The Facts About Modern Manufacturing

6th Edition
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EDS is proud to be a member of the National Association of Manufacturers and is honored to be sponsoring this important publication, *The Facts About Modern Manufacturing*. The NAM has been instrumental in focusing the attention of our nation and its policy-makers on the contributions of manufacturing to our economy and its prospects for future growth.

The manufacturing industry faces many challenges today, from a continuing sluggish economy to intense global competition and increasing productivity and cost challenges. The manufacturing sector has been a major contributor to the economic prosperity we’ve enjoyed for decades and is an important element in reinvigorating our economic growth.

At EDS we work with many leading manufacturers, focusing on the contribution information technology makes in addressing manufacturing’s complex challenges. In fact, most global companies are finding the use of information technology to be a strategic differentiator in lowered costs and global enterprise competitiveness. Key examples where information technology makes a significant contribution include:

- **Powering Globalization** — providing information to plan, run, and manage business across geographies and with business partners.
- **Speeding Product to Market** — using digital product data to share design information, make global collaboration possible, and provide electronic information throughout the manufacturing life cycle.
- **Realizing Productivity Gains** — reducing costs and improving performance through electronic sourcing and auctions, streamlined supply-chain management, and systems consolidations, which unify mergers and acquisitions.
- **Facilitating Business Process Outsourcing** — providing the mechanism to leverage best practices and lower costs of performing non-core business processes.

Information technology is an increasingly important strategic and tactical asset to improve performance in the marketplace. As this report shows, it is one piece of a complex framework that sustains a healthy company and industry.

Through the continued work of the NAM and its members, EDS looks forward with confidence to a renewed manufacturing industry that is, once again, the driving force for national prosperity.

Stuart D. Doyle
EDS
Senior Vice President
General Motors Account

EDS assists companies with knowledge-driven digital manufacturing.
INTRODUCTION

In the midst of the weakest economic recovery in decades, the NAM Board of Directors launched the Campaign for Growth and Manufacturing Renewal to re-educate the nation about the importance of manufacturing to our economy and national security, to call attention to the unprecedented challenges we face and to identify ways to invigorate American industry.

The Facts About Modern Manufacturing is an important part of the NAM’s arsenal of information about manufacturing, which remains the foundation of our nation’s economy and its most important source of creativity, innovation and productivity. Unfortunately, too many Americans are unaware of how dependent they are on manufacturing for their high standard of living, and too many policy-makers are indifferent to the implications of losing our leadership in global manufacturing. But the recession that was fairly shallow for much of the economy, has been deep and painful for manufacturing:

- Exports recorded their largest drop in 50 years;
- More than 2.7 million manufacturing jobs have been lost;
- The manufacturing recovery has been the slowest on record; and
- Costs stemming from natural gas price hikes, rising legal bills, health care and regulation make keeping up with intense global competition all the more difficult.

Manufacturing plays a central role in growth, primarily through a unique, interlocking system of innovation that affects all sectors of the economy. Thus, the overall economy cannot regain its former strength until manufacturing is back on its feet and robust. This was true in the prosperity of the past decade, when manufacturing contributed 22 percent of GDP growth, and it is true today. The strengths of modern manufacturing lie in its —

- formidable research and development, accounting for two-thirds of all R&D;
- unprecedented increases in productivity that reduce costs, raise the standard of living and keep inflation low;
- international competitiveness, which helps the nation pay for its sizeable imports, increases the number of high-paying jobs and stimulates innovation;
- multiplier effect that creates 8 million additional jobs in other sectors; and
- rewarding careers and jobs that pay 18 percent more than the national average.

By highlighting mainly official U.S. government statistics in this publication, manufacturing leaders are armed with the ammunition they need to help elected officials, the press and educators better understand the enormous contributions of manufacturing to U.S. prosperity.

Manufacturers and their employees are committed to aggressively competing in the world economy. We commend this report to you and invite your comments and inquiries at MfgRenewal@nam.org.

Sincerely,

Richard E. Dauch
Chairman, The Manufacturing Institute;
Co-Founder, Chairman and CEO,
American Axle & Manufacturing, Inc.

Jerry J. Jasinowski
President
National Association of Manufacturers
Throughout the 1990s, manufacturing’s contribution to economic growth was strong and robust, on par with the financial sector. Through the invention and application of technology, manufacturers raised productivity higher than ever before and were largely responsible for the low-inflation prosperity of that decade.

The recession that began in manufacturing in the summer of 2000 has had a deep impact on the industry and the nation’s overall growth. Manufacturing has lost more than 2.7 million jobs and has seen the slowest recovery since the Federal Reserve began keeping records in 1919. The recession in manufacturing was prompted by a number of factors, including high interest rates, a sudden spike in natural gas prices and a strong U.S. dollar that undercut U.S. exports.

Clearly the current sluggishness in the overall economy will change only when policies are in place to reinvigorate manufacturing. This section describes several fundamental facts about manufacturing’s role in economic growth, including:

- its seminal role in promoting technology and innovation, which lead to a higher standard of living;
- its disproportionately large contribution to productivity, more than twice the rate of the overall economy;
- the business and jobs multiplier effects, which create more business activity and jobs in other sectors than any other industry, including construction, finance and wholesaling; and
- the high wages paid to manufacturing workers, nearly 20 percent higher than in other sectors.

When the right government policies are in place, 21st-century manufacturing will drive a prosperous economy.
Albemarle Corporation

Founded in 1887, Albemarle Paper Manufacturing Company has grown from a simple producer of blotting paper to a leader in the specialty chemicals industry. This small, energetic company was already thriving when Ethyl Corporation, a venture of General Motors and Standard Oil of New Jersey, hit its stride selling lead antiknock compounds to improve fuels.

In 1962, seeing the end of the blotting paper business and looking for ways to diversify, Albemarle borrowed $200 million to purchase Ethyl Corporation, taking the Ethyl name in one of the first significant buyouts of a big company by a much smaller one (Ethyl had 13 times the earnings of Albemarle). Ethyl’s management immediately began using the technology base in metallic compounds to continue making discoveries in many chemical arenas.

By 1994, the booming specialty chemical business was spun off to Ethyl shareholders as a new company. It was publicly traded on the New York Stock Exchange as Albemarle Corporation (ALB), harking back to its 1887 heritage.

Through internal growth, new products, acquisitions and alliances, Albemarle now has production facilities in the United States, the Asia-Pacific region, Jordan and throughout Europe.

Today, the company continues to grow and reward its shareholders, providing products to industries, such as electronics, construction, pharmaceutical, transportation, paper, home care, agricultural, packaging and many others.

While manufacturing has grown slightly faster than the overall economy over the past half century, the composition of American manufacturing changed because of technological breakthroughs, shifting demand patterns and international competition.

The three largest manufacturing industries today—chemicals; industrial machinery and equipment; and electronics—account for a third of manufacturing gross domestic product (GDP), while 50 years ago these sectors made up only 20 percent of the manufacturing sector.

By comparison, in 1950, the three largest manufacturing sectors were food, primary metals and motor vehicles. These industries continue to contribute significantly to manufacturing, with food and motor vehicles currently ranked the fourth- and fifth-largest manufacturing industries.

The Changing Face Of Manufacturing

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<th>Top Three Manufacturing Industries</th>
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<tr>
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<tr>
<td>1950</td>
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<tr>
<td>Food</td>
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<tr>
<td>Primary Metals</td>
</tr>
<tr>
<td>Motor Vehicles and Equipment</td>
</tr>
<tr>
<td>2001</td>
</tr>
<tr>
<td>Chemicals</td>
</tr>
<tr>
<td>Industrial Machinery and Equipment</td>
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<tr>
<td>Electronics/ Electronic Equipment</td>
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Source: U.S. Department of Commerce
Manufacturing contributed 22 percent of economic growth (real GDP adjusted for inflation) between 1992 and 2000. When software production is added, industry’s contribution to real GDP growth increases to 28 percent—the largest of any sector. By comparison, services contributed 14 percent, and transportation and utilities contributed 10 percent.

While U.S. economic growth increased at an average annual rate of 3.6 percent between 1992 and 2000, manufacturing’s share grew 4.5 percent per year. It has been generally underreported that manufacturing achieved rapid growth during the 1990s and was responsible for the country’s longest economic expansion.

During the 2001 recession, manufacturing output contracted faster than the remainder of the economy, by dropping 7 percent while overall GDP edged up 0.3 percent. Rebuilding manufacturing after this recent severe recession will be an important part of revitalizing the whole economy.

American Axle & Manufacturing

Detroit-based American Axle & Manufacturing (AAM) is a world leader in the manufacture, design, engineering and validation of drive-line systems and related components and modules, chassis systems and forged products for trucks, SUVs and passenger cars.

Founded in 1994, AAM was formed through a purchase asset acquisition of the five axle and forging facilities previously owned by General Motors. The assets purchased at the time were nearly 100 years old, dreary and low tech. Productivity and quality were not up to par. Co-founder, Chairman and CEO Richard E. Dauch, the auto industry veteran who took the risk in purchasing these assets, said, “We first focused and invested in our people to build a world-class workforce. We invested in the right technology. We steadily increased our investment in R&D—minimally, 10 percent more dollars each year. These are the ways manufacturers grow their businesses and the economy at the same time.”

As a result of the billions of dollars of investment in the plants and their associates, AAM now has 23 facilities on four continents and nearly 80 percent of its sales derive from new, high technology products introduced since 1998. AAM has created a flexible, well-paid and well-trained workforce of more than 12,000. Every year it has turned a profit and paid profit-sharing to its associates.
In All Countries, More Manufacturing Means More Growth for Everyone

1991–2001 Average Annual Growth Rate

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<th>Country</th>
<th>Industrial Production: Manufacturing, Mining and Utilities</th>
<th>Rest of Economy</th>
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<tr>
<td>China</td>
<td>12%</td>
<td></td>
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<tr>
<td>Korea</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>-2%</td>
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Source: OECD and Asian Development Bank

EDS

When manufacturing thrives, so do other sectors. EDS helps manufacturers compete effectively through its industry leading services and product life-cycle management (PLM) software. As one example, Palm, Inc.—the world leader in hand-held computing—cut engineering expenditures in half by developing the Palm™ i705 handheld using EDS software.

The Palm i705 is Palm’s first model to deliver always-on push e-mail. It includes up to eight e-mail accounts; firewall-protected e-mail for corporate users; Web browsing via Google or URL entry; plus classic Palm hand-held features such as Date Book and Address Book—in a sleek, silver one-piece package.

Like all Palm hand-holds, the design of the i705 was unique, requiring substantial engineering. To create a great product while minimizing development costs, Palm took a new approach, adopting EDS’s Unigraphics® NX product-development software to create and maintain all product data throughout engineering and manufacturing.

Palm engineering used the EDS software to create the product definition and then shared the digital geometry data files with their tooling vendor and manufacturer. They even used EDS’s software to create photo-realistic images of the i705 for marketing.

The result: a 50-percent reduction in engineering costs compared with previous Palm projects.

Manufacturing drives economic growth and higher living standards within countries. As the chart shows, faster growth in industrial production means faster growth in other sectors of every economy.* Where manufacturing is strong and growing, services, retail, construction and other industries will have strong growth paths as well.

A study of manufacturing’s relationship with other sectors across a broader range of 41 nations shows economies that have no growth in manufacturing experience economic growth of less than 1.5 percent per year. This conclusion is based on an analysis of economies within the Organization for Economic Cooperation and Development and the Asian Development Bank by Joel Popkin, PhD., former senior staff economist at the President’s Council of Economic Advisers. His report, “Securing America’s Future: The Case for a Strong Manufacturing Base,” was completed in 2003.

In his report, Popkin notes that “during the 1990s, the U.S. economy grew at an enviable 3.2 percent per year, on average, very similar to its average rate of growth over the past 50 years. A drop to a 1.5 percent GDP growth rate, less than half of what the United States has recently experienced, would have many adverse consequences on America’s prosperity.”

* Industrial production includes manufacturing, mining and utilities.
Recession Takes Its Toll On Manufacturing

The 2001 recession hit manufacturing much harder than it did the overall economy. While overall GDP edged up by 0.3 percent in 2001, manufacturing production fell sharply, by 7 percent.

The recovery that followed the recession was the shallowest in decades. Unlike the previous five recoveries, when manufacturing production bounced back and grew by 14 percent in the first year-and-a-half of an expansion, from the beginning of 2002 through June 2003, manufacturing output grew by less than 0.1 percent.

Source: U.S. Department of Commerce and Federal Reserve
Manufacturing’s Impact On GDP and Employment

Notwithstanding the recent 2001 recession that hit industry particularly hard, manufacturing’s share of the U.S. economy, measured by real gross domestic product (GDP), has been stable since the 1940s. During this time, the ratio of manufacturing output to GDP has ranged from 16 to 19 percent.

As of 2002, manufacturing’s share of GDP was 16 percent. During expansions, manufacturing grows more rapidly than the rest of the economy; during recessions it contracts more rapidly. However, the overall share remains the same throughout the business cycle.

During this same 50-year time span of alternating recessions and prosperity—including the recent downturn when manufacturing employment fell to 14.8 million—the number of manufacturing employees has remained fairly constant, oscillating at around 16.5 million.

Manufacturing has sustained its share of a growing economy with the same number of workers mainly due to faster productivity growth. As the overall economy has grown, manufacturing’s share of non-farm employment has decreased from 32 percent in 1947 to 11.5 percent in 2002.

Source: U.S. Department of Labor and NAM calculations from U.S. Commerce Department data
Manufacturers Perform The Largest Share of R&D

Manufacturing plays a key role in inventing new products and processes that make the U.S. economy more productive.

Investment in research and development (R&D) is the single most important source of technological advance that leads to higher productivity and increases living standards for all Americans. While the manufacturing sector made up 17 percent of the economy in 2000, it accounts for fully 62 percent of the R&D performed in the United States.

The new technologies developed by manufacturers often spill over into other sectors of the economy. For example, the technology in automated teller machines originated with equipment used on factory floors, while antibiotics and vaccines developed by pharmaceutical manufacturers have been used by the health-care service sector—physicians and hospitals—to nearly eradicate diseases such as pneumonia, measles and polio.

As important as R&D is to the economy’s health, the National Science Foundation reports that manufacturing’s share of R&D has fallen steadily from more than 90 percent of all R&D in 1980 to 62 percent currently.

Dana Corporation

Dana Corporation designs, engineers and manufactures value-added products and systems for automotive, commercial and off-highway vehicle manufacturers. For nearly a century, it has created innovations in product and service technology and developed advanced products and customer-focused solutions.

For the past five years, Dana has emphasized innovation and technology, as combined invention records, patent applications and patents awarded contributed to an impressive five-year growth trend. This innovation is feeding the development of performance-enhancing traction technologies, electronic vehicle-control systems, intelligent cooling systems and many more new technologies.

In all, Dana spends upward of $250 million annually on R&D.

Dana’s role in the R&D of fuel-cell technology has grown through its establishment of fuel-cell support centers in Canada, Germany and the United States. Dana engineers are working to develop technology and high-volume production methods for numerous components and subsystems. The company’s first steps toward becoming a supplier of systems to the fuel-cell industry will be in the residential and industrial markets. Fuel-cell-based home heating systems are expected to reach relatively widespread production within the next several years. Automotive applications should follow during the latter part of this decade.
Productivity Growth Is Disproportionately Large

Snap-on

Snap-on Incorporated, based in Kenosha, Wis., is a leading global developer and manufacturer of tool and equipment solutions for professional tool users. For more than 80 years, Snap-on has focused on delivering the most value to the marketplace, and providing the best service and products to its customers.

To compete in today’s global marketplace, Snap-on’s continuous improvement (CI) mindset reigns throughout the organization. On the manufacturing floor, CI is applied in the form of “blitzes.” The week-long focus of a blitz is on action. On the first day, employees join specific teams and are trained in the tools of the blitz process. Over the next three days, employees are empowered to use their expertise to generate ideas for improvement, implement the changes needed and measure results. On the fifth day, results are reported and follow-up suggestions are submitted.

Since 1998, Snap-on completed 312 blitz team projects, involving 1,430 participants at 18 sites. Activities to implement lean business practices coincide with corporate goals of improving operating income, reducing working investment and increasing sales.

Through the application of these lean principles and value-stream mapping, Snap-on has realized significant improvements that positively affect lead time, inventory and productivity.

Long-term sustainable economic growth is determined by productivity growth and changes in the economy’s labor force. Between 1992 and 2000, productivity growth averaged 2.1 percent per year while the labor force grew by 1.4 percent. Combined, this equals a sustainable growth rate of about 3.5 percent.

Although manufacturing constituted 17 percent of real GDP during these years, it was responsible for fully one-third of the economy’s productivity growth. In other words, excluding manufacturing, other business productivity grew by just 1.5 percent during this time. Without advances in manufacturing productivity, the economy’s growth potential would have been just 2.9 percent. During the 2001 recession, manufacturing productivity continued its unprecedented productivity growth, rising by 4.5 percent.

Between 2000 and 2010, the labor force is expected to grow at an annual rate of just 1.1 percent, which means any economic growth beyond this will have to come from productivity. This is why a thriving manufacturing sector is so critically important to the health of both the current and future overall economy.
Productivity growth in manufacturing has been consistently stronger than productivity in the overall non-farm business sector for the past two decades. Manufacturing productivity growth averaged 2.6 percent in the 1980s and then accelerated to 3.7 percent growth per year during the 1990s. Overall, manufacturing productivity grew at double the pace of overall productivity growth during the entire period.

Fortunately, there has been a dramatic acceleration in non-farm productivity, which includes manufacturing. From 1996 to 2002, productivity has grown by 2.6 percent per year, remaining unusually strong during the recent recession. By comparison, non-farm business productivity stagnated from 1977 to 1995, growing by only 1.3 percent per year.

This increase in productivity has enabled the economy to grow faster without inflation and has been passed through to workers in the form of higher real wages.

The Timken Company

The Timken Company, a leading global manufacturer of highly engineered bearings and alloy steels based in Canton, Ohio, is implementing plans for growth and expansion despite the prolonged downturn in the manufacturing sector. A solid record of achieving productivity gains sits at the foundation of the company’s confidence.

Timken consistently looks for opportunities to enhance its product and service lines and it learned over the years that driving productivity often leads to success. In early 2003, the company bought Torrington, another major bearings maker, for $840 million—an acquisition that will boost revenues, facilities, workforce and R&D capabilities by nearly 50 percent.

The 104-year-old company undertook a similar capital investment strategy in 1985 when it opened a large state-of-the-art alloy steel plant, the first one built in this country since World War II. The new plant’s $500 million price tag represented nearly two-thirds of the company’s total equity at the time. For CEO Jim Griffith, these investments worked for Timken: “We apply state-of-the-art manufacturing and control processes to good human resources practices and drive, drive, drive productivity. Just after that [1985 alloy steel] plant opened, there were seven hours of labor in each shipped ingot. Today it is less than one. When you apply that sort of technology and productivity, you can manufacture anywhere.”
Higher Productivity Leads To Higher Compensation

Nucor

One company that has tied its compensation program to the productivity growth of its 9,800 employees is Nucor Corp. Headquartered in Charlotte, N.C., Nucor is renowned for its modern manufacturing techniques that produce globally competitive steel.

Nucor has been able to remain a growing, profitable steel and steel-products producer because of its performance-related compensation program, in which employees involved directly in manufacturing are paid weekly bonuses on the basis of the production of their work groups.

The bonuses average 90 percent to 170 percent of the base wage. Total average annual compensation for mill workers is $60,000. The plan creates incentives for each individual to perform well. Employees maintain equipment in top condition because no bonus is paid if the machines are not operating.

To foster an environment of equity, senior officers receive no profit-sharing or pension. A significant share of their compensation is based on Nucor’s return on stockholder equity.

All employees are eligible for an extra bonus when the company does extremely well; these bonuses have been as high as $800 per employee.

In a market economy, employee pay and productivity are closely related: When employees become more productive, they earn higher compensation.

American productivity experienced two periods of strong growth over the past 40 years: from 1960 to 1976 and from 1996 to the present. From 1960 to 1976, non-farm productivity growth averaged 2.7 percent and real hourly pay of workers increased by a nearly identical 2.6 percent per year. Since 1996, productivity growth has averaged 2.6 percent, and hourly pay has risen 2.4 percent annually, largely because of technological progress, process innovations and increased training.

These two periods of high productivity and real wage growth—and corresponding economic growth—were interrupted as worker productivity slowed from 1977 to 1995, averaging an anemic 1.3 percent. As a consequence, compensation rose on average of just 1.1 percent during that period. Clearly, the key to higher real incomes and higher standards of living for working Americans is faster productivity growth.
Today’s manufacturing employees are earning higher wages and more generous benefits than those received by many other Americans.

In 2001, average manufacturing employees earned $46,000 a year in wages, while their average total compensation (salary plus benefits, bonuses and Social Security contributions) was $54,000. Average U.S. employees in the remainder of the economy earned $39,000 a year, with total compensation of just $46,000.

While some other occupations have higher salaries, manufacturing provides millions of well-paying jobs, enhancing the well-being of families and communities. Overall, manufacturing offers higher pay than the construction, services and retail trade sectors.
Intermediate Production Contributes Significantly To Total Economic Output

GDP Undercounts Manufacturing’s Share Of Economic Activity

![GDP Undercounts Manufacturing’s Share Of Economic Activity](image)


Gross domestic product (GDP) is based on final sales. However, 43 percent of the nation’s economic activity is not counted in GDP. This intermediate activity is the production of goods and services that goes into making up the final sales. Examples of intermediate activity are raw materials, components and many types of services, ranging from business consulting to factory maintenance.

Sixty percent of the roughly $4 trillion in total manufacturing activity takes place at the intermediate level. Included are such industries as primary metals and semi-finished products, as well as goods that are used to make other products, such as car engines.

Manufacturing’s share of total intermediate activity was 36 percent in 1998. Its share of GDP was 17.8 percent. When the two are combined, manufacturing’s share of total output rose to more than 25 percent.

Because total manufacturing output is larger than final sales of manufactured goods, manufacturing’s contribution to job and business growth in other sectors is also larger.
Manufacturing’s Multiplier Effect Is Stronger Than Other Sectors

Manufacturing’s use of intermediate goods and services in its production process means that it generates substantial economic activity at the intermediate level. This is called the multiplier effect, and it turns out that manufacturing’s multiplier effect is stronger than other sectors.

Specifically, every $1 of a manufacturing product sold to a final user generates an additional $1.43 of intermediate economic output, more than half in sectors outside manufacturing. Manufacturing’s multiplier effect is greater than any other sector and far greater than that of the service sector, which generates only 71 cents of intermediate activity for $1 of final sales—half of the additional intermediate output generated by $1 of manufacturing final sales.

Source: U.S. Department of Commerce
Manufacturing Generates More Employment in Other Industry Sectors

Through the multiplier effect, manufacturing stimulates employment in other sectors of the economy at a greater pace than other industries.

Specifically, every $1 million in final sales of manufactured products supports eight jobs in the manufacturing sector and an additional six jobs in other such sectors as services, construction and agriculture.

By comparison, because the service sector is more labor-intensive than the manufacturing sector, $1 million in final sales supports 13 jobs in the service sector. However, because the service sector has a smaller multiplier effect on the rest of the economy, $1 million in its final sales supports only 3.5 jobs in sectors outside its own.

SBC

Today’s manufacturers have complex needs, with customers scattered around the globe, suppliers based in different time zones and employees at work in dozens of states. Manufacturers need a high-tech communications network and data system to link their sites and customers.

SBC, one of the world’s leading data, voice and Internet service providers, offers networking and e-business services to individuals and businesses. As America’s leading provider of high-speed DSL Internet service, a large segment of SBC’s customers are manufacturers—about 35 percent of all of SBC’s land-line business is with corporate customers.

This is a highly interdependent relationship. SBC’s capital investment directly benefits its suppliers and customers. At the same time, SBC’s networks and systems are driven by the excellent products created by leading manufacturers such as Alcatel, Nortel, Lucent, Corning and Cisco.

Telecommunications depends on quality products: 7.6 million miles of fiber strands; nearly 10,000 SONET rings; 950 frame-relay nodes; more than 300 ATM-switching elements; thousands of routers and hundreds of remote access servers. SBC is a good customer for manufacturers. It is also a good provider of telecommunications services that meet the needs of manufacturers. SBC and its telecom supplier will invest and deploy new products when current, economically harmful regulations are removed.
Manufacturing Supports Millions of U.S. Jobs In Other Sectors

More than one out of every six jobs depends on America's manufacturing base. This is because the manufacturing sector supports millions of workers who make things in America, and nearly an equal number of workers in other sectors of the economy through the multiplier effect.

Specifically, manufacturing supported 23 million jobs in the United States in 2002: 15 million jobs within manufacturing and another 8 million jobs in sectors outside of manufacturing through the multiplier effect.

Source: NAM calculations from U.S. departments of Commerce and Labor

Chubb

As one of the largest writers of package policies in the United States, the Chubb Group of Insurance Companies (Chubb), provides insurance programs and services for manufacturers, including companies in the pharmaceutical, medical device, metalworking, food processing, plastics and electronics industries.

Manufacturing is an important component of New Jersey-based Chubb’s business, and helps to fuel its growth. Chubb handles property and casualty insurance for more than 40 percent of leading technology-focused organizations, including electronics manufacturers and assemblers.

“Chubb has built up a large part of its commercial operations around the manufacturing sector,” explains Paul J. Krump, managing director, Chubb & Son, and chief operating officer, Chubb Commercial Insurance. “By focusing on manufacturing, we’ve been able to gain valuable insight about the manufacturers’ concerns and needs and how to address them. Typically, Chubb’s insurance products include enhancements and specific coverage to help protect manufacturers from exposures and issues that conventional insurance simply doesn’t address.”

Chubb’s insurance products and services help protect facilities and employees, including personal property protection for patterns, molds or dies used by metalworking manufacturers and human clinical trials insurance for pharmaceutical manufacturers.
The increased use of the Internet, lower transportation costs, falling tariffs and other trade barriers are combining to make local differences in manufacturing less important. In light of these and other macroeconomic changes, the role of technology in manufacturing is accelerating as it is increasingly applied to manufacturing operations anywhere in the world.

Over the past 25 years, technology has spread among countries regardless of its origin. Whereas Japan once held a near monopoly on the use of quality management, the United States, Germany and other major industrial countries learned how to apply quality principles and caught up with Japan. In business software, such as material requirements planning (MRP), the United States, Japan and Germany all started at about the same time, but the technology application is now used most extensively in U.S. manufacturing.

This decade will see more prolific use of technologies, including Web-based applications, online collaboration tools and wireless telematics that transform manufacturing with greater interaction between customers and suppliers, and between the front office and the factory floor.
E-business emerged as a new manufacturing tool in the late 1990s. While often associated with dot-coms and retail sales, the main beneficiary of the e-business revolution has been manufacturing. In 2001, nearly one-fifth—18 percent—of manufacturing shipments were e-business transactions. Other sectors have adapted less quickly: Only 10 percent of wholesale activity and just 1 percent of retail sales go through e-business.

In addition, manufacturers are also the largest users of e-business. In 2001, manufacturing e-commerce shipments totaled $725 billion and accounted for 68 percent of all e-business shipments in the U.S. economy. By contrast, e-retail sales of $34 billion made up just 3 percent of e-business activity that year. After surviving its first recession in 2001, e-business has demonstrated that it is embedded in manufacturing sales, procurement and human resource management and training.

IBM

IBM has learned that harnessing e-business is one of the best ways to make it easier for customers to do business with the company. IBM invested nearly $5 billion over the past 10 years to align technology with core business processes.

This leaner, more customer-focused IBM has seen a $14.5 billion return on its e-business investments. The company reconfigured work flows around a set of value chains to streamline and integrate processes for similar product lines—hardware, software and services—greatly simplifying how customers and suppliers do business with IBM. Backroom operations such as ordering and fulfillment are now handled with less personnel, and networks keep research operations going on a global 24/7 cycle rather than experiencing down time from 5 p.m. until the next business day.

IBM’s business transformation has dramatically streamlined many other company operations. For instance:
- a decade ago, IBM operated 155 internal data centers worldwide; today, there are 12;
- a decade ago, IBM ran 31 separate internal networks; today, one global, integrated and outsourced network does it all; and
- Web-based sales have been enhanced to the point where 70 percent of PC sales now take place without human interaction.
In the past decade, U.S. business became more engaged with the world economy, increasing exports and imports, spurring investments at home and abroad and raising pay and living standards for employees working in international trade. Today, the United States is the world’s largest exporter.

Manufacturing stands at the center of this international success story because it is the most trade-engaged sector of the economy. The sum of manufactured exports and imports equals 40 percent of manufacturing economic output, double the percentage of a decade ago. By comparison, non-manufacturing trade equals just 6 percent of the output in the rest of the economy.

Although the manufacturing recession of 2000–2001 and an overvalued U.S. dollar dented the upward growth in international trade, there is no question that growth will resume when the recovery takes hold because manufacturing’s present and future are tied to trade. This is true for both large and small companies. After all, 95 percent of all exporting firms are small manufacturers and their sales abroad are growing faster.

The goods that manufacturers sell abroad create high-paying jobs here at home, paying as much as one-third more than jobs at companies that only sell domestically. In addition, the export sales that support 3.3 million manufacturing jobs also support 4.3 million jobs in other sectors such as the wholesale industry, transportation, finance and accounting.

This section describes how the U.S. economy, American manufacturers and their employees benefit from international trade and investment.
Manufacturing is more globalized than other sectors of the economy. In the 1990s, manufacturers developed new markets abroad and began large-scale sourcing of components from suppliers around the world. Manufacturing trade—exports plus imports—now equals 40 percent of manufacturing’s total output. This is double manufacturing’s trade intensity just a decade ago and is much higher than trade intensity for the remainder of the economy, where it is just 6 percent of total output.

Essentially, manufacturing is more than six times more trade-engaged than the rest of the economy. Continued efforts to reduce tariffs and other barriers around the world are vital to the growth of American manufacturing.

Caterpillar

Based in Peoria, Ill., Caterpillar (Cat) is the world’s leading manufacturer of construction and mining equipment, diesel and natural gas engines, and industrial gas turbines. Manufacturers—like Cat—are more committed to world trade than other U.S. sectors.

About half of Caterpillar’s U.S. production is exported around the world. Its exports have grown from about $3 billion in 1992 to more than $5 billion in 2002. The majority of its manufacturing operations are globally integrated—both importing and exporting materials, components and product.

Serving the world marketplace, exporting manufacturers are the first to identify changes in global industry trends. For example, purchasing patterns in Asia led Cat to develop and introduce its first hydraulic excavator in the early 1970s. After two decades of tough international competition, Cat has become one the world’s top producers of hydraulic excavators. It’s a market Cat couldn’t afford to miss out on because today it comprises 40 percent of all new construction industry sales. Similarly, in the 1980s, Caterpillar quickly followed the lead of the Japanese as they implemented “just-in-time” inventory management techniques.

Cat anticipates growth in such product lines as compact construction equipment, produced at its Clayton, N.C., plant, which will be exported worldwide.

Source: NAM calculations from U.S. Department of Commerce data
It sometimes surprises Americans to learn that the United States is the world’s largest exporter. The U.S. economy is the world’s biggest, but it does not automatically follow that it would also be the largest exporter. U.S. companies have more than enough competition abroad, and some overseas governments provide more active support for their exporters than does the U.S. government. U.S. exporters have succeeded by offering high-quality products at the right price, sometimes using strategic partnerships with companies located in target markets. In 2001, U.S. merchandise exports totaled more than $700 billion, although the recent global recession and overvalued U.S. dollar cut into export sales. Yet, U.S. exports remain 28 percent greater than Germany (the next largest exporter) and nearly equal to all of Western Europe’s exports to the rest of the world.
Exports have doubled in the past 10 years, with manufacturing responsible for 62 percent of total exports. By comparison, agricultural goods account for just 6 percent of the total.

One of the main reasons for American manufacturers’ increased global competitiveness over the past decade is the transformation into market economies of many developing nations, which now consume nearly half of U.S. exports. In general, developing nations tend to import capital equipment and intermediate products, such as industrial supplies, because they lack the resources and/or the know-how to produce these types of goods efficiently themselves. As more nations develop market economies, new opportunities will emerge for U.S. manufacturers, which have a comparative advantage in producing the industrial equipment and supplies sought overseas.

A decline in exports was one of the reasons for the 2001 manufacturing recession. From a highpoint of $692 billion in 2000, manufactured exports fell to $607 billion in 2002. Policies that keep U.S. exports growing are good for manufacturers and the trade balance.
ASIRobicon

ASIRobicon, based in Pittsburgh, Pa., designs, manufactures and markets power-industry electronics, motor and generator products, and electrical and automation system solutions. Its major product line includes such large power-control products as medium voltage variable frequency drives (VFDs).

VFDs are sold globally to energy, water, transportation and industrial markets. At one airport, ASIRobicon’s drives were selected to provide motor control for the airport’s heating, ventilating and air-conditioning systems.

ASIRobicon, with 400 employees, has just ended its second consecutive record year for revenue due, in large part, to its export business. In light of the U.S. recession, the company replaced declining orders from the domestic market with increases in its export business. Orders from China are up 40 percent over last year. Business with South Korea, Singapore and Australia has also grown. Activity in the oil and gas markets in the Middle East has increased substantially. “A return to regional stability in the Persian Gulf will prompt project releases,” says company president Gary Rauscher.

“The strengthening of the Euro by as much as 20 percent also makes a big difference for us. It puts ASIRobicon in a much more competitive position with our European competitors in all overseas markets.”

The U.S. economy drove the engine of world growth throughout the 1990s, and U.S. manufacturing was the strongest sector leading that prosperity. As strong as that GDP growth was in the past decade, U.S. export growth outpaced it significantly. During the 1990s, exports grew nearly three times faster than the remainder of the economy and contributed 21 percent of GDP growth from 1991 to 2000.

U.S. export growth took off noticeably in the late 1980s and kept up that momentum until the recession of 2000–2001. In 1985, 8 percent of all U.S. manufactured products were exported. By 2000, this percentage doubled. American’s top-five manufactured exports are computers and electronics, chemicals, machinery, motor vehicles and aircraft. Together, these sectors account for 56 percent of total U.S. merchandise exports in 2002.

As the most globalized sector of the economy, economic downturns abroad affect manufacturing more severely than other sectors. The year 2002 was the second-worst year in the past half century for exports. During the 2001 global recession, exports fell by 11 percent.
Export-Related Jobs Grow Faster Than Non-Export Jobs

Exports have generated significant new employment opportunities for many Americans and these jobs have grown faster than those not tied to exports. Between 1990 and 2000, jobs supported by exports grew by 56 percent—three times faster than job growth in the rest of the economy—while jobs in the remainder of the economy grew by only 18 percent. These jobs are found in large and small companies alike. A vast number of small manufacturers sell their products to larger companies that export. Large companies are responsible for 61 percent of overall exports. These “invisible exports” are an important part of the U.S. economic growth story as well.
Graybar

St. Louis-based Graybar is a leader in the distribution of high-quality electrical, telecommunications and networking products, stocking and selling products from more than 4,200 manufacturers worldwide. It distributes these electrical and telecom products not only in the United States but internationally as well, particularly in Canada and Mexico. These branch locations increase market opportunities for its manufacturing partners. Today Graybar is one of the largest employee-owned firms in North America.

Founded in 1869, Graybar was among the first suppliers of equipment for the then-emerging telephone industry. Now, years later, it distributes electrical and communications products.

Through its specialized inventory management and logistics services, Graybar provides warehousing, customer counters, sales operations and other value-added services for manufacturers. When a customer needs lighting installation, a switchgear upgrade or deployment of a local- or wide-area network, Graybar combines the knowledge of its own technical experts along with the expertise of its supplier partners to deliver cost-effective solutions.

In 2000, one-in-five manufacturing jobs was supported by exports, a 40-percent increase from 1990 when less than one-in-seven jobs depended on exports. While this represents impressive growth, even more impressive are the good-quality jobs supported by exports that, on average, pay 14 percent more than jobs supported by the domestic economy.

Exports also support jobs in sectors outside of manufacturing. While exports supported about 3.5 million manufacturing jobs in 1997 (the latest published data available), these same exports supported even more jobs—about 4.3 million—in other sectors, such as wholesaling, transportation, finance and accounting. The export-multiplier effect means that total manufacturing exports support 7.6 million jobs, with a highly positive ripple effect throughout the whole economy. When exports grow, many sectors benefit. But when exports decline, the pain reverberates across many industries.

Manufacturing Exports Support a Variety of Jobs In Other Industries

Manufacturing Exports Support Millions of Jobs (more than half are outside of manufacturing)

Source: U.S. Department of Commerce, 1997
Large and small manufacturers alike export, but there is a perception that fewer small manufacturers export directly. In fact, just the opposite is true. According to the U.S. Commerce Department, 97 percent of all exporting manufacturers have fewer than 500 employees (the Small Business Administration definition of a small manufacturer). Moreover, the number of small exporters more than doubled between 1992 and 1999. This pace was nearly twice as fast as the 60-percent growth in the number of large exporting companies during the same time.

While large companies are responsible for 70 percent of the value of exports, smaller companies have learned that export markets are important to their success.
Technical Materials Inc.

Technical Materials Inc. (TMI) transforms metals through bonding, electroplating, electron beam welding and other methods into continuous coils of metal for use in medical products, electronics, telecommunications, automotive electronics, fuel cells, computers and semiconductors.

This Rhode Island-based manufacturer with 200 employees has jumped into the international market because of the growth potential abroad. TMI’s exports have tripled since 1999 and now account for more than 15 percent of its sales.

While TMI sells its products around the world, its largest opportunities are in Southeast Asia and China. President Al Lubrano says that he and other small manufacturers are increasing their exports by selling more to their suppliers in Southeast Asia. TMI made the supplier connection in the semiconductor industry, but the company has also followed its existing U.S. customers to China, where it continues to supply them.

Business potential is significant enough that TMI expects soon to hire its first direct-salesperson to cover the region out of Hong Kong. Lubrano also sees the need several years from now to open a facility in China to service their existing customers as TMI’s business expands far beyond its Rhode Island base.

In 1999, U.S. manufacturers exported $612 billion in goods to all parts of the world, an increase of 66 percent from 1992. Smaller manufacturers led this growth.

Between 1992 and 1999, exports from small manufacturing firms grew by 77 percent. This topped the export growth rates of larger companies and small businesses in other sectors. By comparison, large manufacturers saw their exports grow by 69 percent and other small companies in other sectors saw theirs climb by 58 percent.

Source: NAM calculations from U.S. Department of Commerce data
Through much of the 1990s, a stable dollar and solid economic growth abroad encouraged manufacturers of all sizes to expand into international markets. Based on a decade-long NAM survey, the share of small and medium manufacturers (SMM) who exported at least 25 percent of their firm’s product grew from 5 percent to nearly 9 percent between 1992 and 1998. (Small manufacturers have fewer than 500 employees; medium manufacturers have fewer than 2,000 employees.)

An increase in the value of the dollar coupled with a worldwide recession reversed this trend. By 2001, less than 4 percent of smaller U.S. manufacturers exported at least 25 percent of their company’s sales.

The recent decline in the dollar has given manufacturers new exporting opportunities. For 2003, more than 7 percent of smaller manufacturers anticipate exports will account for at least 25 percent of their company’s sales.
Automatic Feed

Automatic Feed Company makes the machinery used by automobile plants. Its machine tools unroll large coils of steel and feed them through presses that, in turn, stamp out metal parts for cars. As the auto industry has become global, so, too, have smaller manufacturers such as Automatic Feed. More than one-third of the machine tool industry’s output is normally sold outside the United States.

Kim Beck, president of the Ohio-based company founded by his grandfather, says that the value of the dollar affects his business directly. When the dollar became overvalued, he saw more intense competition with overseas competitors than ever before, and sales and employment fell by nearly half. “The high price of the U.S. dollar was like a tariff that priced us out of many of our traditional markets,” said Beck. Then in 2003, the value of the dollar against the Euro fell and Automatic Feed’s prospects for exporting improved.

To remain a top competitor, Automatic Feed redesigned its products. The cost of producing machines that are often as large as a bus and cost more than $1 million each has been cut by as much as 20 percent. New features include software that tracks each machine’s productivity and swiftly identifies breakdowns.

The value of the U.S. dollar has an impact on how well U.S. manufacturers compete in international trade. The U.S. economy and its exporters have had recurring experiences with an overvalued U.S. dollar. Twenty years ago, when the U.S. economy depended far less on international trade, an overvalued dollar reduced America’s competitiveness and held U.S. merchandise export growth to just 0.3 percent per year between 1981 and 1985. As a result, the U.S. share of world manufactured exports dropped from 11.5 percent to 9 percent.

When the dollar’s value declined in 1985, exports took off and recorded their most robust period of growth, increasing by 10 percent a year between 1986 and 1997. By 1997, the U.S. share of world manufactured exports grew to 13 percent.


Since February 2002, the dollar has depreciated against many currencies, including the Euro, improving the export opportunities for U.S. companies. Despite this improvement, China’s artificially pegged currency continues to cause difficulties for U.S. exporters.
Import Competition Restrains Prices

When U.S. companies compete in the global marketplace against imports, lower-priced foreign goods limit product pricing. The more competition, the lower the price the consumer pays. While good for the consumer, this is a challenge for the manufacturer. Manufacturers have had no pricing power for more than a decade because of intense international competition.

During the past decade, import prices for goods became lower than domestic prices for comparable products because it is more expensive to manufacture in the United States. This has had a disinflationary effect on the overall economy. In the second half of the 1980s, import prices rose by 4 percent per year.* Then, in the first half of the 1990s, import prices edged up just 0.7 percent per year. Since 1996, import prices have actually declined by 2.3 percent per year through 2002. This has reduced U.S. companies’ pricing power and put downward pressure on inflation, which increased just 1.7 percent per year since 1996, compared to 3.3 percent per year from 1986 to 1990.

* non-petroleum goods imports
More Trade Means More Pay

Employee pay and trade engagement go hand in hand.

Workers in the most trade-engaged industries—where combined exports and imports amount to at least 40 percent of their domestic industrial output—earn an annual compensation package that averaged more than $60,000 in 2000. This is fully one-third more than average compensation in the least-trade-engaged sectors of manufacturing.

This also extends to other parts of the economy, such as companies in the supply chain. Employers at these companies—where jobs are indirectly supported by exporting—also enjoy an export pay premium.

There are two reasons for the higher pay scale. First, exported products tend to be higher-valued products. These are produced at companies by highly skilled workers who receive premium wages. Second, foreign competition requires exporting companies to be more competitive. This means that employees at exporting companies need to be more productive and, therefore, earn higher compensation.

* Exports+Imports = 40 percent+ of domestic output.
** Exports+Imports = 20–40 percent of domestic output.
*** Exports+Imports = less than 20 percent of domestic output.

Source: NAM calculations from U.S. Department of Commerce data, 2000
The United States Attracts More Investment Than Other Countries

While American manufacturing has been a major recipient of investment for the past decade—especially since 1997—Americans invest abroad, too. Many opportunities exist for investment in plants overseas, both in U.S.-owned and foreign-owned facilities.

All investors want good returns. Foreign direct investment in the United States demonstrates a vote of confidence, not only in the strength of the U.S. economy, but also in the manufacturing sector. Overseas investors see a highly competitive manufacturing industry that has cut costs, raised quality and globalized its operations.

When foreign investors see U.S. companies competing well in their countries, they want to invest in plants here. Those investments are put to work in expanding R&D, modernizing plants and providing a higher standard of living for manufacturing employees.

A globalized world economy means funds, like goods, will flow both ways. The United States is the world’s most stable and innovative economy and, as such, it attracts the most investments. In 1999, the United States attracted more investment from abroad than the next five countries combined.

Honda

Honda has been investing in America since 1959, when it first opened a small, eight-person office in Los Angeles. Today, the company’s $5.9 billion U.S. investment can be seen through its eight state-of-the-art U.S. plants, which annually produce 1.47 million automobiles, motorcycles, ATVs and power-equipment products. More than 24,000 associates design, engineer, produce and market an array of world-class products for the U.S. market and markets around the world.

The economic impact of Honda’s investment goes beyond the company’s direct operations. In 2002, Honda purchased $11 billion in parts and materials from 440 U.S. suppliers in 32 states. Collectively, these U.S. Honda suppliers employ tens of thousands of Americans. Another 100,000 Americans are employed by authorized Honda dealers located in all 50 states.

Honda’s U.S. automobile plants in Ohio and Alabama are the sources for many of its popular automobile models such as the Accord and Civic. Honda operates motorcycle and ATV plants in Ohio and South Carolina. In 2002, Honda began production of the Aqua Trax personal watercraft in its South Carolina plant.

Honda’s continued success in the global marketplace will be determined by its continued investment in America’s future.
To compete effectively in the global economy, U.S. manufacturers often make direct investments overseas, enabling them to gain footholds in major markets and to promote U.S. exports. This has caused some critics to argue that investing abroad results in “exporting” jobs to nations with low labor standards. However, this only presents one side of the coin. Foreign companies invest in U.S. manufacturing for the same reason: gaining access to our market. In fact, foreign investment in domestic U.S. manufacturing has outpaced U.S. investment in manufacturing abroad for six of the past seven years, growing from less than $10 billion during the 1991 recession to $105 billion in 2000 before declining due to the 2001 recession. By comparison, investment by American companies in manufacturing facilities abroad peaked at just $43 billion in 2000 and has since dropped to $30 billion.

Moreover, the amount that U.S. manufacturers invest abroad is dwarfed by the amount invested at home. In 2000, investment in business plant and equipment in the United States totaled $1.2 trillion—more than seven times the $164 billion that was invested abroad. Investments in the United States include those by U.S. companies and by international companies with facilities in this country.

When it comes to investment, U.S. manufacturers keep the vast majority of their money here in America.
U.S. Companies Invest in High-Wage Overseas Markets

A Majority of U.S. Manufacturing Investment Targets Developed Countries

If cheap labor were the driving force behind foreign direct investment, then the low-wage nations should be the primary receivers. The opposite is true: Access to large and growing markets rather than inexpensive labor attracts investment.

Between 2000 and 2002, more than two-thirds of U.S. foreign direct investment to acquire or build affiliates abroad was targeted at high-wage countries, mainly in Western Europe. * U.S. companies establish operations there because it is the single largest market outside of the United States, not because it is a low-wage area. This focus on highly developed markets is similar to the direction of U.S. investment flows since the 1970s, where, on average, high-wage countries have received 70 percent of U.S. investment abroad.

* High-wage countries include Canada, Japan, Australia, New Zealand and countries in Western Europe.

ArvinMeritor

Michigan-based ArvinMeritor, Inc. (ARM) is a $7 billion global supplier of a broad range of integrated systems, modules and components to the motor vehicle and commercial truck industry. The company, which dates back to 1909, has grown over the past century by supplying innovative products for the U.S. auto and truck markets.

ARM is building new business opportunities in the United States and around the world, mirroring the globalization of the auto industry itself. To take advantage of global opportunities and to enhance the diversity of its product lines, a merger between Arvin and Meritor was completed in 2000.

Mergers and joint ventures are an important part of ARM’s business strategy and ARM has completed more than 26 joint ventures around the world. ARM identifies these joint ventures in countries where the auto industry is growing and where it can best serve its customers who demand just-in-time delivery of parts.

These investments have strengthened ARM’s bottom line. In 2002, about 38 percent of its sales were outside North America. Its largest market outside North America is Europe, where the auto industry has a very strong base. Although Latin America is a distant second and Asia/Pacific is third, these locations will be targets for additional investments in the future as the auto industry expands around the world.
Rising Costs Affect Manufacturers’ Competitiveness

Unlike other industries, manufacturing is unable to pass on rising costs to its customers. This limitation stems from the fact that manufacturing is the most globally engaged of all American industries, facing its most intense international competition ever. In contrast, hospitals, restaurants, local banks and other sectors do not face this same overseas competition, so these businesses can more easily pass on costs in the form of higher prices.

The U.S. Department of Commerce inflation data in this section clearly show this disparity: manufacturing prices have remained flat for nearly a decade while prices of non-manufacturing purchases have steadily risen. Rising costs significantly contribute to the relocation of U.S. facilities abroad.

Economists estimate that the compliance costs alone of federal, state and local government regulatory mandates are $1.2 trillion, more than double their 1988 level. Doing business from the United States is more expensive because of rising costs from—

- high U.S. corporate tax rates;
- litigation that pushes some manufacturers into bankruptcy;
- regulatory compliance with federal, state and local mandates;
- health care; and
- natural gas.

Manufacturing can only compete from a U.S. base if these costs are controlled.
Throughout the 1990s, manufacturers have been severely limited in their ability to raise prices on their products. This was due mainly to greater worldwide competition and the overvalued U.S. dollar.

This lack of pricing power is one of the most severe problems facing manufacturers. As costs rise in the United States—many mandated by state and federal governments—companies are often forced to move production abroad to remain competitive.

While companies in other sectors have continued to experience pricing power, manufacturers have operated in a deflationary environment since 1995. Since 1994, prices of manufactured goods have fallen by 6 percent while overall prices have increased 15 percent.

Although this has been good news for consumers, it has forced manufacturers to redouble their efforts to cut costs and raise their productivity or, in some cases, move operations overseas.

ACE Clearwater Enterprises

Established in 1949, ACE Clearwater Enterprises is a 200-person “build-to-data” shop that specializes in complex-formed and welded assemblies. Core competencies include welding, machining, complex forming, tube bending and manufacturing engineering. Serving primarily aerospace, power generation and U.S. government customers, California-based ACE is fighting to retain and increase its limited customer base.

In the past two to three years, intense global competition, as well as demands for productivity improvements from virtually all of the original equipment manufacturers (OEMs), has resulted in yearly price reductions of up to 8 percent, even as raw material prices continue to escalate and the cost of doing business grows.

Efficiencies in production methods, opportunities to build higher level assemblies and an aggressive approach to waste elimination have helped ACE succeed in a difficult business climate. Shop-floor employees have suggested “better, faster, cheaper” approaches. Additionally, long-term agreements with key suppliers have fostered mutual cooperation and creative approaches to winning new business.

Raising prices is not an option. Only aggressive solutions to solving customer needs will help retain and attract new manufacturing opportunities to ACE.
Minerals Technologies

Minerals Technologies Inc. (MTI), a global resource- and technology-based growth company, develops, produces and markets performance-enhancing minerals and related products, systems and services for the paper, steel, polymer and other manufacturing industries. The company reported sales of $752 million in 2002.

The economic downturn that began in 2000 in much of the manufacturing sector—especially the steel and paper industries—continued throughout 2002. MTI, however, showed good growth in the first quarter of 2003, with a 5-percent increase in operating income. This is a result of several factors: The steel industry showed improved demand in much of the world, and the company’s main product line—precipitated calcium carbonate—continued to expand despite a sluggish paper industry.

MTI took action during the downturn to position itself for resumed growth, including strategic acquisitions, restructured operations, tightened control of expenses and improved productivity throughout the organization. Because of these actions, and with some upturn in the global economy, MTI believes it will resume the growth it experienced before the decline of 2000.

Following a sharp decline in after-tax profits during the early 1990s, manufacturers displayed a steady recovery throughout the rest of the decade. In 2000 and 2001, manufacturing after-tax profits plunged dramatically. Contributing enormously to these losses were the worldwide recession and extensive global competition, which prevented manufacturers from raising prices.

Manufacturing profits are recovering, but at a slower pace than in earlier recoveries due to the lackluster GDP growth through the first half of 2003. As of the first quarter of 2003, manufacturing profits remain 30 percent below their level in 2000 before the manufacturing sector entered recession. Because competitive markets continue to restrain price increases, manufacturers are profitable only when they can achieve strong productivity growth.
Legal abuses are making a mockery of U.S. civil justice. An intoxicated roofer fell off a roof and sued the company that made the roofing materials, even though none of its products were implicated in the fall. That small manufacturer, with its 48 employees, was nearly forced into liquidation.

Thousands of similar stories exist, as manufacturers are increasingly subject to legal claims and expenses that have little or no connection with their products. These legal abuses are taking their toll on the future of American manufacturing.

The filing of asbestos-related claims shows how great an impact these lawsuits have on manufacturing. Since the 1970s, an explosion of more than 600,000 asbestos-related lawsuits has occurred, 200,000 of which are still in the courts as of fall 2003. The actual victims of asbestos-related disease are compensated less as trial lawyers representing unimpaired workers barrage the judicial system with lawsuits.

As of fall 2003, these burgeoning claims have pushed more than 65 solid companies into bankruptcy, resulting in the loss of 60,000 jobs. More than 8,400 companies face litigation and many of them could also be pushed into bankruptcy, costing more jobs and undermining local economies. Although companies have already paid out $54 billion for claims and defense, potential outstanding claims remain for more than $250 billion.

USG Corporation

Illinois-based USG Corporation is a leading manufacturer of building materials—such as wallboard and ceiling tile—for the construction and remodeling industries. USG Corporation and its major U.S. subsidiaries are healthy companies with one overriding problem: asbestos litigation. The company filed for voluntary bankruptcy in 2001 to resolve tens of thousands of asbestos claims in a fair and equitable manner and to preserve its assets and market position. Prior to filing for bankruptcy in June 2001, USG incurred asbestos-litigation costs of $100 million in 1999 and $162 million in 2002, and it estimated that those costs would soar to $275 million in 2001. Like many of the other 8,400 companies facing litigation, USG never made, mined or sold raw asbestos—it was a minor ingredient in some products that have not been sold for more than 25 years.

Most of the claims against USG have been filed by unimpaired individuals who have been exposed to asbestos but not harmed by it. Shortly before USG filed for bankruptcy, almost 500 jobs were eliminated in an effort to save money to pay for rapidly growing asbestos costs. The money saved from laying off those workers was wiped out by a single verdict in favor of approximately 20 unimpaired people.
Health-Care Costs On the Rise

Hialeah Metal Spinning

Hialeah Metal Spinning, Inc. (HMS), a Florida-based precision metal forming company with 14 employees, serves the appliance, electronics and medical industries. HMS pays 100 percent of its employee health-care insurance premiums and 50 percent for dependents.

Controlling exorbitant health-care costs is the number-one concern of small employers like Hialeah. In 2002, several insurers quoted HMS a premium increase of 58 percent. Instead of paying $207 per month for a single employee, HMS would have to pay $274–$642 a month, depending on the employee’s age and gender.

Like most manufacturers, Hialeah cannot pass on these costs to its customers. Given the competitive manufacturing environment, HMS customers are demanding price reductions, not increases.

HMS’s solution was to drop its insurer and participate in a Professional Employer Organization (PEO) that has buying clout. HMS was able to insure a single employee for $183 a month with the same benefits program—and the same insurer—that intended to charge HMS up to $642. While this worked for a year, even the PEO’s premiums jumped 19 percent in 2003. Over the long term, employees have seen annual pay raises allocated almost entirely to higher health-care fees and copays.

Manufacturers value the private health-care system and pay an average of 80 percent of employees’ premium contributions. In a recent Manufacturing Institute survey, nearly one-quarter of manufacturers reported that they paid 100 percent of the premium for their workers.

Rising health-care costs, which began in the late 1990s, are leading manufacturers to reconsider their level of support. The institute survey shows that more than 60 percent of manufacturing companies faced cost increases of greater than 13 percent. Most smaller companies saw much higher increases. Large manufacturers pay, on average, $6,375 per employee for family coverage, while smaller manufacturers, with less leverage in the marketplace, pay as much as $7,190 for that coverage.

No single factor is responsible for the rising cost of medical coverage. Movement away from tight networks, increased use of health-care services by workers—who are unaware of their costs—a large, aging baby-boomer population and lifestyle choices have affected the rising cost of health coverage.

**Increase in Average Health Insurance Costs Per Worker**

<table>
<thead>
<tr>
<th>Category</th>
<th>Small Manufacturers</th>
<th>Large Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase less than 6%</td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td>Increase 6–12%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>Increase 13–19%</td>
<td>31%</td>
<td>37%</td>
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<tr>
<td>Increase 20–26%</td>
<td>29%</td>
<td>44%</td>
</tr>
<tr>
<td>Increase more than 26%</td>
<td>17%</td>
<td>4%</td>
</tr>
</tbody>
</table>

*2001 cost increases over previous year; categories have been rounded.

Source: NAM, 2001
More than any other sector, manufacturers bear the highest share of the cost of regulation. Many regulations have positive benefits for the economy and society. Yet few understand the cost of these regulations and their impact on companies that face intense global competition with overseas firms that often do not have similar costs.

The cost of simply complying with federal regulations is steep. Manufacturers bear the highest cost—nearly $8,000 per employee—almost twice the average for all U.S. industries.

George Mason University’s Mercatus Center has estimated that workplace regulations alone cost manufacturers $2.2 million per firm per year, or roughly $1,700 per employee. As a benchmark of comparison, the cost of workplace regulations exceeds the amount U.S. companies spend on retirement-income benefits.

These and other high costs that are unique to the United States hinder the international competitiveness of manufacturers and constrain the demand for workers in U.S. facilities. Rising costs at home are further inducements to locate production abroad.
Hewlett-Packard

During its 2002 fiscal year, Hewlett-Packard Company’s (HP) worldwide revenues—including Compaq Computer Corporation, which HP acquired in May 2002—exceeded $72 billion. HP is a leading global provider of computer products, technologies, solutions and services to consumers and businesses. HP’s offerings span information technology infrastructure, personal computing and other access devices, global services and imaging and printing. During this period, HP spent almost $4 billion on R&D, most of it in the United States.

HP competes in world markets: Almost 60 percent of its revenue derives from customers outside of the United States. In the 1980s, the United States was a leader in reducing corporate income-tax rates. In recent years, however, many countries have reduced their corporate income-tax rates below those of the United States, while aggressively increasing incentives for research and development.

“A country’s corporate income-tax rate is one of many considerations taken into account when HP decides where to conduct new activities,” said Lester Ezrati, HP’s senior vice president, taxes. “The United States’ economy clearly would be more competitive if U.S. corporate tax rates were once again lower than those of our major trading partners.”

In a climate of increasing global competition, many countries are lowering corporate income taxes to lure mobile corporate dollars and encourage business investment. Since 1996, the average OECD corporate income-tax rate has decreased dramatically, from just below 38 percent to less than 31 percent in 2003.

Even in Europe, tax rates are low, and in Latin America and Asia, the average corporate rate is just over 30 percent.

Meanwhile, the average corporate income-tax rate in the United States stands at about 40 percent.* While tax rates alone do not fully capture the total tax burden—indirect taxes and other financial incentives play a role—they do provide a general impression of relative competitiveness. And on this point, it is clear that the United States is falling behind.

* This is an effective tax rate including both federal and state income taxes.

Source: KPMG International
In 2002, businesses paid nearly $380 billion in state and local taxes, representing 41 percent of total state and local taxes. These taxes, which exceeded personal income taxes by 85 percent, encompass corporate income tax, property taxes on business property, sales and excise taxes paid by businesses, various licensing taxes and unemployment insurance and workers’ compensation taxes.

These state and local taxes rose by 6 percent between 1999 and 2002, even though manufacturing profitability was falling in those years. While manufacturers are proud of the ways in which their plants support the local community, there needs to be a balance between the level of taxation and the economic development needs of each state. High taxes, like high regulatory costs, cannot be passed on by manufacturers to consumers in the form of higher prices in today’s market. They make doing business in the United States more difficult for manufacturers faced with intense international competition.

MAC’s success is driven by the philosophy of founder Konosuke Matsushita: “Contributing to the progress and well being of society through the production and marketing of quality products.” One way in which MAC implements that philosophy is through its tax payments and its community programs.

Every year, MAC directly pays more than $1 million in state and local taxes, including real estate and personal property taxes, payroll taxes and corporate business taxes such as the income tax. Not included are the additional taxes paid by MAC’s U.S.-based suppliers.

MAC supports local communities in other ways: Their employees are Little League coaches, science fair judges, Habitat for Humanity workers and school volunteers.
Rising Social Security Taxes Affect Workers, Jobs And the Economy

Because of Social Security’s mounting liabilities, Congress will continue to feel pressure to raise payroll taxes, which harms employment and growth in the manufacturing sector.

Since Social Security is a pay-as-you-go system, longer life expectancies and lower fertility rates are causing a widening gap between the system’s expected income and its actual costs. The payroll tax rate on Social Security has already increased from 2 percent of the first $3,000 in income in 1937 to 12.4 percent of the first $85,000 today.

The Social Security actuaries estimate that, absent reform, payroll taxes would have to increase by 50 percent (from 12.4 percent to 19.6 percent) to pay currently promised Social Security benefits. Social Security is now the largest tax that two-thirds of families pay—and its continued growth will increase the share of GDP dedicated to Social Security by 60 percent.

The economic costs of the growth in Social Security are best seen in a recent study by the National Association of Manufacturers, which found that the modest payroll tax increases from 1984 through 1997 cost the U.S. economy more than 1 million jobs and lowered GDP by $80 billion. An increase in the payroll tax of another 50 percent would be devastating.

Zaclon

Zaclon, Inc., a Cleveland, Ohio, manufacturer of basic and specialty chemicals, has been hit hard by the natural gas price swings. Its products are used domestically and in 19 different countries. Its 35 employees generate annual revenue of $12 million.

“...the natural gas price swings. Its products are used domestically and in 19 different countries. Its 35 employees generate annual revenue of $12 million.

“...in 1999 to 2002 almost forced Zaclon out of business. To survive, Zaclon placed an energy surcharge on its products, thus reducing its competitiveness with rivals in Europe and China.

“The combination of increasing energy costs with declining sales revenues is unsustainable for any length of time,” explains Krimmel. “We are running out of other cost-reduction opportunities, and we really can’t pass the increases on to our customers without giving up some significant share of the U.S. market to our overseas competitors.”
Modern manufacturing improves the standard of living in communities in every state. California and Texas are the two largest manufacturing states—both in terms of employment and the contribution to the state economy.

Jobs in manufacturing pay higher wages and benefits than jobs in other sectors and demand higher level skill sets than ever before. To ensure they have a 21st-century workforce to operate the sophisticated technology in today’s plants, manufacturers are heavily investing in quality worker-training programs and health care.

Yet workplace challenges remain, with many poorly educated job candidates and a shortage of new workers to take the place of the baby-boom generation, which is starting to retire in large numbers.

Today’s plants are generally clean and bright and they are also safe, with nearly a 40-percent decline in workplace injuries in the past decade alone.

Manufacturing lowers its costs by reducing environmental waste and harnessing technology for cleaner air and water. The result of these business decisions has been a dramatic reduction in emissions and other hazardous wastes.

The following pages describe in more detail how manufacturers—with more diverse leadership than ever before—contribute to the well-being of their employees and their communities.
Manufacturing’s Contribution to State Economies, 2001

(In Billions of Dollars)

Alabama . . . . . . . . . . . . . . . . . . . . $22
Alaska . . . . . . . . . . . . . . . . . . . . . . 1
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Nevada . . . . . . . . . . . . . . . . . . . . . . . 3
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Wyoming . . . . . . . . . . . . . . . . . . . . . 2

While manufacturing’s contribution to total U.S. economic growth has remained relatively steady for decades, its geographic distribution has shifted, with more manufacturing taking place outside of the traditional centers in the Northeast and Midwest. This broadening of manufacturing’s base is increasing its importance to regional economies.

The table to the right shows the five largest manufacturing states are California, Texas, Ohio, New York and Michigan.

Manufacturing is an important part of every state economy. According to the U.S. Commerce Department, it is the largest business sector in 20 states: Alabama, Arkansas, Idaho, Indiana, Iowa, Kentucky, Louisiana, Maine, Michigan, Missouri, Mississippi, New Hampshire, North Carolina, Ohio, Oregon, South Carolina, South Dakota, Tennessee, Vermont and Wisconsin.

Even in states where manufacturing’s share is lower, it still provides a major force for economic growth. For example, in California, manufacturing alone generates $164 billion in economic activity, larger than many entire state economies.
Manufacturing Employed Sizeable Workforces In the States

General Mills

At General Mills, not only are Wheaties for champions, but so are community groups that help foster a better understanding of nutrition and fitness among children.

The company established the forerunner of its Champions program in 1958, when President Eisenhower challenged the country to improve its fitness after discovering that American youth placed well behind their counterparts in Europe.

More recently, General Mills has partnered with the President’s Challenge, part of the President’s Council on Physical Fitness and Sports, and the American Dietetic Association Foundation. Under this program, General Mills Champions grants $500,000 a year to 50 schools and community-based groups throughout the United States to use in innovative youth fitness and nutrition programs.

For example, in Minneapolis, Minn., Champions supports program materials, award certificates and celebrations at each of 65 participating schools, recognizing students who complete 60 minutes of physical activity a day, every week for six weeks. The grants also support a strong nutritional education component as part of the company’s effort to instill healthy lifestyle habits in youngsters.

The manufacturing industry has never been as labor intensive as the service industry. Manufacturing’s chief contribution to economic growth lies in its innovative processes and productivity enhancements.

Due to the recent recession, more than 2.7 million manufacturing jobs were lost as the result of several adverse factors:

- The 1999 rise in interest rates made the cost of borrowing expensive, which discouraged capital investments.
- The U.S. dollar climbed in value, undercutting manufactured goods exports.
- Natural gas prices spiked repeatedly, creating dramatic price increases in manufacturing’s basic fuel.
- Inventory buildup discouraged manufacturers from hiring more workers.

Even so, manufacturing still directly employs almost 15 million workers in the United States, with sizeable workforce populations in nearly every state.

The five states with the largest manufacturing workforces are California, Texas, Ohio, Pennsylvania and Michigan. Together, they are home to more than one-third of all U.S. manufacturing employees. California’s manufacturing workforce of nearly 2 million is almost twice the size of the next state in this lineup.

Source: U.S. Department of Labor, 2001
A recent report by the Educational Testing Service (ETS) shows that the shortage of jobs requiring at least some post-secondary education or training will exceed 10 million in the second decade of this century.

Demographers point out that with the retirement of the baby-boom generation, there won’t be enough employees to go around. Between 1999 and 2020, the number of 18- to 24-year-olds is projected to grow by about 4 million. After 2010, the retiring 65-and-over population grows by 14 million.

According to a recent report from the Center for Workforce Success, *Keeping America Competitive: How a Talent Shortage Threatens U.S. Manufacturing*, more than 76 million baby boomers will retire over the next 20 years, but only 46 million generation Xers will take their places. Rising productivity, technology, training and immigration are all elements of the solution. But even these may not be enough, leaving the nation with a severe shortage of men and women to run tomorrow’s plants and offices.

Manufacturers are taking action now, ensuring their own plants have skilled employees for the future. The ETS report notes, however, that “Unless we increase the quantity and quality of [post-secondary] education and training, we are unlikely to generate enough skill to replace the retiring baby boomers, especially given an increasing demand for post-secondary skill levels on the job.”

Key employee-training initiatives for Hardinge include both theory and hands-on experience in such areas as lean manufacturing, inventory management and basic machining.

The on-site Basic Machinist Skills course was developed as a response to the declining number of machinists in the U.S. today. This 500-hour course combines classroom lectures with hands-on experience in Hardinge’s machine shop. Participants must demonstrate an aptitude for math and reading; successful graduates become candidates for employment.

“There will always be manufacturing, and machine tools are the backbone of manufacturing,” explains Chairman and CEO J. Patrick Ervin. “We are well positioned for an increase in U.S. manufacturing activity. We’ve continued to invest in our products and capabilities, and our training systems will help us take a proactive approach to the upcoming demographic changes that we’re expecting in the workforce.”

Hardinge sees the need to replace some long-term employees who will retire in the next few years, while also training current employees for new skills.
Shortage of Skilled Workers Imperils the Industry

Not Enough Qualified Job Candidates for Manufacturing

- 19.5% No Shortage
- 20.2% Serious Shortage
- 60.3% Moderate Shortage

Source: NAM Skills Gap Report, 2001

Butler Manufacturing

To stay competitive, Kansas City, Mo.-based Butler Manufacturing has embraced multi-faceted School-to-Work programs at all of its manufacturing facilities.

Butler’s managers know that they will be ahead of the curve if teachers and students learn about the good careers in manufacturing. The company provides paid summer internships for high-school teachers to learn about modern manufacturing and to incorporate that experience into lesson plans. That experience enabled a science teacher, who worked at the Butler Research Center, and a high-school math teacher, who helped Butler apply trigonometry for drafting technicians, to underscore the relevance of these subjects in the classroom.

Butler’s Texas plant partners with the local school district and offers applied workplace experience in AutoCad, a customizable software for 2D and 3D design, and other related technical drafting training. This two-semester program often leads to full-time jobs at the plant for high-school graduates.

In an initiative aimed at older employees, Butler’s North Carolina plant works with a local community college to improve skills by giving employees a better command of increasingly complex manufacturing processes.

Manufacturing is known for its innovations, its use of technology and its persistent pursuit of more efficient productivity to increase competitiveness. A well-trained and highly skilled workforce is a key part of this equation.

One of the most protracted problems that manufacturers face is the lack of new skilled workers to operate their plants. Five years after the NAM’s first study on the workplace, a shortage of qualified job candidates in manufacturing for both large and small companies still exists.

Even during the recent recession, 80 percent of manufacturers said they had a moderate to serious shortage of good production applicants, not just of engineers and IT workers. Now the more pervasive problem is the need for production workers, machinists and craft workers skilled enough to work in the manufacturing jobs of the 21st century.

To identify solutions, the NAM and The Manufacturing Institute have launched the Manufacturing Careers campaign to promote manufacturing as a preferred career option by 2010 through integrated awareness, career-planning and public-education programs.
Manufacturers Provide Employees With Non-Wage Compensation

Benefits, including medical coverage, retirement savings plans and training, are investments that most manufacturers willingly make in their employees.

Health care is by far the most popular form of non-wage compensation. In addition, most manufacturers offer retirement plans, life insurance, dental care and tuition reimbursement.

Reimbursement of tuition expenses encourages employees to upgrade their skills to be more productive. It is, however, only one of many forms of corporate training. In 2002 the share spent on tuition reimbursement fell due to the recession.

Small manufacturers offer many of the same benefits that larger firms do. The NAM Small Manufacturers Operating Survey shows that many of these benefits have grown substantially over the past decade. Aside from health care, the top five employee benefits are:

- 401(k) retirement accounts, offered by more than 80 percent of companies;
- bonuses, offered by 79 percent of companies;
- term life insurance, offered by 77 percent of companies;
- dental insurance, offered by 63 percent of companies; and
- tuition reimbursement, offered by 52 percent of companies.

Sources: American Society for Training and Development, 2003

Tuition Reimbursement in Manufacturing
As Percentage of Total Training Expenditures

To support this company strategy, Toyota offers a highly competitive tuition reimbursement program as a cornerstone of maintaining a positive work environment and supporting long-term company objectives. Annually, Toyota spends $8 million on tuition reimbursement to attract and retain world-class employees. The Toyota philosophy about team-member benefits provides protection for today and security for tomorrow. Toyota's competitive benefits package, such as the tuition reimbursement program, reflects the company's concern for the future of its team members' development and education.

Education benefits were recently expanded for team members' children through the establishment of the Toyota Manufacturing North American Scholarship program, commemorating the 10 millionth vehicle built in North America.
Although the cost and availability of health care has been a major concern for many U.S. companies and workers in recent years, manufacturers lead the way in providing this benefit. Manufacturers have found that offering strong health-care benefits is an important tool in attracting and retaining skilled workers.

In 2001, 84 percent of manufacturing workers received direct health-care coverage through their employers. Only government employees received comparable coverage. The number is even higher for members of the National Association of Manufacturers (NAM); surveys show that 97 percent of NAM member companies provide health-care coverage for their employees.
The antiquated image of a dirty, unsafe factory may linger, but it is not the workplace of today. Manufacturers’ investment in safer workplaces has paid off, with 36 percent fewer employee injuries over the past decade.

One of the main reasons for the successful decline in injury rates at manufacturing plants is that business owners are taking voluntary steps to address workplace safety. A 2001 survey of National Association of Manufacturers members found that 85 percent of the responding companies have written safety and health programs, up from 70 percent three years ago.

These plans may require employees to use personal protective equipment and take safety-related training courses, or they may be based on installation of safety controls on machinery, frequent inspections and explicit safety rules. About 55 percent of surveyed companies report that their health and safety programs address ergonomic-related injuries.

A more flexible and cooperative regulatory approach by federal and state officials has bolstered manufacturers’ voluntary efforts. Financial incentives—such as lower workers’ compensation premiums and lower fines from state and federal regulators—have also played a role in improving worker safety. In addition, workplace safety improves product quality while demonstrating to employees that their employers care about their well-being.

The Cleaner, Safer Manufacturing Workplace

Saint-Gobain Containers

Saint-Gobain Containers Inc. (SGCI), headquartered in Muncie, Ind., is the nation’s second largest glass container manufacturer for food, beverages, beer, wine and liquors. For the past five years, SGCI has been implementing a three-point plan to create and maintain a safe workplace for its 5,400 employees spread out over 18 plants in 13 states.

The company has established policies, procedures and programs to correspond with its enhanced safety focus. It has also worked diligently to change the company culture, establishing credibility within the workforce and involving employees in safety initiatives at all levels of the organization.

The SGCI Safety & Health Department regularly conducts risk analysis, safety audits and training, and has implemented a comprehensive industrial hygiene program. As a result, the company has reduced its total recordable injury rate by 29 percent over the past three years.

In 2001, SGCI’s manufacturing facility in Lincoln, Ill., was ranked as the top glass plant in the country. The Lincoln plant had no recordable lost-time accidents in 2000 or 2001, and it earned Saint-Gobain’s highest worldwide honor—the Diamond Award—for its remarkable performance in 2001. The plant earned the company’s Gold Award for its top performance in 2002.
A Growing Trend: More Women In Manufacturing

Pacific Plastics & Engineering

Fifteen years ago, as a retired school teacher, Stephanie Harkness and her husband were looking for new careers. They wanted a business they could run together that fulfilled their dreams and the dreams of their coworkers. Today, Harkness is chairman and CEO of Pacific Plastics & Engineering, located near San Jose, Calif.

Their unlikely choice was a rundown former plastics factory, which Harkness says was “filthy, unorganized and not computerized.” But for the one-time teacher, this was just the challenge she wanted. Now, after new investment and years of rebuilding, Harkness moved the injection molding plant to a new location. She has expanded to nearly 50 skilled workers and has developed new customers, ranging from Hewlett-Packard and IBM to the biotech industry.

In her career as a manufacturing executive, she has found tremendous fulfillment by creating a new company and new livelihoods for her employees. Pacific Plastics was ranked 14th in a recent listing of the top-50 women-owned businesses.

Harkness is one of many women who find satisfaction in manufacturing. “There are more women who are leaving corporate life. They’re taking their skills and competencies and creating offers in the marketplace,” she says.

Manufacturing owners and employees are often thought to be primarily men. Increasingly, however, manufacturing requires more brains than brawn as new technologies transform the manufacturing process. A growing trend in manufacturing is the role of women managers and owners.

According to the Center for Women’s Business Research, there were approximately 10.1 million privately held majority or 50 percent women-owned businesses in the United States in 2002. This includes 6.2 million majority women-owned firms and 3.9 million firms equally owned by women and men. These firms employed 18.2 million workers and generated $2.3 trillion in sales.

Nearly 20 percent of all manufacturing companies are majority women owned—and another 21 percent are equally owned by women and men. Majority women-owned firms are growing faster than other manufacturing firms. Among privately held firms with employees, majority women-owned firms grew by 27 percent from 1997 to 2002, compared with 8 percent growth for all manufacturing firms with employees. The Center for Women’s Business Research estimates that women-owned manufacturing firms with employees accounted for 15 percent of all manufacturing employer firms in 2002.
Economic Growth Improves the Environment

As we look over the past three decades, we see a real record of success in cleaning up and protecting our nation’s environment. By many measures, our environment is healthier today than it was in 1970,” stated the EPA’s 2003 Draft Report on the Environment.

Manufacturing has not only strengthened America’s economy but it has contributed many significant improvements to the environment. For example advances in technology and productivity have enabled firms to further reduce or eliminate their emissions.

Despite a huge leap in economic growth, a rise in energy consumption and a growing population, air and water quality has dramatically improved, resulting in cleaner lakes and rivers and reduced pollution. In the past 30 years, despite a 161-percent increase in the size of the economy and a 150-percent increase in vehicle miles traveled, EPA data show that airborne lead emissions were cut by 98 percent; particulate matter by 75 percent; volatile organic compounds by 42 percent; sulfur dioxide by 39 percent; and carbon monoxide by 28 percent.

Capital investments by manufacturers, many of them voluntary, stand behind these dramatic improvements. Enhancements in productivity and technology, as well as economic growth, contribute to these successes.

Revere Copper Products

Founded in 1801 by Paul Revere, Revere Copper Products’ copper resheathed the U.S.S. Constitution, or “Old Ironsides,” one of the most famous ships in U.S. naval history. Today, Revere manufactures copper and such copper-alloy products as sheet, strip, coil, plate, bus bar and extruded rod and specialty profiles.

Revere strives to be the world’s best at manufacturing copper products in a safe, environmentally sound manner. Revere’s Rome, N.Y., division—a consistent winner of the industry’s safety award—has also been honored by New York’s Department of Environmental Conservation for the region’s best industrial wastewater treatment system.

Revere President Brian O’Shaughnessy chairs the industry’s environmental program, which uses sound science to research the impact of copper on human health and the environment. His industry’s research led the EPA to drop inappropriate PBT criteria for evaluating the toxicity of metals and to declare most metals non-toxic. Significant new research by the industry on the critical importance of copper in fetus development has been reported in the New England Journal of Medicine.

Revere produced a film for students about a snowboarding expedition. Sent to more than 2,000 classrooms worldwide, the film discusses copper’s impact on the environment.
For today’s manufacturers, compressed air is a utility on par with electricity, gas and water. Using compressed-air generators, which squeeze and then distribute ambient air under pressure through piping to power assembly tools, industrial equipment and a range of processes, plant operators are able to transform air into a reliable and relatively inexpensive source of energy.

Purchasing new, efficient air compressors is a top priority for manufacturers eager to reduce their energy costs. Moreover, proper management and maintenance of a plant’s existing compressed-air system eliminates contaminants and leaks in a system’s piping, thereby greatly enhancing its effectiveness.

Ingersoll-Rand’s Air Solutions business unit identifies and ameliorates inefficiencies in existing compressed-air systems, helping its customers save up to 20 percent in annual air-consumption costs. Installation of new equipment reduces energy consumption and costs by a minimum of 28 percent during the unit’s operating life.

New equipment and better management of existing equipment have big payoffs. One Ingersoll-Rand customer saved approximately $130,000 in utility costs annually at its plant through improved systems management and design. Saving energy is a high priority among manufacturers worldwide because it improves their bottom lines.

Today, the United States uses energy more efficiently than it did 50 years ago. While gross domestic product has risen 161 percent since 1970, total energy usage has increased only 41 percent.

Likewise, manufacturing today uses energy-efficient methods and practices developed through technological improvements. While manufacturing’s share of GDP remained constant over the past 50 years, the rate of energy consumption per dollar of output in manufacturing has declined dramatically—by 44 percent—since 1970.

Even with the dramatic increase in energy efficiency, overall energy consumption has still increased. Within the same period, manufacturers have increased their electricity consumption from 3 percent to 16 percent. The usage of natural gas has risen from 25 percent to 41 percent, although oil consumption went up only slightly.
A capital-intensive industry, manufacturing requires reasonably priced funds to grow. Firms borrow money at a variety of interest rates, ranging from long-bond rates to commercial paper rates. One of the most commonly used benchmark rates is the prime, which is the rate charged by banks to their prime customers.

With the Federal Reserve’s successive interest rate cuts from 2001 to 2003, the real prime rate—the actual prime rate minus inflation—dropped to its lowest level in 25 years by the first quarter of 2003. For many firms this has meant that the cost of borrowing has also dropped, enabling them to more readily invest in their companies.

JLG Industries

JLG Industries Inc. thought its business model was complete. As the leading global manufacturer of aerial work platforms and a leading producer of telehandler products, it offered a warranty program, parts and supplies, used equipment operations and, above all, a quality product. However, JLG recognized an unmet customer need: equipment financing.

The Alta Group, a global equipment leasing and finance consulting firm, helped JLG refine its financial services model and launch Access Financial Solutions Inc.

JLG’s primary customers are equipment-rental companies and distributors that often have difficulty gaining access to capital. Understanding JLG’s market, Access Financial Solutions offers customers financing tailored to their unique business models.

“As part of our value-add service philosophy, we offer our customers a variety of ways in which they can own JLG equipment. Financing—whether arranged through third parties or financed through JLG—provides yet another solution for our customers’ needs,” says Kevin Ramsburg, managing director of Access Financial Solutions.

JLG directly or indirectly financed roughly 25 percent of every dollar in 2002, and sales in the fiscal year ending July 31, 2002, totaled $770 million. JLG proved that financing is an important piece of its service-oriented business model.
National savings consists of household savings, the government surplus and savings by firms. Savings by firms include both undistributed profits and depreciation charges—funds set aside to replace old capital.

In 2002, firms contributed 83 percent of national savings. By comparison, total consumer savings was 18.5 percent while government savings was -1.4 percent, as a federal deficit overwhelmed modest state surpluses. The government has historically saved only a very small amount. Until the late 1990s, the federal budget was in deficit. Individuals also have had low savings rates during the past five years.

Because total national savings influences the level of investment, the high business-savings rate is critical to capital formation, and, hence, growth.
The Manufacturing Institute and the National Association of Manufacturers have been issuing *The Facts About Modern Manufacturing* for more than a decade. This sixth edition marks the transition of the economy from the prosperous 1990s to a period of some uncertainty, especially for many manufacturers who have seen export markets dry up, overseas competition increase, natural gas prices soar and skilled workers remain in short supply.

Through the good times and the bad, manufacturing remains the foundation for the American economy’s innovation, international competitiveness and good-paying jobs. This publication provides policy-makers, students, teachers and the general public with the best overview of modern manufacturing available in this format.

Numerous people made this publication possible. First, we want to thank NAM President Jerry Jasinowski and institute Chairman Richard E. Dauch for their encouragement and support, as well as their enthusiasm and eagerness to tell manufacturing’s story. We are deeply grateful to EDS for underwriting the production and distribution costs of the book. Thanks also to the many companies that provided the invaluable sidebars that illustrate so many of the pages.

David Huether, the NAM’s chief economist, provided most of the data and much of the analysis underlying this publication and he tirelessly updated it when new information was released from U.S. government sources.

We thank the members of the NAM Communications Council who recommended new content and improvements over the fifth edition; many of them provided their company stories to illustrate the realities of modern manufacturing. The NAM policy departments and all of my colleagues at The Manufacturing Institute added their insights and perspective, contributions that strengthened the scope and breadth of this report. Two college interns, Alex Ernst and Jeff Deitrich, helped immeasurably in many ways.

The design and editing team that made this so readable and attractive included Kevin Sullivan, Irina Stepanova, Marissa Gandelman, Ronni Hutchason, Amy Harris and Jeanne Sano. We are most grateful to them for making what is often dry economic data spring to life in these pages.

Bill Canis
*Executive Director*
The Manufacturing Institute