maker cut lumber for one of DeVore’s electronics projects.\(^{145}\) These types of collaboration are often essential to the success of small and medium-sized manufacturers, so creating spaces that facilitate this kind of exchange is good economic development practice.

The industrial park is also working to support and appeal to sustainable manufacturers.\(^{146}\) The Yard has begun to plan and put up “green industrial buildings” and is overhauling infrastructure to improve water efficiency. These green initiatives have garnered financial backing, with the state senate pledging $15 million in support of additions to the park’s environmentally-friendly manufacturing areas.\(^{147}\) These funds are helping in part to finance the Yard’s


\(^{141}\) Ibid.

\(^{142}\) Richard Drucker, “Brooklyn Navy Yard Development Corporation, Senior Vice President, External Affairs”, May 2011.

\(^{143}\) Ibid.


\(^{147}\) Kavanagh, “Brooklyn Navy Yard Sees Major Growth in 2010.”
expansive new Green Manufacturing Center. The center will offer space for numerous tenants and will incorporate environmentally conscious design features like refurbished structural supports and solar panels. The Navy Yard development is financed with a mix of private, city, state, and federal funds. The rent payments that the Yard receives from its tenants are used for infrastructure improvements, allowing funds generated by Navy Yard operations to flow back into the park’s maintenance. In terms of city backing, New York Mayor Bloomberg’s administration has helped fund Navy Yard projects, committing more than $200 million to these development efforts in recent years. Navy Yard projects have also received federal funding through entities such as the Economic Development Administration.

The Navy Yard is also having success in attracting foreign direct investment. Through the federal EB-5 Investor Visa Program, foreign nationals may receive visas upon committing to investment in development ventures that will promote job growth.

When New York City recently became a participating region for investment under the EB-5 program, the Navy Yard was the first recipient of capital in the region. Part of the $60 million that stemmed from this program has been slated for the Green Manufacturing Center construction.

All told, the Brooklyn Navy Yard is an example of how leadership and innovative economic development practice can breathe new life into old industrial properties and neighborhoods. The Brooklyn Navy Yard estimates that the park is home to 5,800 jobs currently. However, the Navy Yard’s projected employment figures continually increase. Completion of ongoing development efforts is expected to add roughly 2,000 temporary or permanent jobs.

---

149 Drucker, “Brooklyn Navy Yard Development Corporation, Senior Vice President, External Affairs.”
150 Kavanagh, “Brooklyn Navy Yard Sees Major Growth in 2010.”
151 Drucker, “Brooklyn Navy Yard Development Corporation, Senior Vice President, External Affairs.”
152 U.S. Citizenship and Immigration Services, “USCIS - Employment-Based Immigration: Fifth Preference EB-5”, n.d., http://www.uscis.gov/portal/site/uscis/menuitem.eb1d4c2a3e5b9ac89243c6a7543f6d1a/?vgnextchannel=facb83453d4a3210VgnVCM100000b92ca60aRCRD&vgnextchannel=facb83453d4a3210VgnVCM100000b92ca60aRCRD.
153 Drucker, “Brooklyn Navy Yard Development Corporation, Senior Vice President, External Affairs.”
155 Drucker, “Brooklyn Navy Yard Development Corporation, Senior Vice President, External Affairs.”
156 Ibid.
Newton, Iowa: Leveraging Workforce Strengths to Recover from Mass Layoffs

In 2006, Whirlpool decided to cease operations at its Maytag plant in Newton, Iowa. The Maytag plant had been in the community for over 100 years and provided nearly 1,900 direct jobs in a community of only 16,000 residents. Local, regional, state, and federal stakeholders developed a comprehensive effort to save Newton from the fate of so many manufacturing communities that have seen their major employer leave. Much of this work was funded through a Regional Innovation Grant provided by the U.S. Department of Labor. Partnering with Iowa Workforce Development, local economic developers developed and administered dislocated worker surveys to capture the skills, experience, and aspirations of workers who were about to be laid off. These data proved essential to the success of revitalization and economic diversification efforts in Newton.

First, dislocated worker surveys helped economic developers identify industries that would be attracted by the workforce assets available in Newton. By examining the collected data, economic developers were able to target economic sectors that represented the best opportunities for diversifying the local economy. For example, when the results of the surveys were analyzed, it became clear that many of the skills needed to make appliances translated well into assembling windmill components.

Dislocated worker surveys also proved key to attracting new employers to diversify the economic base of Newton. Kim Didier, Director of the Newton Development Corporation when the dislocated worker surveys were conducted, saw the tool as essential to attracting firms to replace the jobs that had been lost. “When you’re asking a business to make a $25 to $30 million investment, they’ve got to be 100 percent sure that you’ve got a skilled workforce,” Didier said.

By fall of 2008, Newton had attracted over 1,200 replacement jobs in the advanced manufacturing, renewable energy, information technology, research, and service sectors. Most of these new employers were attracted to the workforce talents and skills available in the region, as demonstrated by the data captured through dislocated worker surveys.

---


159 Economic Modeling Specialists, Iowa Town Reshapes its Economy with Data Focused Plan, Partnerships.
Mississippi’s Integrated Longitudinal Education and Workforce Performance Management System: Measuring Results

As discussed throughout this report, workforce development is essential to a vital manufacturing sector. However, many state and local workforce development systems are not prepared for rigorously measuring and delivering the specific skills that workers and firms need. Moreover, workforce evaluation and training systems are often imperfectly connected. However, this is starting to change. This case study reviews how Mississippi is developing more systematic techniques for identifying and delivering critical skills.

Creating Report Cards for Workforce and Education Programs

The Integrated Longitudinal Education and Workforce Performance Management System is a 10-year-old project that involves a host of partners, specialized technology, and leadership from the governor. The system has one simple goal: to create a comprehensive report card on the effectiveness of workforce training programs. The data are used to address specific workforce goals developed by the Mississippi State Workforce Investment Board. Training and education efforts are evaluated according to four central criteria:

- Are Mississippians able to secure employment after receiving training or completing postsecondary degrees?
- Are Mississippians engaging in education and skill development better able to retain employment over time?
- Do Mississippians get better pay after receiving training or completing postsecondary degrees?
- Do Mississippians who receive training and degrees meet the education and job skill demands of business and industry?

The system answers these questions by tracking workers once they graduate from training programs. The next section reviews how different data sources are used to provide answers to the four questions outlined above.

Compiling and Coordinating Data from Multiple Partners

The project engages all state agencies involved in education and workforce training, including the K-12 system, community colleges and employment security agencies. Each agency tracks the progress of its trainees and feeds the data into a common database managed by the National Strategic Planning and Analysis Research Center (nSPARC) at Mississippi State University. nSPARC cleans the data and stores it, utilizing in-house technical expertise to ensure the data are protected. Since each agency’s metrics are slightly different, nSPARC tags incoming data so that the most relevant information can be pulled to address specific workforce questions, such as employment or graduation rates. Figure 22 represents the input-output flow of information for this process.
Figure 22: Data Flow for Mississippi’s Integrated Education and Workforce Management System

Source: National Strategic Planning and Analysis Research Center, Mississippi Integrated Longitudinal Education and Workforce Performance Management System (Mississippi State University, 2011).
**Accomplishments**

The process of developing the measurement system has helped the state identify and coordinate the activities of various state agencies tasked with public education and workforce planning. This helps to ensure that programs are not duplicated, no need falls through the cracks, and the state’s financial resources go as far as possible. For instance, the state is using these data to formulate school-to-work policies, transitioning students from high school to college and from community colleges and universities into the workplace. The data are also allowing the state to clearly define each agency’s respective role in order to effectively deliver across-the-board workforce development services. In the long run, the performance measurement system will help Mississippi implement the most impactful workforce policies and programs by providing hard data on the successes and failures of current programs.
Union Labor Life Insurance Company: Economically Targeted Investment of Pension Funds

Economically targeted investment, most often found in the management of union or public employee pension funds, is the practice of targeting investments to create jobs, infrastructure, housing, or other public benefits. The Union Labor Life Insurance Company (ULLICO) operates the “J for Jobs” unit, a managed trust fund that targets investments in “worker-friendly, job-producing construction projects and industries”\(^{161}\). Between 1977 and 1995, the fund invested nearly $800 million in 184 projects that created nearly 8,000 jobs\(^{162}\). From 1995 to the end of third quarter 2006, the fund invested $16.1 billion in 219 projects, creating a total of 162,000 jobs\(^{163}\).

Shipyard Double-Hull Project Case Study — Newport News, Virginia

One of the most successful projects initiated through the J for Jobs program was a Newport News shipyard construction project where funds were used to finance double-hull tankers. The fund invested a total of $280 million in construction of five environmentally safe, double-hulled oil tankers\(^{164}\). A $10 million equity stake from ULLICO allowed it to stipulate that the construction would occur at one of the few remaining unionized shipyards in the United States\(^{165}\). The project provided work for 12,000 steel workers for almost two and a half years\(^{166}\). The firms operating the ships also agreed to a union pre-hire agreement which guaranteed jobs for 150 Seafarers International Union members. ULLICO completed the investment and recovered 100 percent of invested capital plus an internal rate of return of 20.4 percent\(^{167}\).


\(^{162}\) Ibid.

\(^{163}\) Ibid.

\(^{164}\) Ibid.

\(^{165}\) Ibid.

\(^{166}\) Ibid.

\(^{167}\) Ibid.

The Michigan Supplier Diversification Fund, established in 2009 and subsequently expanded into the Michigan Business Growth Fund, was initially developed to promote market diversification for manufacturers supplying the auto industry. The program, which has since expanded, is ameliorating specific gaps in the private credit market that often prevent small and medium-sized manufacturers from growing and creating jobs. The Michigan Business Growth Fund recently secured over $79 million in aid from 2010’s State Small Business Credit Initiative, which is financed by the U.S. Treasury under the Small Business Jobs Act.

Two key programs under the Michigan Business Growth Fund’s umbrella are the Michigan Collateral Support Program and the Michigan Loan Participation Program. The two programs, which are administered by the Michigan Economic Development Corporation, each work to remedy specific problems that small and medium-sized manufacturers experience in accessing growth financing.

As its name suggests, the Michigan Collateral Support Program (MCSP) helps participating firms boost their collateral with financial backing. Increasing collateral is an immediate concern for many small and medium-sized manufacturers, as the recession caused significant depreciation of firms’ assets and thus their available collateral. By depositing funds for a specific firm at the loaning bank, the MCSP helps these businesses qualify for loans by increasing the assets tied to the firm. As the borrowing firm pays off its loan, the deposited cash is gradually reabsorbed by the fund.

The Michigan Loan Participation Program (MLPP) takes a more direct role in a company’s loan. The MLPP helps firms by taking a share of the firm’s loan off the issuing bank’s hands. By assuming a share of the loan, the MLPP reduces the risk for the lending institution, which is particularly critical in today’s risk-averse private credit market.

The Michigan Supplier Diversification Fund helped 39 firms secure loans over the course of its operation.

---


169 Ibid.


172 Ibid.


of one year. The program secured over 2,600 jobs. With federal backing from the State Small Business Credit Initiative, the Michigan Economic Development Corporation plans to further develop its Business Growth Fund efforts and target a wider range of industries.

---

176 Ibid.
177 Ibid.
Green Manufacturing Training and Certificate: Building the Workforce Needed for Sustainable Manufacturing

The Purdue Technical Assistance Program (TAP), in partnership with the Society of Manufacturing Engineers (SME), has developed a series of courses to educate manufacturing workers on how to identify and implement sustainable practices in the workplace.

The training program, provided by Purdue TAP and its partners, prepares workers to sit for the Green Manufacturing Specialist Certificate exam, offered through the Society of Manufacturing Engineers. The Purdue Manufacturing Extension Partnership Center is co-located with and provides support for TAP.

Each course blends classroom-style instruction with hands-on simulations of the topics being covered. For example, attendees will discuss principles of production line efficiency and then run through a simulation in which they are asked to identify ways to make the production process more efficient and reduce waste generation. The courses aim to provide practical knowledge that will help workers improve the environmental sustainability of manufacturing operations.

The rest of this section outlines the components of the training program and certificate exam.

Green Generalist

This course was developed by Purdue’s Technical Assistance Program to provide an overview for manufacturing workers on green concepts, practices, and issues. The course covers topics such as energy management, water management, and solid waste reduction. Green Generalist training can be delivered online or in a one-day workshop setting.

Green Specialist Series

After the Green Generalist course, a series of topic-specific courses provides advanced training on different elements of sustainable manufacturing practice. Each course is delivered in a one-day workshop format. All of the specialist series courses blend classroom-style instruction with hands-on implementation simulations.

Workshops in this series include:

- Energy Management
- Managing Chemical Use & Hazardous Waste
Material Use & Solid Waste Management
Air Emissions and Climate Impact
Supply Water & Waste Management
Environmental Business Management

While these courses are designed to fit together, they can also be taken individually.

Green Manufacturing Specialist Certificate
Developed by the Purdue TAP and the Society of Manufacturing Engineers, the Green Manufacturing Specialist Certificate is an important first step toward codifying the knowledge that manufacturing workers need to improve the sustainability of their operations.

The certificate test is designed to follow completion of the Green Generalist course and the six Green Specialist courses. The Society of Manufacturing Engineers administers the test and backs the certificate. To date, more than 100 people have taken the certification exam.

Bringing Courses to Your Community
The Purdue TAP has partnered with a variety of organizations such as community colleges, professional associations, labor unions, utilities, and local EDOs to bring green manufacturing courses to local communities. To date, one or more of the courses has been offered in 16 states. The nature of the arrangement is flexible depending on the needs and resources of local organizations. In some cases, the local organization pays for the program and makes it available to members free of charge. In other cases, the course is funded through participant fees so the local organization does not carry the entire cost.

Local EDOs can play a variety of roles that include:

- **Identify interest**: One of the key issues with this type of training is identifying manufacturers who want to improve the sustainability of their operations. Local EDOs can serve a critical role identifying the specific firms that would be interested in participating.

- **Publicize**: Local EDOs can also use their networks to publicize training courses that are coming to their communities.

- **Fund**: For EDOs with sufficient resources, funding green manufacturing workshops can help to convince companies to participate.

- **Market the Certified Workforce**: Local EDOs can also play a role by marketing the availability of these training courses and trained workers to companies searching for a site to locate. As more and more manufacturers move to green their processes, expect an increasing demand for workers that understand how to make manufacturing processes more sustainable.
Strategic Early Warning Network: Preventing Mass Layoffs

The Strategic Early Warning Network (SEWN) is a program of the Steel Valley Authority (SVA) that provides early layoff warning and job retention services to manufacturers in Pennsylvania. SEWN operates three offices across the state and plans to open a fourth in the near future.

Early Warning Network
SEWN has taken many years to build into an effective alert system. Experience has shown that layoff aversion programs are most effective if a troubled manufacturer is identified before the firm reaches a point of crisis. Through sustained partnerships with the Manufacturing Extension Partnership, Pennsylvania state agencies, local financial institutions, labor unions, and other organizations, SEWN has constructed a network of stakeholders that can identify manufacturers in need of turn-around and stabilization assistance.

Technical Assistance
Once a troubled firm is identified, SVA contacts the manufacturer’s management, owners and union officers. Within 48 hours of the initial call, SVA responds with the purpose of arranging visits and tours of the affected manufacturing plant(s). SVA then surveys the manufacturer’s challenges and narrows its focus to define the manufacturer’s problem areas, after which SVA works with affected stakeholders to inventory any resources available to strategize and develop solutions.

While SEWN has marshaled assistance on a variety of manufacturing issues, some of the common challenges include:

- **Restructuring finances**: SVA helps manufacturers determine optimal ways to stabilize fiscal operations, including helping to create new business plans and assisting with restructuring companies to garner more capital and meet financial obligations and future investment needs.

- **Responding to transitions of ownership and employee buyouts**: SVA offers help in planning for dramatic changes that can result from transitions in company ownership. SVA offers access to programs, services and resources at free or limited cost that help sustain manufacturers undergoing difficult ownership succession. Well-structured employee buyouts can offer advantages in the form of tax benefits to owners and long-term job security to employees. SVA helps workers and owners determine an optimal strategy while working to maintain business and employment continuity.

- **Labor–management relations**: Poor labor–management relations put manufacturers at risk. SVA extends past mediation of internal disputes in labor–management relationships to work with all stakeholders in generating creative problem-solving strategies. Effective workplace strategies depend on a number of factors, including continual information exchange between employees and managers, robust decision-making structures, and workforce education and training.

- **Operations and cost management**: Many manufacturers fall short when trying to
maximize existing operational effectiveness or in attempting to systematically evaluate internal operations practices. SVA identifies qualified consultants to review finances and operations. SVA may also be able to help manufacturers improve competitive performance, resulting in pragmatic answers to challenges that improve a manufacturer’s operations, quality and cost structures.

- **Finding new markets**: SVA can help provide cost-effective access to sales and marketing professionals who can improve sales performance and a company’s ability to locate and access new markets. Helping manufacturers diversify their market presence is particularly critical if they’ve lost their primary customer base.

**Evidence of Success**

Though the staff and part-time consultants of SEWN are relatively limited in number, SEWN has nonetheless been able to provide layoff aversion services and consultations to 700 companies. Since its inception in 1993, the program has helped to retain nearly 16,000 manufacturing jobs in Pennsylvania.\(^{178}\)

SEWN demonstrates how cost effective layoff aversion programs can be. Average overall program cost per job retained was $747 (2009-2010).\(^{179}\) While some business attraction incentive deals break down to tens of thousands of dollars per new job created, SEWN has been able to save jobs for a fraction of the cost. Moreover, the program is becoming more cost-effective as it matures.

---

\(^{178}\) Steel Valley Authority, “Saving Pennsylvania Jobs: The Strategic Early Warning Network (SEWN)” (Steel Valley Authority (SVA), 2011).  

\(^{179}\) Ibid.
79/Seventy: Creating Manufacturing a Certification Program

The 79/Seventy Manufacturing Certification Program emerged through collaboration between the Career & Technology Education Centers (C-TEC), Ohio’s Heath-Newark-Licking County Port Authority, The Licking County Chamber of Commerce, and Licking County manufacturers. The program was designed to address a forecasted lack of baseline manufacturing skills in the local workforce and to channel training graduates straight to the manufacturing firms that are hiring.

C-TEC is an Ohio-based career training institution that offers its students tools ranging from test preparation to specific vocational instruction\(^\text{180}\). C-TEC Adult Education Center operates the 79/Seventy Manufacturing Certification Program, which offers trade-specific training\(^\text{181}\). Local manufacturers play an important role by identifying the training material that needs to be covered and ensuring that graduates are connected to job opportunities.

The local chamber and the Heath-Newark-Licking County Port Authority help to connect local manufacturers directly with C-TEC. The port authority has been actively supporting the certification efforts for the last year, promoting C-TEC’s program to its clients and encouraging their involvement\(^\text{182}\). These clients operate out of the Central Ohio Aerospace and Technology Center, a converted military site that the port authority currently runs as a business complex\(^\text{183}\). The Boeing Company and Goodrich are among the manufacturers located on port authority property that have partnered with the C-TEC certification program, and these firms’ status helps to incent student application to the program\(^\text{184}\).

Participating manufacturers from the 79/Seventy Advanced Materials Corridor, which includes the port authority’s Aerospace and Technology Center, help to build the curriculum for the certification course. Manufacturers also play an important role in student instruction. In addition to C-TEC faculty and resources, select manufacturers also teach some of the program courses; for instance, Goodrich’s quality manager instructs a course in his area of expertise\(^\text{185}\). Industry participants continue to provide student learning experiences outside of the classroom. Manufacturers who teach for the C-TEC program also bring students to their production sites\(^\text{186}\).

The 79/Seventy program also contributes to the community’s economic development efforts and local manufacturers. In addition to receiving an insider’s glimpse of the


\(^{181}\) Ibid.

\(^{182}\) Rick Platt, “Telephone Interview with Rick Platt of Heath-Newark-Licking County Port Authority”, May 26, 2011.


\(^{184}\) Platt, “Telephone Interview with Rick Platt of Heath-Newark-Licking County Port Authority.”

\(^{185}\) Ibid.

\(^{186}\) Ibid.
manufacturing field through industry professionals, students also earn National Association of Manufacturers’ (NAM) certification upon completion of the course\(^{187}\). Students also may have access to career opportunities through the associated manufacturing firms, as these manufacturers may hire from the group of C-TEC graduates who have completed the program\(^{188}\). By teaching courses for the certification program, manufacturers sense the caliber of potential future employees through interactions with C-TEC’s students\(^{189}\). Further, the certification program also cuts down on training expenses for manufacturers, as C-TEC graduates enter the labor market with a strong background from the program.

The port authority’s economic development efforts also benefit from 79/Seventy program. As part of its business attraction efforts, the port authority can entice manufacturers with the promise of a qualified supply of laborers\(^{190}\). A secure labor supply has become an increasingly important consideration for area businesses as working baby-boomers approach retirement\(^{191}\).

Overall, the C-TEC Manufacturing Certification Program is an excellent example of effective alignment between economic and workforce development. By leveraging its networks in the local manufacturing community, the Licking County

\(^{187}\) Ibid.
\(^{188}\) C-TEC, “C-TEC Homepage.”
\(^{189}\) Platt, “Telephone Interview with Rick Platt of Heath-Newark-Licking County Port Authority.”
\(^{190}\) Ibid.
\(^{191}\) Ibid.
Kurzarbeit Program: Building Workforce Strengths During Economic Downturns

Germany’s Kurzarbeit program is an excellent example of how workforce and economic development programming can work together. Kurzarbeit (German for "short-work") is designed to help manufacturers survive temporary dips in market demand and use the down time to improve the capacity of the manufacturing sector. Under the Kurzarbeit plan, employers are able to retain their workers while decreasing employee hours, with the German Federal Employment Agency stepping in to pay laborers the bulk of the wages they’ve lost due to these cutbacks\(^\text{192}\). This program requires commitments from all parties involved. While the government agrees to supplement employee earnings, employers are obligated to retain workers whose schedules have been cut back\(^\text{193}\). Additionally, in certain cases, workers have to participate in workforce training initiatives in order to receive their government compensation\(^\text{194}\). Under Kurzarbeit, companies offering worker training during the reduced-work period receive targeted tax breaks from the government\(^\text{195}\).

German businesses and employees have been receptive to the Kurzarbeit arrangement. The OECD estimated that as of 2009, roughly half a million employees were able to keep their jobs under the plan, which they otherwise may have lost\(^\text{196}\). The program regulations have also changed over the last several years. While initially there was a one-year cap on the amount of time employees could participate in the Kurzarbeit program, by 2009 coverage increased to two full years\(^\text{197}\). Manufacturers have embraced the program, with industry giants like Stuttgart employing large numbers of Kurzarbeit employees. In an Ifo Institute 2010 study, surveyed manufacturers' participation in the short-term work plan was almost 40 percent\(^\text{198}\). Overall, perhaps partly due to the Kurzarbeit program, the German economy appears healthier than many neighboring countries, with its 6.6 percent national unemployment rate a full three percentage points lower than the European Union’s collective unemployment figure\(^\text{199}\).


\(^{194}\) Ibid.

\(^{195}\) Silvia, “Keynes in Lederhosen: Assessing the German Response to the Financial Crisis.”

\(^{196}\) Brett Neely, “Germany’s reduced shift plan could serve as a model for other countries,” Deutsche Welle, September 2009, http://www.dw-world.de/dw/article/0,,4705732,00.html.

\(^{197}\) Silvia, “Keynes in Lederhosen: Assessing the German Response to the Financial Crisis.”


\(^{199}\) Steinbauer, “How Do You Say Kurzarbeit In English?”. 

Advanced Manufacturing Park – Sheffield, United Kingdom: A Model for Advanced Industrial Parks

Situated on 100 acres of green space on the Sheffield-Rotterham border in central England, the Advanced Manufacturing Park (AMP) has introduced a model for research and development in advanced manufacturing that is being replicated around the world. Since its establishment in 2005, AMP has become a hub for some of the world’s leading materials and structures research and development organizations, including the University of Sheffield Advanced Manufacturing Research Centre (AMRC), Boeing, Rolls-Royce’s Factory of the Future, Castings Technology International, and TWI Technology Center. The site provides facilities and services to businesses working to develop technologies for use in precision industries such as aerospace, automotive, nuclear energy, oil and gas, environment, defense, and construction. In the brief period AMP has been operating, it has grown exponentially and currently serves as an archetype for centers of research and innovation in fields related to advanced manufacturing.

History
The borough of South Yorkshire and city of Sheffield in particular have a long and distinguished history of excellence in manufacturing. The region helped to spearhead the industrial revolution during the 18th and 19th centuries, a period during which it gained an international reputation for metallurgy and steel-making. Though heavy industry began to decline in the region during the mid-20th century, the long-standing tradition of excellence in manufacturing and engineering, both at local universities such as the University of Sheffield and other local organizations, allowed it to maintain some of its dominance in the field and continue as a center for innovation. Indeed, though industry began to decline in the region beginning in the 1960s, from 1995 to 2003 the city of Sheffield saw the Gross Value Added from industry across all sectors increase by 13 percent (Office for National Statistics). Though the region was negatively affected by the decline of heavy industry that hit many industrialized nations in the mid-20th century, the resiliency of its many institutions with deep ties to manufacturing allowed it to weather the decades-long downturn. Today, that resiliency is finally paying dividends.

Goals
The goal of the Advanced Manufacturing Park is to create a modern innovation environment in South Yorkshire. Its approach is two-fold. First, the AMP model stresses research orchestration, which includes tapping into the institutions that already exist in Sheffield and partnering them with leading world businesses and institutions from outside of the region. Academic institutions partner with an OEM and work to help all of the supply chain companies in its environment to integrate their research and operations. In essence, an OEM will bring all of its supply chain businesses to the campus, where a partner academic institution will work to synchronize their operations. This leads to higher operational efficiency, as the streamlining of the research process enables the OEM to harness the collective ability of its entire supply chain to the greatest extent possible.
possible degree (Anwyl 7/20). In addition to research orchestration, by bringing OEMs and their supply-chain firms onto one campus, AMP facilitates an exchange of ideas from both technological and operational perspectives that would not be possible in a traditional business environment. By harnessing the combined expertise of these businesses, the Sheffield region hopes to stay at the forefront of advances in manufacturing, with the ultimate aim of establishing a strong regional economy based around those industry sectors.

From Concept to Reality
Originally conceptualized by researchers at the AMRC, AMP is a truly joint venture in every possible interpretation of the concept. The idea for a single campus on which advanced manufacturing and materials organizations could co-locate was taken by Keith Ridgway and Adrian Allen of AMRC to Boeing, which initially was uninterested due to an anticipated plan to change its business model. AMRC persisted, adjusted its proposal to suit the upcoming changes at Boeing and ultimately was able to convince the aerospace giant of the benefits of integrating its supply chain on a single campus (Anwyl 7/20).

In concert with Yorkshire Forward, a regional economic development organization, the parties worked with UK Coal, Britain’s largest producer of coal, to reclaim land that could be used for the park. A joint venture between Yorkshire Forward and UK Coal was signed that established provisions for reclaiming the land, building the necessary infrastructure and undertaking business development and marketing efforts aimed at attracting businesses to the site. Thus, Yorkshire Forward and UK Coal are joint owners of the AMP site. UK Coal owns roughly two-thirds of the site, with Yorkshire Forward owning the remaining third while also funding site infrastructure and management of the park for the initial five years of its operation.

All of this extensive planning would have been for naught, however, were it not for the UK Strategic Partnership, a joint venture between UK Coal and British economic regeneration specialist Strategic Sites. The UK Strategic Partnership was tasked with bringing the initial businesses to the AMP. Through extensive deployment of marketing and outreach programs, the UK Strategic Partnership was able to get 27 businesses, now called Tier One Partners, to buy into the AMP project and co-locate on the Sheffield site. These Tier One Partners include AMRC, Boeing, Castings Technology International, Rolls-Royce, Bromley Technologies, and others.

Perhaps one of the more crucial components to the success of AMP is that there is no one controlling mind or group that sets the vision for what AMP will become in the future. Growth and expansion at the park is and always has been an organic process, in the sense that firms are given considerable leeway to decide how they utilize their space. There is no master plan imposing artificial boundaries or goals for the future. This allows the businesses themselves to shape the identity of AMP. In that sense, the park is constantly growing and changing, and thus is able to reflect the rapidly changing environment in which its partner businesses work.
Services
AMP is situated on 100 acres and accommodates businesses of all sizes, from start-ups to multinational conglomerates like Boeing. By sharing a single campus, businesses of different sizes and stature benefit from shared expertise. There is doubtless much that Boeing, for instance, with its vast resources, can do better than a small business with a few employees. Boeing, however, may also have something to gain from collaborating with smaller, more nimble businesses. Outside of the AMP, there might be little chance that these companies would interact. By bringing them all to one place, AMP helps to establish networks which in turn facilitate and accelerate innovation. In addition, AMP holds a variety of social and networking events to help strengthen the bond between like-minded businesses on the campus.

The campus divides its facilities into three tiers – incubation, evolution, and expansion – to accommodate different kinds of businesses.

Incubation
Businesses under the incubation banner are located in the Technology Centre, AMP’s incubation facility. Spaces in the Technology Centre range from as small as 200 square feet up to 2,000 square feet and offer office, laboratory, and workshop space for advanced engineering, manufacturing, and materials organizations. In addition, the Centre offers a range of meeting and conference rooms and other business support services. Businesses are co-located with firms of similar size and are generally in a nascent stage of development.

Evolution
Firms whose needs have expanded beyond the incubation stage and that are looking to further build capacity can be found in the Evolution @ AMP facility. Spaces range from 2,300 – 27,000 square feet and can be purchased or let. Evolution units are open to firms moving directly from AMP’s incubation facility, as well as established firms from outside AMP. Of the 14 units currently constructed, all are suitable for industrial warehousing and can be converted for use in a number of high-tech endeavors or office use.

Expansion
Firms that fall under the expansion category are large, well established and generally in need of a custom-built facility. An example is the Rolls-Royce Factory of the Future facility that is located on-campus. The Factory of the Future is a massive, carbon-neutral plant that is powered by two giant wind turbines located outside the building and lit by 98 percent natural light. Facilities can be custom-built to serve a variety of different functions, including research and development workshops, conducting pilot assembly, hybrid office/industrial sites, and test facilities (AMP).

Funding
Initially, funding at the AMP came from both private and public sources. Today it is mostly funded by the businesses on the park’s campus. Through Yorkshire Forward, the government has contributed several million pounds for land remediation and infrastructure projects on site. The British government has also funded some research at the park, but all told, less than 5 percent of total spending at the AMP has come from public coffers. Since government in England...
can’t directly subsidize an individual business, businesses at AMP are on their own, for the most part, in terms of funding, and all buy or lease land at the park at commercial rates.\footnote{Joe Anwyl, “Telephone Interview with Joe Anwyl”, July 2011.}
Commonwealth Center for Advanced Manufacturing: Fostering Collaborative Innovation

When Rolls-Royce approached economic developers in Virginia about opening a new aerospace manufacturing facility, the company was interested in more than just tax breaks or monetary incentives. Rolls-Royce’s business plan is based on continual innovation. The ultimate deal hinged on the establishment of the Commonwealth Center for Advanced Manufacturing (CCAM), in Petersburg, Virginia201. CCAM is in the process of finalizing construction on its facility, hiring key research staff, and augmenting private-sector membership.

CCAM is a non-profit, public-private partnership staffed by researchers from the University of Virginia and Virginia Tech that will conduct research and development to support aerospace manufacturers in the region. CCAM’s concept is based on the Sheffield Advanced Manufacturing Park, detailed earlier in this report.

This case study discusses how the CCAM is indicative of several emerging trends in economic development programming, and attraction deals in particular. First, CCAM is an example of collaborative innovation, in which manufacturers in the same sector work together to innovate new products and processes. Second, CCAM shows how important workforce development is to attracting and retaining advanced manufacturing. Third, CCAM is an example of how to effectively leverage the resources of colleges and universities to support a sustainable manufacturing base.

Collaborative Innovation

CCAM will focus on advanced surface engineering, which is critical to the aerospace, energy, semiconductor, chemical and shipbuilding industries.

An exciting aspect of CCAM will be the incorporation of a test factory floor within its walls. This will allow testing of more advanced and efficient production techniques to occur without halting production on existing floors. This will reduce testing costs and also allow for practical training to occur outside of the actual production line.

As was discussed in Chapter 5, this collaborative innovation model is an increasingly common way for companies to pool resources and share risk.

Master Agreement

One of the critical features of CCAM is its founding master agreement. This agreement creates a framework for contributing to and sharing in the benefits of collaborative research and development. The agreement has several key features, including:

- **Sharing of intellectual property:** Much of CCAM’s work will be paid for by membership dues from private companies. Under the master agreement, all contributing members will possess a non-exclusive, non-royalty-bearing license to use any of the innovations emerging from research funded through general membership contributions.

- **Universities relinquish intellectual property rights:** Participating universities release all claim to the intellectual property rights associated with their research and discoveries. Virginia Tech and the University of Virginia are more concerned with driving economic development, increasing their research profiles, and creating opportunities for their students than with capturing intellectual property rights. This removes one of the most challenging hurdles to collaboration between universities and private firms.

- **Two tiers of private membership:** The agreement allows for greater and lesser degrees of financial support and influence over the research program.
  - **Tier one:** Members have half of their membership fees directed to research that they specify for themselves. For self-funded research, tier one members receive 100 percent exclusive ownership of any resulting intellectual property rights. The other half of their fee is directed into general research.
  - **Tier two:** Members pay a quarter of the fees of Tier one members. Tier two members pay only toward the general research fund and share in intellectual property emerging from that research.

- **Allowance for research done off-site:** Under the agreement, the center’s research can be undertaken outside of the CCAM facility. This enables the use of existing and expensive infrastructure available at each of the educational institutions that is involved. This stipulation greatly improves access to the state’s research and development assets, removing a potential barrier to innovation.

CCAM’s master agreement provides a guide for the types of issues that should be addressed in founding an organization to accelerate collaborative innovation.

**Workforce Development**

The national gap between the skills required by manufacturers and the skills possessed by many workers has increased over the last decade, accelerating since the Great Recession of 2008. Growth is predominantly occurring in advanced manufacturing industries, which typically require higher levels of innovation to remain competitive and more technically specialized staff to operate. Rolls-Royce identified this gap back in 2006 as one of the key factors in its site selection process. One of the many selling points for Virginia was the programs that the University of Virginia already had in operation.

As part of the deal CCAM deal, John-Tyler Community College, the nearest to the Rolls-Royce facility, will receive substantial upgrades to its teaching facilities and equipment. In addition, CCAM will create opportunities for students from the University of Virginia and Virginia Tech. This focus on practical development of industry-relevant skills, rather than a theoretical classroom approach, allows members to provide their employees with the necessary skills, but also allows the community to produce work-ready graduates who are ideal for advanced manufacturers.
Effective University Engagement

The willingness of universities to participate in this program was possibly the most important piece of the puzzle. In many cases, the administrative and bureaucratic entanglement of faculty and management can make working with universities painful. Both of the flagship public universities in Virginia have long-standing economic development outreach efforts, which proved critical to the formation of CCAM.

The University of Virginia had previously worked with Rolls-Royce through its business school, a relationship that made the company confident that it could work effectively with the school. Virginia Tech also had existing links to Rolls-Royce, which helped to sensitize the company to the research strengths that the university could bring to bear.

This is an excellent example of why university economic development leadership is essential. Based on long-term efforts to build working relationships with private manufacturers, Virginia Tech and the University of Virginia were ready to answer Rolls-Royce’s call. Without the schools as partners, this deal may have gone to a different state, or even a different country.
CHAPTER 9

Toolkit

This chapter provides tools for economic developers who are working to support manufacturers in their communities.

The toolkit has the following parts:

1. **Dislocated Worker Survey**: A tool for assessing the transferable skills and experience of manufacturing workers who are about to be laid off.
2. **Layoff Aversion Tools**: This includes tools for developing a system to identify and support manufacturers that are at risk of initiating major layoffs.
3. **Transportation and Logistics Assessment**: This tool outlines important but often overlooked metrics that are vital to understanding your community’s competitiveness in the global transportation and logistics system.

**Dislocated Worker Survey**

This section provides practical guidance on how to administer and utilize dislocated worker surveys. In most cases, economic developers need to coordinate and work with workforce development organizations to administer, interpret, and act on dislocated worker surveys.

**Administer Surveys Before Layoffs Occur**

First, it is much easier to administer the surveys when the workers who stand to lose their jobs are still in one place. By using the workplace as the point of distribution and collection, it is easier to achieve a high completion rate and to inform respondents about how these surveys will be used. Often, dislocated worker surveys are attached to worker pay stubs and a collection spot is established where employees congregate at work.

Second, getting ahead of the layoff event provides more opportunity to use the data effectively. Identifying specific skill gaps that will need to be filled provides more lead time to establish programs to serve the dislocated workforce.

Third, it is important to identify related occupations for those who are about to lose their jobs. Often, manufacturing employees have transferable skills but lack sufficient information about alternative careers that are open to them. Knowing the occupations that provide the best career alternatives for dislocated workers can help in developing an economic development strategy and in providing direct assistance to the workers who are about to be laid off.

**Critical Information to Capture**

While it may be prudent to tailor dislocated worker surveys to fit the challenges of a specific layoff event, common types of information captured include:
• **Previous job title:** Provides detail on the types of workers being impacted. This allows economic developers to market available talent and to identify the types of training services that are needed.

• **Specific job duties:** Provides additional specificity on the types of skills that are becoming available. Also allows workforce and economic developers to identify specific groups of workers that are in greatest need of additional training.

• **Educational attainment:** Provides additional information on qualifications of dislocated workers and where additional education would be the most effective.

• **Professional certifications:** Assists in marketing existing assets and identifying training needs.

• **Training not culminating in degree or certification:** Many training programs do not result in a degree or certification, but still impart important skills to the worker.

• **Additional skills:** Permits workers to identify additional strengths that are not captured elsewhere.

• **Previous wage or salary:** Helps economic developers to identify the local market rates for different occupations, skills, and level of experience. In turn, this information can be used to inform other existing manufacturers or attraction candidates that need to assess the local labor market.

• **Methods of searching for new employment:** Guides employers who are trying to access available labor talent. Also allows workforce and economic development professionals to identify where workers need assistance in searching for new opportunities.

• **Place of residence:** Helps manufacturers identify where skilled talent can be found within a region. This information also helps economic and workforce development professionals identify the best locations to deliver training services.

• **Willingness to commute or relocate:** Gives employers information on how far workers are willing to commute or relocate, also informing the site selection process.

• **Future employment plans:** Identifies broad trends in whether dislocated workers plan to look for other work, go back to school, relocate, or open their own business. Collecting these data on individual workers can also help support services to be tailored to each worker’s plans.

This is not necessarily a complete list. However, as with all surveys, additional questions often drive down response rates. As a general rule, it is best to keep surveys to a single page, front and back.

**Summarizing Results**

A sample summary sheet is included in the example section of this tool, but it is worth highlighting how the survey results can presented for maximum impact.

First, provide a summary of the number of dislocated workers by education level, training, certification, specific skills, and occupational title. A snapshot of this sort can provide a good diagnostic tool for economic and workforce development practitioners seeking to identify strengths and weaknesses. In addition, this snapshot can be critical in
demonstrating available capacity to other existing manufacturers and attraction candidates.

Second, it is often useful to produce a map that shows where dislocated workers live and their main methods of getting to work. As can be seen in the example provided below, a map of the region is an excellent way to quickly understand the distribution of dislocated workers throughout the community. This can assist in identifying good training locations, promising manufacturing sites, and communities where the impact is concentrated.

**Examples**

This remainder of this section provides a sample survey and sample results summary. As noted above, it may be necessary to amend these instruments to address specific local concerns, but the models provided here have emerged from substantial experience with administering and using dislocated worker surveys.
Figure 23: Example Dislocated Worker Survey

Company Name Worker Survey

All information from this survey is strictly confidential. Results of this survey will only be reported in aggregate to outside agencies.

Today’s Date: ____________________________
Name: __________________________________
Residential Address: ______________________
City: ___________________________________ State: ________ Zip Code: ____________
Phone Number: ___________________________ SSN: __________________
E-mail Address: __________________________
Age: ________ Gender: □ Male □ Female

Full Job Title: ____________________________
Job Duties: ______________________________
Additional Skills: _________________________
Wage Information: Hourly Wage: $_________ or Annual Salary: $_________
How far are you currently commuting: __________
Length of Employment: ___________________

When looking for employment opportunities, which advertising media do you use? (select top two)
□ Local Workforce Development Centers  □ Newspapers (list paper)
□ Networking through Friends  □ Internet (list site)

Highest Education Completed:
□ Less Than 9th Grade
□ Some High School, No Diploma
□ High School Diploma/GED
□ Some Education Beyond High School
□ Associate Degree Completed
□ Type of Degree: __________________________
□ Trade Certification Completed
□ Type of Certification: ___________________
□ Vocational Training Completed
□ Type of Training: _______________________
□ Undergraduate Degree Completed
□ Type of Degree: _______________________
□ Postgraduate Degree Completed
□ Type of Degree: _______________________

List Other Training/Certification:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Source:

Figure 24: Example Dislocated Worker Survey Continued

**Company Name** Worker Survey

How many children do you have living at home? ____________

Are you currently enrolled in school?  Yes  No
   If yes:  High School or GED  Post-High School

What is the lowest wage you will accept at your new job?  Hourly Wage: $ ________________
   Annual Salary: $ ________________

How far are you willing to commute: ________________________________

Please indicate the tasks that you are able to perform on a computer:
   - Access the Internet
   - Financial record keeping/bookkeeping
   - Send & receive e-mail
   - None of the things listed above
   - Write letters or other documents
   - Other: ________________________________

Are you interested in receiving basic computer instruction?  Yes  No

Do you require any special accommodation at the workplace?  Yes  No

Future Plans:

   Yes  No
   - Search for another job?
     Are you willing to relocate?  Yes  No
   - Open your own business?
     What type? ________________________________
   - Retire?
   - Enroll in school/educational program?
     What type of education/training will you pursue? ________________________________
   - Unknown

I would like individual assistance with the following:

   - Finding out what jobs are available
   - Understanding how my skills & experience relate to new jobs
   - Deciding what jobs I can do
   - Learning how to find a new job
   - Develop a résumé
   - Filling out job applications
   - Dealing with my loss of employment
   - Paying moving expenses
   - Budgeting & paying my bills without a job
   - Helping my family through this current situation
   - Deciding which college/school would be best for me
   - Tuition & books
   - Child care for my children while I go to college/school
   - Transportation expenses to & from school

Enter Survey Administrator Contact Information Here
Name, Address, City, State ZIP, Phone Number

Source: 203

---

203 Ibid.
Figure 25: Example Dislocated Worker Summary Hand-Out

Company Name
Dislocated Worker Characteristics
Released May 2010

Education Level:
- 51.5% High school diploma or GED
- 39.4% Have some education beyond high school
- 5.1% Trade certified
- 3.3% Vocational training
- 9.1% Associate degree
- 0.7% Undergraduate degree
- 3.7% Currently attending school

Wages:
At Separation:
- Median hourly wage - $18.60/hr
- Males - $16.50/hr
- Females - $16.31/hr
- Lowest median wage willing to accept - $14.00/hr
These wages may vary depending upon occupational category

Job Search Media:
(by percent interest)
- Local/Regional Newspapers
- Local/State Workforce Development Centers
- Networking through friends, family, and acquaintances
- Internet
  - www.iowaworkforce.org
  - www.monster.com
  - www.iowajobs.org

Computer Abilities:
- 69.6% Have interest in receiving basic computer instruction
- 79.3% Able to access the internet
- 89.1% Able to send & receive e-mail
- 47.9% Able to use word processing software
- 20.7% Able to use financial & bookkeeping software

Workshops Available:
(by percent interest)
- Job & Career Options
- Your Successful Job Search
- Budgets & Finances
- Coping With Change

Workshops Time of Day Preference:
- 54.9% Night
- 23.3% Morning
- 22.2% Afternoon

Available Skilled Labor:
Business Operations:
- Purchasing Agents - 1
Production:
- Assemblers & Fabricators - 10
- Electricians - 7
- Inspectors, Testers, Sorters, Samplers, & Weighers - 24
- Maintenance & Repair - 15
- Multiple Machine Operators - 58
- Fabricators - 6
- Press Machine Operators - 13
- Production Workers, All Other - 96
- Tool & Die Makers - 3
- Welders - 3

Transportation & Material Handling:
- Forklift Operators - 7
- Laborers - 10
- Undisclosed - 12
Total - 275

Individuals Would Like Assistance With:
- Finding out what jobs are available - 72.0%
- Deciding what jobs they can do - 53.5%
- Understanding how their skills & experience relate to new jobs - 49.1%
- Developing a resume - 46.0%
- Deciding which school would be best for them - 45.6%
- Tuition & books - 45.1%
- Transportation expenses to & from school - 44.0%
- Learning how to find a new job - 42.2%
- Budgeting & paying their bills without a job - 33.1%
- Filling out job applications - 29.5%
- Dealing with the loss of their employment - 18.5%
- Paying moving expenses - 17.8%
- Helping their family through this current situation - 14.5%
- Child care for their children while they go to school - 7.6%

For additional information contact:
Insert local workforce or economic development office contact information here

Source: 204

204 Ibid.
## Related Jobs

### Jobs Related to Structural Metal Fabricators and Fitters
- Sheet Metal Workers
- Welders, Cutters, and Welder Fitters
- Solderers and Brazers
- Model Makers, Metal and Plastic
- Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
- Lay-Out Workers, Metal and Plastic
- Precious Metal Workers
- Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic
- Stone Cutters and Carvers, Manufacturing
- Team Assemblers
- Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic
- Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders
- Molding and Casting Workers

### Jobs Related to Electricians
- Helpers—Electricians
- Electric Motor, Power Tool, and Related Repairers
- Electrical and Electronics Installers and Repairers, Transportation Equipment
- Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
- Electrical and Electronics Repairers, Commercial and Industrial Equipment
- Control and Valve Installers and Repairers, Except Mechanical Door
- Signal and Track Switch Repairers
- Electronic Equipment Installers and Repairers, Motor Vehicles
- Electro-Mechanical Technicians
- Electromechanical Equipment Assemblers
- Maintenance Workers, Machinery

### Jobs Related to Fork Lift Operator
- Laborers and Freight, Stock, and Material Movers, Hand
- Hoist and Winch Operators

### Jobs Related to Welder
- Welders, Cutters, and Welder Fitters
- Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
- Sheet Metal Workers
- Structural Metal Fabricators and Fitters
- Solderers and Brazers
- Boilermakers
- Lay-Out Workers, Metal and Plastic
- Pipe Fitters and Steamfitters
- Structural Iron and Steel Workers
- Industrial Machinery Mechanics
- Reinforcing Iron and Rebar Workers
- Control and Valve Installers and Repairers, Except Mechanical Door
- Maintenance Workers, Machinery
- Computer-Controlled Machine Tool Operators, Metal and Plastic
- Team Assemblers
- Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic


---

205 Ibid.
Layoff Aversion Tools

As discussed at a number of points throughout this project, a growing number of economic development organizations have launched efforts to help manufacturers that are at risk of going bankrupt or moving operations offshore. When it comes to layoff aversion, time is usually of the essence, so it is critical to have systems in place to identify firms that are in need of assistance and to provide the support needed to avert layoffs.

This section provides two interrelated tools to anchor a layoff aversion program. The first is a tool to guide the creation of an early warning dashboard. This tool lists sources of information that can help to identify firms that are struggling, and provides a rubric for organizing these diverse sources into a single snapshot of each firm being tracked. The second tool is a spreadsheet to help in mapping the resources that are available to help troubled firms. Putting these two tools together can help communities to get ahead of and minimize manufacturing layoffs.

**Early Warning System**

Creating an effective early warning network depends on being able to identify firms in danger of plant closings or mass layoffs. A proactive business retention and expansion program is the essential foundation for any effective layoff aversion program. In fact, layoff aversion can be seen as a targeted initiative that builds from and reinforces conventional business retention and expansion efforts.

This section first reviews a variety of hard data sources that can be used to identify struggling manufacturers. Next, it identifies stakeholders that can alert economic developers when a manufacturer appears to be in trouble. Finally, this section provides a sample dashboard for organizing these diverse information sources into a single diagnostic tool for evaluating a company’s level of distress.

**Hard Data Sources**

A variety of public and proprietary data sources can help economic developers identify firms that are in or heading for trouble. Likely source of hard data are outlined in Table 13 below. As different states have different data resources, this is not an exhaustive list. The resources listed below have been used to good effect in existing layoff aversion programs.
Table 13: Information Sources for Layoff Aversion Early Warning System

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worker Adjustment &amp; Retraining Notifications (WARN)</strong></td>
<td>The federal WARN Act (1988) requires employers to provide advance notice (60 days) of plant closings and mass layoffs. The notice is legally required to be given to (1) workers and/or representatives (e.g. labor unions), (2) the state dislocated worker unit and (3) the appropriate local government entity. Two main events trigger WARN: (1) plant closings affecting 50+ employees and (2) mass layoffs affecting 500+ employees or 50-499 employees if they account for one-third of an employer’s workforce. WARN notices are quasi-official indicators of troubled firms. Unfortunately, no federal law or regulation has yet been introduced to govern public availability and accessibility of WARN notices, but most states can provide information on companies issuing WARN notices.</td>
</tr>
<tr>
<td><strong>Trade Adjustment Assistance for Workers (TAA)</strong></td>
<td>TAA is a Department of Labor program providing aid to workers who suffer job loss (or reduction in work hours and wages) as a result of increased imports. TAA offers a variety of benefits and reemployment services for unemployed workers (which may include training, job search and relocation allowances, income support and other services). Applications to the TAA program often signal that a company’s export markets are under threat, a general indicator that firm may be stressed. Economic development organizations can find information on workers or employers in their region that have filed a petition with TAA.</td>
</tr>
<tr>
<td><strong>Trade Adjustment Assistance for Firms (TAAF)</strong></td>
<td>Funded by the Department of Commerce, eleven regional Trade Adjustment Assistance Centers provide support to manufacturers that are experiencing significant foreign competition. Services include advocacy and providing matching funding to support increased firm competitiveness. Applications to the TAAF program can indicate that a manufacturer is struggling to keep pace with its competition and may be in need of support.</td>
</tr>
<tr>
<td><strong>Unemployment Insurance Claims</strong></td>
<td>State or federal unemployment data can help identify firms that are under greater duress than their peers. Unemployment Insurance claims data can be used to identify firms that are</td>
</tr>
</tbody>
</table>

206 Many states have adopted supplementary and/or complementary WARN-related legislation to augment the scope of existing federal WARN legislation and address perceived loopholes. These states include California, Connecticut, Hawaii, Illinois, Kansas, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Oregon, Rhode Island, South Carolina, Tennessee and Wisconsin.

207 Three states do not disclose information related to in-state mass layoffs and plant closures: Arkansas, Nevada & Wyoming.

generating more unemployment claims than expected. For confidentiality purposes, Unemployment Insurance claims are not made publicly available, but organizations in some states (e.g., the New York Department of Labor) may have access to this type of data. Though they too cannot release these data, if these groups are part of the broader early warning network, they can at least inform others of potential warning signs of certain manufacturing firms.

**Proprietary Market Data**

- **www.dnb.com/ecomp/help/scores.htm**

Private-sector data and intelligence can help identify struggling manufacturers in a region. For example, Dunn and Bradstreet (D&B) publish “financial stress scores” for individual companies that indicate the level of each company’s financial stress. D&B’s financial stress scores are designed to help predict a business’s potential failure and the likelihood that a company will obtain legal relief from creditors or stop operations without fully paying creditors within a year of closing. Other proprietary data sources exist (e.g., Hoovers); most provide some measure of a company’s risk profile.

**Business Retention Surveys / Interviews**

Business retention and expansion surveys can also be used to gather data on the health and needs of local manufacturers. An organized layoff aversion program should settle on a set of company benchmarks and include those questions in business retention and expansion surveys and interviews. Coordinating and tracking these data streamline the connection between traditional BRE programs and layoff aversion efforts.

**Soft Data Sources**

To complement hard data sources, it is critical to build an alert network of insider stakeholders that can raise the alert when a manufacturer in the community looks headed for trouble. The specific partners to include in an alert network will vary by community and context.

Early warning network members and sources of leads may include:

- **Private Industry Managers and Owners:** Private industry managers and owners may be the best source of non-public information on the state of industries in a region. Thus, outreach efforts aimed at engaging these leaders and sharing information is critical for developing an early warning network.

- **Financial Institutions & Banks:** Though area financial institutions generally cannot release private financial information on at-risk firms, developing relationships with area lenders may foster informal information channels that can help identify area firms that are at risk of financial stress.

- **Local Economic Development Organizations:** EDOs with robust business retention and expansion programs are often privy to non-public information about the health of certain manufacturing firms.
- **Labor Unions**: By virtue of their direct role in working with manufacturing management and employees, unions can often identify at-risk manufacturing firms, particularly as related to impending layoffs.

- **Manufacturing Extension Partnership Centers**: Manufacturing Extension Partnerships exist in virtually every state and are part of a formal network coordinated by the National Institute of Standards and Technology. These public-private partnerships work actively with manufacturers on a wide range of issues and may have information about the health of different firms in a region.

- **Local Elected Officials**: Local and state government officials may be informed ahead of time of impending plant closings or mass layoffs, depending on their relationships with local manufacturing firms (for example, if an at-risk firm has obligations to the state or municipality as part of a formal incentive program).

- **Small Business Development Centers**: Though considered more of a resource for assisting business start-ups, SBDCs often work with existing small and medium-sized firms to assess firms' financial and market positions, particularly in weak economic times when a company is undergoing financial stress from lagging sales and product demand.

- **Trade Associations**: Trade associations are also an important source of referrals to some early warning networks.

- **Civic Organizations**: Companies that have long track records of participating in civic organizations but cease to do so may be headed for trouble. A company that is planning to move off shore may no longer see the need to invest in local civic obligations, and a company that is hitting tough financial times may not be able to afford civic expenditures. Either way, companies that suddenly stop participating in civic activities deserve closer attention.

### Example Layoff Threat Dashboard

Table 14 provides an example layoff threat dashboard intended to help economic developers identify and prioritize firms that may be at risk of layoffs or plant closings. The purpose of this tool is to combine diverse sources of alert information into a single snapshot.

In this example, Company A looks to be in serious trouble. Both hard data sources and alert network members have identified the company as at-risk, so there is a strong likelihood that the firm will need assistance in the near future. Company B may have challenges to overcome, but does not appear to be in dire straits like Company A. Company C looks to be in the clear for now.

The next section provides guidance on mapping the resources that are available to struggling manufacturers. If Company A is in as much trouble as it appears, it may be necessary to rapidly marshal all available assistance to avoid significant layoffs.
Table 14: Example Layoff Threat Dashboard

<table>
<thead>
<tr>
<th>Source</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical Indicators (Hard Data)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker Adjustment &amp; Retraining Notifications (WARN)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade Adjustment Assistance (TAA)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Unemployment Insurance Claims</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proprietary Market Data (e.g. Dun &amp; Bradstreet)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Network Alerts (Soft Data)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Industry Managers / Owners</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Institutions &amp; Banks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Economic Development Organizations</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor Unions</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Manufacturing Extension Partnership Centers</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Local Elected Officials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Business Development Centers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade Associations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Alerts</strong></td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
**Technical Assistance Network Map**

Given the wide range of issues that threaten a manufacturer, a wide range of expertise may be needed to keep a firm afloat. It’s therefore critical to have available sources of assistance mapped out ahead of time.

Table 15 below is designed to help economic development organizations and stakeholders identify resources and partners that can assist troubled firms and avoid or minimize layoffs. No two communities will have the same resources or potential partners, but this basic guide can help identify community assets available to provide technical assistance to troubled firms.

**Table 15: Technical Assistance Asset Mapping Tool**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Likely Partners</th>
<th>Contact Information</th>
<th>Strength of Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Financial Restructuring</strong></td>
<td>Manufacturing Extension Partnerships (MEP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Banks &amp; Financial Institutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Small Business Development Centers (SBDC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In-House Economic Development Organizations (EDO)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Business Model Improvements</strong></td>
<td>Manufacturing Extension Partnerships (MEP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Small Business Development Centers (SBDC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Production Line Improvements</strong></td>
<td>Manufacturing Extension Partnerships (MEP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>University Research Extension Programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Workforce Development</strong></td>
<td>Workforce Investment Boards (WIB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community Colleges</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Local Politicians</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Universities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ownership Transition</strong></td>
<td>Manufacturing Extension Partnerships (MEP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Technology Acceleration</strong></td>
<td>Manufacturing Extension Partnerships (MEP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>University Research / Extension Programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Supply Chain Development / Management</strong></td>
<td>Manufacturing Extension Partnerships (MEP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market Development</strong></td>
<td>Manufacturing Extension Partnerships (MEP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Small Business Development Centers (SBDC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>University Research Partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Transportation and Logistics Self-Assessment Tool

Transportation and logistics assets are increasingly important to the location of manufacturing operations. As transportation costs increase and delivery schedules tighten, manufacturers must choose where to locate with great care.

This means that it is vital for economic developers to understand their communities’ comparative standing in the global transportation system. This tool is designed to assist in identifying the transportation and logistics metrics that manufacturers, site selectors, and logistics firms use to evaluate community strengths and weaknesses.

Table 16 below contains a breakdown of many of the leading metrics that today’s manufacturers use to evaluate where to locate production operations. This tool is organized by type of transportation strength or weakness. For each category, the tool provides metrics, a description of why each metric is important, and possible sources of information on specific communities.
### Table 16: Transportation and Logistics Self Assessment Guide

<table>
<thead>
<tr>
<th>Metric</th>
<th>Significance</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RAIL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of rail providers</td>
<td>Whereas a single rail provider essentially operates as a monopoly, multiple providers compete in price and quality. Secondary lines can serve as a backup resource; in case of a malfunction on one line, freight can be rerouted to another.</td>
<td>The Intermodal Association of North America (IANA) provides a by-city directory of rail providers serving intermodal terminals (<a href="http://www.intermodal.org/skedz/index.php">http://www.intermodal.org/skedz/index.php</a>).</td>
</tr>
<tr>
<td>Dependable rail infrastructure</td>
<td>Large volumes of freight require heavy, well-maintained tracks that minimize the risk of derailment.</td>
<td>Rail providers and local public transit authorities typically publish maps of local and regional heavy and light rail lines.</td>
</tr>
<tr>
<td>Number and capacity of rail interchanges</td>
<td>Interchanges should be able to accommodate long trains. Inadequate interchanges can delay transfers between rail lines and cause congestion.</td>
<td>Rail providers and local public transit authorities can help to identify interchange needs.</td>
</tr>
<tr>
<td>Type of rail service</td>
<td>There is a major different between class 1 and short-line rail service. Capturing and listing the type(s) of rail service provided in your community can be just as important as whether rail exists or not.</td>
<td>Rail service providers</td>
</tr>
<tr>
<td>Accessible class 1 rail lines</td>
<td>Class 1 rail lines also differ on a variety of important characteristics, particularly the destination markets that they serve. As such, it is vital to know which Class 1 rail lines are accessible from your community.</td>
<td>Rail service providers</td>
</tr>
<tr>
<td>Minimum load requirements</td>
<td>Most rail companies have minimum load sizes needed to maintain service, particularly daily service. This can determine whether rail service is a viable option for specific manufacturing firms, particularly firms that do not regularly move large amounts of freight.</td>
<td>Rail service providers</td>
</tr>
</tbody>
</table>
## ROADS

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity of interstate or limited access, 4-way national highway system</td>
<td>Highway access is a top priority for manufacturers who rely on trucking services as a baseline transport mode. Furthermore, highways are typically more reliable, faster and safer than other roads. The Federal Highway Administration depicts state maps of the national highway system, including interstates and intermodal connectors (<a href="http://www.fhwa.dot.gov/planning/nhs/">http://www.fhwa.dot.gov/planning/nhs/</a>).</td>
</tr>
<tr>
<td>Quality of highways (congestion, maintenance level)</td>
<td>Any benefits provided by a highway are quickly eliminated if traffic is constantly rerouted by maintenance work or if congestion is high. EDOs should focus on the number of highway lane miles in the area rather than the number of route miles. The Texas Transportation Institute provides detailed data by city on congestion, using a comprehensive set of metrics including congestion cost (<a href="http://mobility.tamu.edu/ums/congestion_data/">http://mobility.tamu.edu/ums/congestion_data/</a>). The American Society of Civil Engineers' infrastructure reports offer a general overview by grading states and large cities on their congestion levels.</td>
</tr>
<tr>
<td>Obstacles along the highway (bridges, overpasses, tunnels, etc.)</td>
<td>Manufacturers that must move large parts (such as wind turbine towers) are very concerned with road obstacles, which can delay or prevent transport. EDOs trying to attract wind manufacturers especially should focus on this metric, perhaps doing fieldwork to gather this information.</td>
</tr>
<tr>
<td>Alternative transportation routes to highway</td>
<td>Alternative routes are established along national highways and state routes to connect secondary towns and cities to major roads. These routes are typically longer in distance than highways, but also usually suffer less congestion. Alternative routes are a valuable resource to manufacturers because freight can be rerouted in case of problems on main highways. Maps provide a preliminary overview of alternative routes. EDOs can also consult with existing manufacturers on what alternative routes they use and for what purposes.</td>
</tr>
<tr>
<td>Road traffic congestion</td>
<td>As road and highway traffic congestion increases, it is more important for manufacturers to have access to rail and intermodal services. State departments of transportation, Bureau of Transportation Statistics</td>
</tr>
</tbody>
</table>
## TRUCKING

| Number of trucking agencies in area | Trucking services are a must-have for manufacturers transporting across land or across other modes of transport. Having multiple trucking agencies serve the area helps ensure competitive pricing. | TruckDriver.com manages a directory of trucking agencies obtained from U.S. Department of Transportation registration records. The directory provides information on fleet, cargo types, contact information and more, and is searchable by state and zip code. |

| Type of trucking service | Like rail, there is a significant difference between long-haul and local trucking service. Some manufacturers can have their needs serviced by local trucking firms, but for many, long-haul service is essential. Therefore, it is important to develop separate lists of types of trucking firms that service your community. | Trucking service firms |

## AIRPORTS/PORTS

| Availability of air freight services at airports | Air freight transport is key to serving international markets. Some airports have adjacent air cargo logistics facilities with building storage and parking space for logistics operations. These logistics centers typically have rail and waterway connections, allowing for intermodal transport. It is also important for airports to have expansion space to accommodate increased demand, or be located near other airports that can provide backup air freight services. | Airports |

| Number of air freight service providers at airports and ports | As with rail, multiple air freight providers ensure competitive pricing and quality of service, and serve as backup in case of emergencies or sudden increased demand. | This information can also be found by contacting airports. Some airports and ports provide listings of freight transport companies that service the facility. |

| Foreign markets served by airports/ports | Exporters need direct connections to specific foreign markets. EDOs can research what international markets are served at airports/ports, as well as what markets could potentially be served. | This information can be provided by contacting airports and ports. In addition, local manufacturing firms may be able to provide insight into the markets served. |
| Speed of customs at airports/ports | International airports/ports are often served by customs brokers who help facilitate and streamline the customs process for importers and exporters. Customs brokers can greatly expedite import/export processes, especially regarding sensitive materials such as medical equipment or perishable foods. | This information can be provided by contacting airports and ports. Airports/ports serving freight customers also frequently post a directory of customs brokers online. |
| INTERMODAL HUBS | | |
| Availability of intermodal facilities | Intermodal transport helps manufacturers efficiently transfer between various modes of transport, decreasing costs and transport time. For example, shipments brought into a port can be quickly loaded onto a truck in a standardized container. Trucks can transport locally to rail, which is typically cheaper over long distances. The growth of international markets in recent decades further necessitates smooth transfer between transport modes. Local/state agencies can evaluate their transportation infrastructure to determine where bottlenecks in the transportation supply chain are and how to invest public transportation funds accordingly. | The Federal Highway Administration has conducted several national-scale studies on the condition and needs of intermodal freight transport. The Intermodal Association of North America (IANA) also provides networking and educational resources. In some cases, it may be necessary to engage consulting firms to evaluate the intermodal assets that are relevant to your community. |
| Average processing time | There is significant variance in how long it takes intermodal hubs to move cargo from one form of transit to another. As such, it is important to know the speed at which goods move through the intermodal hubs that are available to your community. | Local or regional intermodal facilities |
| Major markets served by relevant intermodal facilities | The location and connectivity of an intermodal facility can have a large bearing on which destination markets it can competitively serve. As such, it is important to know which destination markets are easily accessible from the intermodal facilities in your region. | Local or regional intermodal facilities |
## TIME TO MARKET

| Distance to different markets | Manufacturers typically favor proximity to large markets to minimize travel time to their customers. Of course, manufacturers wish to be close to different types of markets, whether they are concentrations of people, natural resources like solar and wind, or other manufacturers. | EDOs should pinpoint the specific markets of target industries and use a mapping tool to determine distance to markets served by existing transportation infrastructure. |
| Travel time to different markets | Transport time and ground distance are not interchangeable. While distance is a necessary measure, travel time serves as a more accurate estimation of markets' proximity. | Depending on the type of transport involved, there are many sources of information on transit time to different destination markets. The Federal Highway Administration provides information on highway freight travel time. Rail, trucking, air freight, shipping, and logistics firms all can provide additional information on travel time to specified destination markets. |

## GOVERNMENT

| Typical response time to delays, inefficiencies, safety concerns | This metric is tied to the overall quality of infrastructure. Swift action in dealing with emergencies helps to minimize congestion and further delays. Also, a government's responsiveness to transportation concerns typically signals that it is sensitive to the needs of modern business. |
| Planned infrastructure improvements | A manufacturer looks not only for current infrastructure capacity, but also a city or state's dedication to future expansion to accommodate economic growth. Future improvements should be accompanied by a sensible plan to temporarily reroute traffic during the construction process. |
## WORKFORCE

| Logistics skills available | As transportation and logistics becomes more technical, it is increasingly important for communities to cultivate the skilled workforce needed to provide top-notch service. Therefore, it is important to know and market the transportation and logistics expertise of your regional workforce. | Workforce Investment Boards, Bureau of Labor Statistics, local logistics firms |
CHAPTER 10
Federal Resources

Department of Commerce

Manufacturing Extension Partnership (MEP)
The Hollings Manufacturing Extension Partnership (MEP), housed in the National Institute for Science and Technology, was created in 1988 with the goal of helping small and medium-sized manufacturers to survive, grow, and create jobs. At a budget of less than $130 million in 2011, the MEP is hardly the largest program in the federal government’s portfolio of support for manufacturing, but it provides an enormous variety of services. Today, MEP supports 60 regional centers, with over 370 field locations, in all 50 states.

MEP centers come in many shapes and sizes. Some centers are housed in state economic development offices, some in universities, and some are stand-alone organizations. Each MEP center must secure two dollars in local funding for every one dollar in federal investment. Once the local matching funds are included, the total budget for all MEP centers is nearly $300 million. Local support can come from state and local governments, universities, and fees paid by manufacturers for services rendered. While the federal government provides financial and organizational support, each center is independently operated and retains its own brand name. EDOs can work directly with their local MEP center.

As the MEP program has matured, the diversity of expertise available through the network has increased. Whereas MEPs focused heavily on strategic or lean management practices throughout much of the 2000s, the centers have broadened their efforts substantially in recent years to support a broader range of manufacturing competencies.

MEP centers focus on helping manufacturers to improve in the following core areas:

- Technology acceleration
- Supplier development
- Workforce
- Sustainability
- Continuous improvement

EDOs can leverage the resources of MEP centers in a variety of ways. Often, small and medium-sized manufacturers don’t know of the range of resources that MEP centers have to offer, so EDOs can play a vital role by connecting manufacturers to the resources available through MEPs.

MEP centers can be particularly effective partners for business retention and expansion efforts. In the most dire cases, MEP centers have been able to save manufacturing companies that otherwise would have folded or moved elsewhere by helping them to improve their business or production models. MEP centers can also
alert EDOs about firms that may be in trouble.

MEP centers can help manufacturers overcome many of the challenges that traditionally come with expansion. MEPs have successfully helped manufacturers to:

- Find new technologies that improve their products or processes
- License research conducted in public laboratories
- Identify and satisfy the requirements in order to secure federal government procurement opportunities
- Find new suppliers for specialized components
- Reduce waste and cost as production scales up
- Develop effective management systems
- Improve transportation and logistics systems
- Develop sufficient information technology systems
- Identify and pursue export markets
- Find and cultivate skilled workers

Every one of these challenges can stymie a company’s growth. As MEP has worked on such a range of issues, it has developed a national network of expertise that can be tapped. If an MEP center in your community or state does not specialize in a particular type of production or management issue, chances are that someone at a different MEP center is a world-class expert on the issue.

Connecting with MEP Services

MEP is still a developing program. It is actively seeking to distribute its resources into more communities and to increase its ability to assist manufacturing companies. In most cases, a local EDO should contact the MEP center in its region or state, even if the center does not have a physical presence in the community.

Website

http://www.nist.gov/mep/

Regional Offices

http://www.nist.gov/mep/find-your-local-center.cfm

Economic Development Administration

Economic Adjustment Assistance

Economic Adjustment Assistance (EAA) is a program of the Department of Commerce that provides technical, planning, public works and infrastructure assistance to regions experiencing acute or chronic economic dislocations. Economic Adjustment Assistance can help manufacturers with strategy development to produce goods and reach markets more effectively.

EAA generally provides assistance on larger, community-wide issues such as infrastructure development. EDOs can work with their community to develop strategies for economic recovery.

Website

http://www.eda.gov/AboutEDA/Programs.xml

Regional Contacts

http://www.eda.gov/AboutEDA/Regions.xml
Trade Adjustment Assistance for Firms (TAAF)
TAAF assists manufacturers negatively impacted by international imports. TAAF is a matching program, providing 50 percent of the cost of consultants, engineers, designers, or industry experts to improve competitiveness. The funds flow directly from TAAF to the consultant, allowing the manufacturer to put its resources into the recommended improvements.

EDOs can help manufacturers make contact directly with TAAF offices in their area.

Website
http://www.eda.gov/Research/TradeAdj.xml

Regional Contacts
http://www.eda.gov/AboutEDA/Regions.xml

National Digital Engineering and Manufacturing Consortium
The program is designed to catalyze development of new technology to accelerate the design process and make small and medium-sized companies more competitive. The program also aims to foster collaboration between large manufacturing firms and their small and medium-sized supply chain manufacturers, and provide advanced manufacturing modeling and simulation resources that use high-performance computing (HPC) technologies. HPC technologies speed the design process and provide a realistic model of the final product.

Website
http://www.eda.gov/NewsEvents/PressReleases/20110302_CouncilonComp.xml

Local Resources
http://www.eda.gov/Contacts/Contacts.xml

International Trade Administration (ITA)
ITA enforces America’s trade laws and agreements. ITA is divided into four complementary but distinct units:

- U.S. Foreign and Commercial Service
- Manufacturing and Services (MAS)
- Market Access and Compliance (MAC)
- Import Administration

The U.S. Foreign and Commercial Service is ITA’s trade promotion arm. EDOs can help businesses that feel they have been harmed by unfairly priced or subsidized products through the Petition Counseling and Analysis Unit. On a global level, ITA conducts trade advocacy on behalf of U.S. companies to level the playing field for international procurement.

While all of ITA’s activities can benefit EDOs, the MAS unit is particularly relevant for organizations providing manufacturing support in local economies. The MAS unit of the ITA focuses on increasing American exports, improving the global competitiveness of U.S. industry, providing access to international markets for exporters, and fostering policy development. President Obama has pushed for investment in ITA as part of his broader effort to boost job creation and economic recovery through export promotion.

MAS oversees the Market Development Cooperator Program (MDCP), which works with representatives of U.S. industry to assist private enterprises. EDOs are ideal candidates to use an MDCP award to
benefit an entire community. Grants can be used to leverage free trade agreements to maximize the benefit to local economies, translate and publish product brochures and company directories, help U.S. industries capitalize on effective global supply chain strategies, and expand exports of emerging American technologies, among other uses.

Website

http://trade.gov/

Regional Offices

http://www.trade.gov/cs/states/csinyourstate.asp

Foreign Trade Zones

A foreign trade zone is a government-designated business area in the United States where companies can take advantage of special procedures to encourage economic activity and add value to their operations. Foreign trade zones help American businesses by allowing delayed or reduced duty payments on foreign merchandise, as well as offering other benefits. Once granted zone status and separately approved for FTZ activation by a local U.S. Customs and Border Protection official, businesses may use the zone for business operations. FTZ sites and facilities remain within the jurisdiction of local, state or federal governments or agencies.

Communities can establish both general-purpose zones and subzones. Manufacturers may operate within foreign trade zones, but more often manufacture within specially designated subzones.

The International Trade Administration provides guidance to EDOs looking to get involved in the FTZ process. The online FTZ Manufacturing Center can provide EDOs with guidelines, sample successful grant applications, and a calculator tool for potential savings within a FTZ. These savings can be significant and can encourage a community to maximize the benefits of the export market.

EDOs can play a role in helping communities determine if the application process for a foreign trade zone is worth the time and expense involved. The application process can take about a year and approval comes with significant security and operating costs. EDOs can begin this process by analyzing the level of international trade in their area.

Website

http://ia.ita.doc.gov/ftzpage/grantee/staff.html

Regional Contacts

http://ia.ita.doc.gov/ftzpage/grantee/staffbyregion.html

FTZ Manufacturing Center

http://ia.ita.doc.gov/ftzpage/info/toolbox.html

CommerceConnect

CommerceConnect is designed to unify Department of Commerce (DOC) programs under one roof. Starting with a pilot location outside of Detroit, Michigan, and expanding to 16 economically and regionally diverse locations in 2011, CommerceConnect operates facilities staffed by specialists trained in the broad range of DOC programs. CommerceConnect ultimately aims to create virtual “one-stop shops” throughout the country so that entrepreneurs nationwide
can receive the kind of manufacturing support Detroit now enjoys.

CommerceConnect office specialists act as “case workers” for individual businesses seeking assistance. These case workers can help manufacturers by offering assessments that meet a business full spectrum of needs, including access to capital, intellectual property protection, export promotion, and guidance on how to make operations more efficient. EDOs can help alert business owners to CommerceConnect’s services. EDOs can also reach out to CommerceConnect personnel directly for more information.

Website
http://commerceconnect.gov/

Regional Offices
http://commerceconnect.gov/about/ouroffices000170.asp

Small Business Administration (SBA)

The SBA is the largest federal source of financing for small firms. Through its two main loan programs, 7(a) and 504, the SBA provides over a billion dollars in financing per year to small manufacturing firms. Thousands of firms across the country use these financing tools each year, making the SBA one of the most important sources of working and growth capital for small manufacturers. SBA programs often make it possible for manufacturers to survive and grow in cases when the private debt market is unwilling to provide financing. As outlined in more detail below, the SBA has taken strides to make its financing programs more accessible for manufacturing firms.

The SBA also provides a range of technical assistance services to small manufacturers through Small Business Development Centers and Procurement Technical Assistance Centers.

7(a) Loan Guarantee Program

The 7(a) program is SBA’s largest and most popular program. Designed for small businesses that are unable to obtain conventional financing, 7(a) funds can be used to finance a new business or the acquisition, expansion, or operation of an existing business. In 2010, the maximum loan size was permanently increased from $2 million to $5 million.

Although the loan comes directly from a financial institution, SBA guarantees the majority of the loan value. This significantly lower risk profile can make banks more willing to lend. However, SBA cannot force
financial institutions to approve loans. Each bank has its own internal loan qualification process, and being denied a loan at one bank does not mean the same 7(a) loan application will be denied at another bank or non-bank lender. Therefore, it is recommended that business owners approach multiple institutions at the outset of the loan process. It is up to each individual owner to negotiate the terms and conditions of the loan.

SBA offers a variety of special purpose 7(a) loans, which are outlined below.

**CAPLines**
This program provides capital to companies that need short-term and cyclical funding through a line of credit. It is divided into five different loan types: the Seasonal Line, the Contract Line, the Builders Line, the Standard Asset-Based Line, and the Small Asset-Based Line.

**Community Adjustment and Investment Program (CAIP)**
CAIP was instituted to assist companies in areas of the U.S. that have been negatively impacted by the North American Free Trade Agreement (NAFTA). This program pays lender fees on qualifying SBA-backed loans, as these fees can be sizeable on larger loans. The CAIP program lowers borrowing costs and allows the SBA loan programs to reach an even wider net of companies. Eligibility requires the company to be located in a county that has been deemed negatively affected by NAFTA in terms of job losses and the unemployment rate. In addition, the program requires one job to be created for every $70,000 of 7(a) loans or $65,000 of 504 loans. Currently, 24 states have counties that have been labeled as CAIP-eligible.

**Export Loans**
In addition to the special purpose loans, the 7(a) program includes various export loan programs. SBA estimates that approximately 70 percent of all U.S. exporters have 20 or fewer employees. Since exports are vital to the American economy, SBA is making every effort to support this sector. The program is run through a network of SBA officers located in U.S. Export Assistance Centers throughout the country. These experts can explain the various program offerings in detail and offer advice to business owners. They can also connect companies with outside resources to help bolster their exports.

**Export Express Loans**
This program offers streamlined financing of up to $500,000 for companies that are at least one year old and can demonstrate that the loan funds will buttress their export activities. Funds can be used for classic purposes like factory expansion and equipment purchase, but they can also be used to cover the cost of attending a foreign trade show. Or, the loan can be used to translate marketing materials into a foreign language.

**Export Working Capital Program**
This program provides companies with loans in advance of finalizing an export sale or contract. This allows companies greater flexibility to negotiate payment terms, as they do not have to worry about obtaining last-minute production capital. The money can be used to finance suppliers, inventory, or the production of export goods. It can also serve as working capital during extended payment cycles.
International Trade Loan Program
This program provides financing to companies that plan to start or continue exporting, or that have been adversely affected by competition from imports. SBA will guarantee up to $1.75 million of the loan as long as it improves the competitive position of the borrower. However, these funds can also be used to refinance a previous loan that has been used for the same purposes.

SBAExpress
SBAExpress provides expedited loan procedures for targeted groups of borrowers, including military personnel, veterans, and borrowers from distressed communities.

Community Advantage
This pilot initiative is designed to increase the volume of SBA loans that reach underserved communities. This program also features expedited processing, with turnaround generally within 10 business days.

Small Loan Advantage
This program is geared to encourage large, existing SBA lenders to offer smaller loans. The effort is partially designed to increase financing in underserved markets.

504 Loan Guarantee Program
The SBA 504 loan guarantee program is one of the primary sources of federal financing for small manufacturing firms. The 504 program is designed to help small businesses finance growth costs. Many manufacturing firms across the country use 504 loan guarantees each year to finance plant expansions, retrofits, equipment purchases, and other expansion costs.

504 loan guarantees are administered through Certified Development Companies (CDCs). CDCs are private, nonprofit corporations set up to contribute to economic development in a community. Many local EDOs have chosen to establish themselves as CDCs to streamline the loan granting process.

Assisting small manufacturers is explicitly identified as one of the community development goals of the 504 program. To that end, SBA has adjusted some of the program requirements to make it easier for manufacturing firms to qualify. These adjustments include:

- **Relaxed job creation requirement:** 504 loans usually carry a cap of $50,000 per job created. This limit is increased to $100,000 per job for manufacturing firms.
- **Increased maximum loan size:** Small manufacturers may access $5.5 million in 504 guarantees, instead of the $5 million maximum for non-manufacturing firms.
- **Maximum applied per project instead of per company:** In the most significant adjustment, SBA considers loan maximums for manufacturing firms on a per-project basis. For non-manufacturing companies, the $5 million cap applies to all projects, whereas manufacturers can access up to $5.5 million in loan guarantees for each project that needs financing.

Website
http://www.sba.gov/category/navigation-structure/loans-grants/small-business-loans/sba-loan-programs
Regional Offices

http://www.sba.gov/about-offices-list/2

Small Business Investment Companies
Small Business Investment Companies (SBICs) are privately managed investment funds that mix their own resources with those provided by the SBA to provide equity investment and debt financing to small businesses. SBICs are licensed by the SBA, but the SBA does not invest directly in individual small businesses. SBICs vary according to whether they provide debt financing, equity investment, or a combination of the two.

Website

http://www.sba.gov/content/sbic-program-0

List of SBICs by State


Microloan Program
The Microloan program provides relatively small, short-term loans to small businesses through non-profit, community-based organizations with experience in lending, management, and technical assistance. The maximum loan amount is $50,000, while the average is about $13,000. Loans serve a variety of purposes. While some small manufacturers use SBA’s Microloan Program, the financing needs of most firms surpass the maximum allowable, so this program is not a primary source of financing for manufacturers.

Website

http://www.sba.gov/content/microloan-program

Regional Offices

http://www.sba.gov/about-offices-list/2

Small Business Development Centers (SBDCs)
SBDCs are located in all 50 states, as well as the District of Columbia, Puerto Rico, and U.S. territories. SBDCs are operated at a state-wide or region-wide level. The SBA has 63 lead SBDCs. Each lead organization coordinates program services offered to small businesses through a network of sub-centers and satellite locations in each state. Each center has a director, staff members, volunteers and part-time personnel.

SBDCs offer a range of services to small manufacturers, including:

- **Financing guidance**: Though SBDCs are not sources of capital per se, they often act as intermediaries between companies seeking financing and the regional lenders, banks and capital networks that may be able to finance companies in need.
- **Market analysis**: SBDCs typically offer a range of free or low-cost research products to clients. SBDCs can provide highly sophisticated reports on specific industries, industry best practices, consumer demand, and market opportunities.
- **Provide access to higher education**: Most SBDCs are affiliated with or officially part of an institution of higher learning. This is potentially important for manufacturers because SBDCs are well
situated to connect manufacturing firms to university assets and expertise that companies need (e.g., research specialties, technical assistance, and workforce training).

SBDCs can be valuable partners for EDOs working with small manufacturers. At a minimum, they can provide lists of and contacts with area firms. They also can help to identify troubled firms, identify challenges and opportunities for firms in a region, connect small firms with each other, develop regional supply chains, and a host of other important business retention and expansion functions.

**Website**

http://www.sba.gov/content/small-business-development-centers

**Regional Offices**

http://www.sba.gov/about-offices-list/2

**Procurement Technical Assistance Centers**

Procurement Technical Assistance Centers provide assistance to small businesses seeking to sell products to local, state, or federal governments. Counseling can be provided locally and in-person. All services are either free or low-cost. The federal government sets aside certain contracts for special categories of businesses, such as women-owned, minority-owned, or HUBZone. The centers can help business owners research past winners to help improve their chances of success.

Procurement Technical Assistance Centers can help manufacturers determine if they are ready for government contracting. To be eligible, businesses must have sufficient resources to commit to the process of government contracting. The centers can help businesses take advantage of federal databases that they need to register for, and determine if businesses would benefit from additional certification. These certifications can sometimes help manufacturers become more competitive if they are worth the time and financial investment to the business.

**Website**

http://www.sba.gov/content/procurement-technical-assistance-centers-ptacs

**Regional Offices**

http://www.sba.gov/about-offices-list/2
National Institute of Standards and Technology

Engineering Laboratory
NIST's Engineering Laboratory invests in manufacturing technologies and services related to scientific measurement, engineering tools, and standards and codes. It operates through five divisions: Materials and Construction Research, Building Environment, Fire Research, Intelligent Systems, and Manufacturing Systems Integration.

Manufacturers can enter into a Cooperative Research and Development Agreement (CRADA) with the Engineering Laboratory, in which the partners conduct joint research and share staff, equipment, facilities and/or funds. Companies can also access the lab's technical experts by engaging them in a research and development contract.

NIST, the parent agency, provides competitive grants to fund research in precision measurement, fire research, and materials science. For example, NIST participates in the federal Small Business Innovation Research (SBIR) program, issuing grants to companies developing early-stage, innovative technologies. A link to a full list of NIST grant solicitations is below.

Main Website

http://www.nist.gov/el/

NIST Solicitations

http://www.nist.gov/director/ocfo/grants/grants.cfm

Internal Revenue Service

Industrial Development Revenue Bonds (Federal Tax Exemption)
Earnings on Industrial Development Revenue Bonds are exempt from federal taxes, which allows projects to be financed at a significantly lower interest rate than through conventional financing or taxable bonds. The federal government only provides the tax relief; the bonds themselves are issued by state and local governments and EDOs.

IDRBs can be used to finance equipment and real estate purchases, but not working capital and inventory. They are frequently used for building new manufacturing facilities or expanding or renovating current ones.
Department of Labor

Workforce Investment Boards

Workforce Investment Boards (WIBs) are federally designated state and local entities established under the Workforce Investment Act of 1998 to further engage the private sector in the government’s workforce development services.

To this end, the majority of each WIB is composed of business representatives, including the chair of the board. Other representatives come from government, youth, labor, workforce and human services organizations. Local WIBs help carry out the mission of the state WIB. Each local WIB is required to engage young people through Youth Councils. The Workforce Investment Act delegates responsibility to each state's governor for establishing both state and local WIBs and ensuring that they meet federal standards.

The main functions of WIBs are to direct funding for workforce development programs, research local or state workforce needs, and operate One-Stop Career Centers for job seekers. One-Stop Career Centers provide job seekers with employment information and connect them to job training programs in their area.

WIBs can be a valuable resource for workforce training. Manufacturers can join their local or state WIB to help direct workforce development activities on a broader scale. The one-stop centers also work with individual employers on their workforce needs: searching for qualified workers, training new or existing workers, providing training grants, preparing for layoffs and researching labor market conditions. Each WIB provides a slightly different array of services.

Website

http://www.doleta.gov/usworkforce/wia/

Map of One-Stop Career Centers by State
http://www.doleta.gov/usworkforce/onestp/onestopmap.cfm

Employment and Training Administration

The Employment and Training Administration (ETA) is the arm of the U.S. Department of Labor that administers most federal assistance programs for job training and employment, including unemployment insurance. It does this primarily through One-Stop Career Centers, but the ETA also has a number of other support programs to assist businesses with workforce needs. ETA also provides a variety of grants to public agencies and EDOs. These vary year by year, but in the past have targeted programs involving disabled workers, H-1B (foreign) workers, green jobs, and trade adjustment assistance. In addition to One-Stop Centers, ETA-administered programs include:

- **Federal-State Unemployment Insurance Program**: Provides temporary payments to workers who are laid off through no fault of their own.
- **Work Opportunity Tax Credit**: A federal tax incentive for private companies that hire from nine target groups with significant barriers to employment (veterans, ex-felons, empowerment zone residents, etc.). The tax credit can be as high as $2,400 per new adult hire.
• **Rapid Response Services:** The Rapid Response teams of each state are trained to help growing businesses find qualified workers and to help downsizing businesses transition through a layoff or plant closing. The teams implement the Worker Adjustment and Retraining Notification (WARN) Act, which requires companies to notify employees, the state department of labor, and the local WIB in case of mass layoffs or plant closings. This allows the Rapid Response teams to help dislocated workers transition into new jobs more quickly and to reduce the cost of unemployment insurance for the business.

• **Education and Training:** ETA offers technical assistance for worker training programs. The programs target pre-employment, on-the-job, and incumbent workers. ETA also helps businesses establish registered apprenticeships, which is a combination of on-the-job training and classroom instruction.

**Current ETA Grant Solicitations**

http://www.doleta.gov/grants/find_grants.cfm

**DOL's Primary Small Business Assistance Website**

http://www.careeronestop.org/BUSINESS/BusinessCenterHome.asp

**WARN Handbook for Employers**


**State Unemployment Insurance**

http://www.servicelocator.org/OWSLinks.asp

**Rapid Response Coordinators by State**

http://www.doleta.gov/layoff/rapid_coord.cfm

**Eligible Training Providers by State**

http://www.careeronestop.org/WiaProviderSearch.asp

**State Offices of Apprenticeship**

http://www.doleta.gov/oa/stateoffices.cfm
Department of Energy

Industrial Technologies Program

Save Energy Now
Save Energy Now is a new initiative of the Industrial Technologies Program (ITP). ITP works under the Office of Energy Efficiency and Renewable Energy at the Department of Energy. Save Energy Now is designed to form alliances with private organizations to advance energy efficiency. The program is designed to strengthen America’s energy security, environmental quality, and economic vitality. Industrial companies must pledge to improve their energy efficiency by 25 percent in 10 years to become eligible. Successful applicants will receive a thorough assessment of their potential for energy efficiency.

Save Energy Now provides consulting and technical assistance directly to manufacturers. Manufacturers can use these resources to identify ways to improve the energy efficiency of their activities. Companies signing the Save Energy Now LEADER pledge have priority access to energy assessments and other resources. Companies that choose not to sign the pledge may also access DOE training resources to identify shortcomings in their energy efficiency efforts and resolve these problems. Manufacturers can access online resources immediately through the DOE website. Manufacturers may also contact a training coordinator to get more information on in-person trainings taking place throughout the country.

Website
http://www1.eere.energy.gov/industry/saveenergynow/

Regional Contacts
http://www.ie.energy.gov/field.htm

Training Contacts
DOEITPTraining@ppc.com

National Renewable Energy Laboratory (NREL)
NREL is the primary American laboratory for research and development (R&D) of renewable energy and energy efficiency technologies. NREL accelerates research from scientific innovations to market-viable alternative energy systems. NREL scientists and researchers support critical market objectives. NREL divides its efforts into R&D and technology transfer and commercialization. NREL’s four core R&D competencies are:

- Renewable electricity conversion and delivery systems
- Renewable fuels formulation and delivery
- Efficient and integrated energy systems
- Strategic energy analysis

NREL offers five main avenues for R&D and commercialization:

- **Cooperative research and development agreements (CRADAs):** When NREL and a partner intend to collaborate on a project, a CRADA protects the existing intellectual property of both sides. A CRADA allows the company to negotiate for an exclusive field-of-use license to potential innovations arising out the
partnership. NREL and a partner may establish different kinds of CRADAs. For example, a shared-resources CRADA involves a joint project that proceeds without funds changing hands, which must fit within the scope of a Department of Energy-funded NREL project.

- **Technology Partnership Agreements**: Technology Partnership Agreements provide partners with technical support to help commercialize and deploy energy technologies and products. NREL does not fund any projects under a technology partnership agreement. The partner provides the necessary resources and covers NREL's expenses for providing technical services.

- **Work-for-Others Agreements**: Work-for-Others Agreements (WFOs) are used when a partner seeks technical services to complete a project but does not intend to perform joint research. The partner pays the costs of the work and provides NREL with the necessary resources. They are broken into four kinds of agreements: Interagency Agreement-Government (IAG), Funds-In Agreements (FIA), Technical Services Agreement (TSA), and Analytical Services Agreements (ASA). In IAG, an agency other than DOE provides funds directly to NREL. DOE and the agency are still the parties to the agreement. In an FIA, a research project is sponsored by a non-federal entity. The government uses a nonfederal project sponsor to obtain title to inventions. A TSA is an agreement between NREL and a non-federal entity for NREL to provide assistance with an analytical problem. In an ASA, nonfederal sponsors pay for specialized, narrow analytical services performed by the lab in 13 different categories of testing or characterization services. The maximum work duration is three months and the maximum value is $25,000.

**Energy Innovation Portal**

http://techportal.eere.energy.gov/

**Website**

http://www.nrel.gov

**Regional Offices**

http://www.nrel.gov/contacts/
Department of Defense

**ManTech**

ManTech is a program of the DOD targeting high-risk, high-priority defense technologies developed by the private sector. ManTech focuses on accelerating technologies in the R&D phase into production. The Army, Navy, Air Force, and Defense Logistics Agency each have a unique ManTech program catering to their respective technology needs. All four organizations participate in the Joint Defense Manufacturing Technology Panel, which helps coordinate the ManTech program across all DOD agencies.

ManTech provides funding for commercialization of priority defense technologies. Its focus has included advanced electronics, advanced materials, information systems, robotics, and sensor systems. ManTech's centers of excellence also house specialized equipment that can be used for joint projects with defense contractors. The centers also provide technical expertise to Army and Navy contractors.

**Main Website**

[www.dodManTech.com](http://www.dodManTech.com)

**Army ManTech**


**Navy ManTech**


**Air Force ManTech**


**Defense Logistics Agency ManTech**


**Defense Advanced Research Projects Agency (DARPA)**

DARPA is the Department of Defense's primary vehicle for investing in cutting-edge defense technologies. The agency is divided into six arms serving various technology platforms:

- **Adaptive Execution Office**: Focuses on transitioning new technologies into use on the ground.
- **Defense Sciences Office**: Identifies most promising concepts in the sciences for defense applications.
- **Information Innovation Office**: Handles technology related to the transfer of information.
- **Microsystems Technology Office**: Develops defense systems, including mechanics, electronics, algorithms, architectures and photonics.
- **Strategic Technology Office**: Focuses on innovative war strategies such as those involving energy, self-sufficient operations, networks and electronic warfare.
- **Tactical Technology Office**: Develops tactical technology and advanced weaponry.

DARPA also operates a Disruptive Manufacturing Technologies Program that focuses exclusively on manufacturing small volumes at short lead times.
Environmental Protection Agency

Office of Brownfields and Land Revitalization

The EPA Brownfields Program works to empower EDOs and other community stakeholders to assess, improve, and redevelop sites that are or may be polluted. Potential projects can range from the very large, such as major manufacturing sites, to the very small, such as disused gas stations with buried fuel tanks. Redeveloped areas may be repurposed for new industrial uses, community activities, or to support new businesses. EDOs, as well as local and state government personnel, EPA staff, tribes, and nonprofits with active EPA Brownfields Cleanup Grants may request direct support at no cost. EDOs bring unique insight and familiarity with local entrepreneurs and the regional manufacturing landscape to the brownfields redevelopment process.

The Brownfields Program provides a range of financial assistance grants through the four central programs described below. Approximately 40 to 45 percent of industrial projects supported by these programs are redeveloped into new industrial sites. Of the industrial reuse projects, industry experts expect roughly one quarter will be geared to manufacturing.

Brownfield Assessment Grants

Brownfield Assessment Grants are available for pre-cleanup activities, such as inventorying brownfield sites, site investigation and environmental assessment, planning for remediation and
redevelopment, health monitoring, long-term site care, and environmental insurance.

**Brownfield Cleanup Grants**

Brownfield Cleanup Grants make up to $1 million available to communities to establish revolving loan programs. These loan programs must make no- or low-interest loans available to public or private developers for cleanup activities. The fund can provide grants to pay for cleanup on publically owned or nonprofit-owned properties. Applicants must contribute 20 percent matching funds to the project.

**Direct Cleanup Grants**

Direct Cleanup Grants provide up to $200,000 to pay for site-specific cleanup. Eligible cleanup activities must take place on publically owned or nonprofit-owned properties. Applicants must contribute 20 percent matching funds.

**Environmental Workforce Development and Job Training Grants**

EPA provides up to $300,000 for two years for environmental job training through this program. By collaborating on workforce development and job training with other programs within the Office of Solid Waste and Emergency Response, EPA hopes to empower communities to collaboratively improve the environment and promote growth. Both public and private training institutions, such as colleges, community or nonprofit job training centers, and state and local governments are eligible to participate.

Nonprofit organizations and individual applicants should be prepared for significant training requirements. These include up to 40 hours of Hazardous Waste Operations and Emergency Response (HAZWOPER) training, underground storage tank leak prevention awareness training, solid waste management or cleanup-related training (such as recycling center operating training and landfill remediation and capping), and innovative and alternative treatment technologies awareness training (such as green remediation techniques and stormwater management).

EDOs may contract for goods and services with for-profit organizations, but may not submit a joint application with such an organization. EDOs may help an applicant by providing assistance on creating an effective narrative proposal and program outline, providing references and letters of support on behalf of the organization to EPA, and sharing insights into the federal grants process.

**Website**

[www.epa.gov/brownfields/basic_info.htm](http://www.epa.gov/brownfields/basic_info.htm)

**Local Resources**

[www.epa.gov/brownfields/regcntct.htm](http://www.epa.gov/brownfields/regcntct.htm)
National Science Foundation

**Directorate for Engineering**
The National Science Foundation provides grants toward basic technology research (rather than technology applications). However, some innovations have very close manufacturing ties. NSF funds about 20 percent of all federally supported basic research at American colleges and universities and funds private-sector research as well.

NSF’s Civil, Mechanical and Manufacturing Innovation (CMMI) division has the strongest potential for manufacturing innovations. Most of the awards for engineering are made through the Directorate for Engineering, which also operates NSF’s SBIR program.

**Solicitations Website**
http://www.nsf.gov/funding/pgm_list.jsp?org=ENG

Multi-Agency Resources

**Manufacturing.gov**
This resource is a clearinghouse of information on federal programs that support manufacturing. The webpage contains tools, lists of information, databases, guidance on securing funding, lists of state and local resources, market intelligence, and a variety of other information and resources. While operated by the National Institute for Standards and Technology, manufacturing.gov is designed to guide companies and developers through the many resources available from the federal government.

**Website**
http://www.manufacturing.gov/

**Fed Biz Ops**
Fed Biz Ops allows companies and developers to search for different types of business opportunities available through the federal government. For companies trying to identify procurement opportunities, this website can provide a great deal of valuable information.

**Website**
https://www.fbo.gov/

**Green Supplier Network**
A joint venture between the Environmental Protection Agency, the Manufacturing Extension Partnership, and private industry, the Green Supplier Network assists companies that are working to improve their operational sustainability. The program engages large manufacturers and their
suppliers in assessing and implementing strategies to reduce waste and improve overall sustainability. The network facilitates technical assistance, technical solutions to sustainability challenges, and improving supply chain relationships. The Green Supplier network leverages the expertise of the Manufacturing Extension Partnership and member companies.

**Website**

DATA APPENDIX

Survey of Economic Development Manufacturing Programs

In support of this project, IEDC conducted a survey of economic development organizations that work to strengthen and grow the manufacturing base in their communities. The purpose of this survey was to identify common practices and trends in economic development programming as applied to manufacturing. The survey was sent to the full membership of IEDC using Zoomerang.com and was in the field from July 21 through July 29, 2011.

This appendix section provides some of the basic demographic information on the respondents who completed the survey. It is vital to note that this survey is not rigorously representative of the field of economic development. Most importantly, the data were gathered only from economic developers who indicated that they work directly with manufacturers. Moreover, the survey pool was not designed in a way that would permit statistical inference, as it was not balanced to reflect the regional or organizational breakdown of the universe of economic developers. All that said, the general demographic information provided below indicates that these respondents reflect a cross section of organization type and community size. As such, the data provided throughout this report can be taken as a reasonable indication of what economic developers are doing to attract and grow manufacturing firms.
### Table 17: Breakdown of Survey Respondents by Organization Type

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>Number of Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public-private partnership</td>
<td>73</td>
<td>36%</td>
</tr>
<tr>
<td>Municipal government</td>
<td>43</td>
<td>21%</td>
</tr>
<tr>
<td>County government</td>
<td>24</td>
<td>12%</td>
</tr>
<tr>
<td>Chamber of commerce</td>
<td>13</td>
<td>6%</td>
</tr>
<tr>
<td>Consultancy</td>
<td>10</td>
<td>5%</td>
</tr>
<tr>
<td>Educational institution</td>
<td>5</td>
<td>2%</td>
</tr>
<tr>
<td>Utility</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>State government</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>Federal government</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>28</td>
<td>14%</td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Table 18: Breakdown of Survey Respondents by Community Size

<table>
<thead>
<tr>
<th>Community Size</th>
<th>Number of Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10,000</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>10,000 – 24,999</td>
<td>17</td>
<td>8%</td>
</tr>
<tr>
<td>25,000 – 49,999</td>
<td>25</td>
<td>12%</td>
</tr>
<tr>
<td>50,000 – 99,999</td>
<td>32</td>
<td>16%</td>
</tr>
<tr>
<td>100,000 – 249,999</td>
<td>48</td>
<td>24%</td>
</tr>
<tr>
<td>250,000 – 499,999</td>
<td>19</td>
<td>10%</td>
</tr>
<tr>
<td>500,000 – 999,999</td>
<td>19</td>
<td>10%</td>
</tr>
<tr>
<td>1 million – 1.99 million</td>
<td>22</td>
<td>11%</td>
</tr>
<tr>
<td>&gt; 2 million</td>
<td>12</td>
<td>6%</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>100%</td>
</tr>
</tbody>
</table>