The skills gap 2001

Manufacturers confront persistent skills shortages in an uncertain economy
Introduction

By Jerry J. Jasinowski

In 2001 more than 80 percent of manufacturers report a shortage of qualified job candidates despite the recession in manufacturing and the economic downturn overall. This is the major news coming out of this survey by the National Association of Manufacturers, the Center for Workforce Success and Andersen, the worldwide professional services firm. This marks the third time in 10 years that the NAM has conducted a survey on skills and training issues in the manufacturing sector.

These survey results show that substantial progress has been made in closing the technology skills gap. However, more than two-thirds of the firms surveyed said their most serious workforce shortages are in production areas ranging from entry level workers, operators, machinists and craft workers to technicians and engineers.

The good-news side of the coin is the survey’s indication that, despite the recession, there are still good production jobs out there for workers with the right skills. On the more ominous flip side, however, the survey shows that some 60 percent of manufacturers are having difficulty maintaining the production levels necessary to meet demand, and 40 percent say they cannot implement new productivity improvements.

The major areas of concern have shifted from technology skills back to the fundamentals, with basic employability skills cited as the number one deficiency for both current hourly workers and applicants for hourly positions. Poor reading, writing, math and communication skills were also significant concerns.

To put this survey data into context: Restoring long-term economic growth and vitality depend on the ability to maintain and improve productivity. Productivity depends on a highly skilled workforce, and a highly skilled workforce is exactly what manufacturers say they simply don’t have.

America needs to become more effective in education and training by raising the standards of quality and accountability, as the reform legislation recently passed by Congress seeks to do. We need to strengthen public-private partnerships on education, beef up business involvement and take a holistic approach that encompasses all stakeholders: employers, teachers, students and government leaders. In short, we need to make effective workforce development a top priority.

The skills shortages identified in our survey are serious and will only get worse as the decade progresses and demographic and other forces begin to take hold. According to forecasters, America could be facing a shortage of up to 10 million skilled workers by 2020.

The U.S. manufacturing workforce is the best in the world, but this latest survey highlights the need to get back to the basics of a good education that gives workers the full range of skills necessary to maintain high productivity and economic growth. Success will depend on a strategic approach that engages employers, employees, teachers, students and government leaders to make effective workforce development a top priority.

If you have any comments on the survey, our analysis or recommendations, please feel free to contact us at manufacturing@nam.org. To order additional copies of this report, please visit our Web site at www.nam.org/bookstore.
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Acknowledgements

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We appreciate the help of the Andersen team, without whom we could not have conducted this broad national survey: Steven M. Hronec and Steve M. Samek who sponsored the survey; Christopher McGee, Christopher E. Ryan, and Christine M. Ehly from Andersen’s Human Capital practice who helped with survey design and interpretation; Dr. Michael J. Brien who reviewed the report; Carl E. Hanssen and Helen Wan who built the response database and provided statistical analysis; Margaret M. Hoag who helped write the report; Daniel P. Ciciora who designed the report; Tony Kellers, from zun partners (Chicago), who designed the report cover; and Catherine A. Roberts who managed the project for Andersen.

This survey would not have been possible without the thoughtful and objective responses that we received from our members. Thank you for sharing your experiences with us.

We especially thank NAM President Jerry Jasinowski for his continuing support of our efforts to tell the story about modern manufacturing and to make manufacturing careers the preference of students and employees in the 21st century.

Phyllis H. Eisen
Vice President, The Manufacturing Institute
Executive Director, Center for Workforce Success

Survey instrument

This survey marks the third time in 10 years that the NAM has asked members to share how they manage their employees and knowledge capital in a competitive global marketplace, and what they are doing to ensure a continuing supply of skilled, creative and productive workers.

Last May, 6,000 NAM members were chosen at random to receive the survey. More than 600 responded, answering a variety of questions about their general labor situation, recruitment and retention practices, the effects of labor and skills shortages on company operations, their own employee training and education programs, and their views of the public training and education systems.

Survey respondents represented more than 20 different industries, from every part of the United States. Approximately 13 percent of the respondents were from large companies (500 or more employees); the remaining were small companies (fewer than 500 employees). Respondents included human resource professionals, CEOs, COOs and plant managers.

This report includes the results of the survey, our analysis of the responses and our recommendations. The report also contains several brief stories of training and workforce-development activities of NAM-member companies that illustrate the main points of this report.

This study was conducted by the NAM, The Manufacturing Institute’s Center for Workforce Success and Andersen.
The primary finding of this study is that U.S. manufacturers face a persistent skills gap in the workforce, despite an economic downturn and despite billions of dollars spent on education and training initiatives in the past decade. This gap derives from long-term forces—demographics, technology and globalization—whose impact will be felt for years to come. In dealing with short-term cyclical impacts on the workforce, the nation must not lose sight of these long-term forces, whose challenges to the economy are severe and require a concerted response.

The 2001 study affirms trends we have already documented in our prior studies on the same subject: *The Skills Gap—The Shortage of Qualified Workers: A Growing Challenge to the American Economy (1997)* and *The Need for Skilled Workers (1991)*.

**Skills shortages persist...**

What is striking about today’s manufacturing environment compared to 1997 is that the most severe skills shortages now are mainly in the production workforce. These skilled hourly workers have traditionally been the backbone of manufacturing. Moreover, the major skills lacking in hourly workers (both job applicants and current employees) are those of basic employability (attendance, timeliness, work ethic, etc.), with reading, communication and math skills ranking as a second cluster of deficiencies.

...even in a manufacturing recession.

When this survey was taken in May 2001, the economy as a whole had been cooling for several months. In manufacturing, however, the slowdown had started eight months before, and some sectors had already suffered cuts in production and substantial layoffs. Nonetheless, the manufacturers responding indicated they are still experiencing serious skills shortages.
General findings

Despite the slowing economy, 80 percent of manufacturers continue to experience a moderate to serious shortage of qualified job candidates.

The most serious shortages now affecting manufacturers are not of computer or information technology workers. Instead, the major shortages are among skilled hourly workers. More than two-thirds of respondents said their most serious workforce shortages are among production workers and those directly supporting them—ranging from entry level workers, operators, machinists and craftworkers, to technicians and engineers.

The top deficiency identified by respondents for both current hourly workers and applicants for hourly positions is a lack of basic employability skills (attendance, timeliness, work ethic, etc.).

Nearly two-thirds of respondents said the lack of skilled workers negatively impacts their ability to maintain production levels to meet customer demand, and 40 percent said it makes it difficult to improve productivity.

Manufacturers are investing in training their employees. More than half of respondent companies are spending more on training than they did three years ago, with the need to keep pace with technology the main reason for offering training.

Eighty percent of respondents said that voluntary turnover is highest among hourly production workers. The most common reason employees voluntarily leave is for higher wages. Respondents said that monetary incentives are the most effective recruitment and retention practices.

Manufacturers see a serious problem with the availability of future workers. Seventy-eight percent of respondents believe public schools are failing to prepare students for the workplace, which represents little change from the 1991 and 1997 surveys, despite a decade of various education reform movements. Respondents said the biggest deficiency of public schools is not teaching basic academic and employability skills.

More than half of respondents believe the government’s role in the effort to attract and retain a highly effective workforce should be in the form of tax relief for companies offering training. One-third said the government should provide direct funding to companies for employee training.

Reflecting the key shortage of hourly production workers, more than twice as many employers (22 percent) said they would like the government to allow greater immigration of skilled hourly workers than of professional/technical workers (10 percent).

Respondents ranked technical colleges, business associations and community colleges roughly equally as their top sources for outside training. This is the first time that business associations were ranked among the top sources for training and reflects their changing role in workforce development.

One-quarter of respondents said that labor shortages make them more willing to hire immigrants, high-school students, people moving from welfare to work and retired workers. This is a significantly higher percentage than had been previously reported. More than 30 percent of those who hired workers from among these groups were satisfied with the results.

Two-thirds of respondents said that the manufacturing industry suffers from a poor and outdated image in competing for competent workers.

Despite the recent economic downturn, the persistent skills shortages confronting manufacturers and other employers derive from powerful long-term forces in the economy.

Advancing technology: New technologies—in computers, materials and processes—continue to infuse all sectors of the economy, raising skill requirements.

Demographics: The Baby Boom workers are beginning to retire, taking their skills with them. America’s labor force is growing only through the addition of immigrants, many of whom lack adequate education, language and job skills.

Globalization: America’s high-wage manufacturers compete in an increasingly global economy where their success is defined by quality and productivity, which are dependent on the skills of the workforce.

Overemphasizing four-year college attendance: Too many educators, students and parents focus solely on four-year college education. In addition
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Reauthorization of the 1998 Workforce Investment Act is an opportunity to improve our national workforce development practices. The public training system must be more responsive to employer needs, including the need to train current workers. Many adults need greater literacy skills in order to succeed and advance in the workplace. While the Bush Administration is focused on literacy for young students, improving adult literacy must also be a priority.

Immigration policy should include initiatives to meet the cultural, language and technical skill needs of immigrants, who are the main source of growth in the labor force.

The public education system needs improved standards and accountability, but educators must also produce graduates familiar with the world of work and skilled enough to succeed in it. We support business/education partnerships that allow students and teachers the opportunity to complement academics with workplace experiences such as internships. In addition, certificate and associate degree programs in the nation’s community colleges and technical institutes should be expanded to meet 21st-century skill requirements.

Tax policies supporting continuous learning throughout a person’s career should be continued and expanded. In addition, tax incentives should be structured to encourage training by small- and medium-sized employers where the education resources are limited; and, since our survey found that employer associations now rival community colleges as preferred suppliers, they should receive some public funding to play a stronger role in workforce development.

Manufacturing continues to suffer from a negative image. As an industry, we must take action to make manufacturing a preferred career option for students and workers. Students, parents, teachers and workers at all levels must be informed about the satisfying, remunerative career opportunities that manufacturing offers. The NAM, the Center for Workforce Success and the U.S. Department of Commerce have implemented a national multimedia awareness and school-focused campaign—GetTech—to encourage young people to prepare for a technology-driven future, with manufacturing as an important choice.

Conclusion

Despite the concerns identified in this survey, the U.S. manufacturing workforce is the most productive in the world, and manufacturing has been the primary driver of economic growth in the past decade. The survey results highlight the need for a prepared workforce that is ready to meet the future. Success will depend on employers, employees, teachers, students and government leaders working together to address these issues.

The NAM’s recommendations

Some factors that have contributed to the workforce challenges that manufacturers face are beyond the control of public or private policies. However, there are steps that can be taken in both the public and private sectors that will help to relieve manufacturers’ immediate need for skilled employees, as well as ensure a continued supply of trained workers.

Employers should invest in their workforce. As we called for in the 1997 Skills Gap report, employers should aim to invest at least 3 percent of payroll to train and educate employees, and should offer a range of programs that cover basic literacy and basic academic skills, as well as computer/technology training and tuition reimbursement for higher education.

to the many jobs in manufacturing requiring a four-year degree, many satisfying, remunerative careers in manufacturing and other sectors require a training certificate or two-year degree. Jobs requiring this academic level are growing, yet are often overlooked.

According to experts, these factors will generate a shortage of up to 12 million skilled workers by 2020. Long-term skills shortages pose challenges distinct from the short-term impact of cyclical economic slowdowns. The nation must focus on both if it is to meet its workforce and competitive needs.

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What we found
The skills gap 2001

Does the manufacturing workforce have the skills in place to stay competitive in a global economy? Is there a shortage of qualified job applicants? What steps should be taken—by manufacturers, schools, industry associations and the government—to create a prepared and productive workforce?

The survey respondents agree: U.S. manufacturing is suffering a severe shortage of skills in its workforce. What kinds of skills? Every kind, but with some surprising findings about which job categories have the most severe shortages.

First, we asked about finding and hiring new employees:

- Eighty percent of manufacturers, large and small, report a “moderate to serious” shortage of qualified job candidates (Figure 1), with 20 percent saying the problem is “serious.”

Not surprisingly, the hardest hit regions are the central states—a traditional center of manufacturing—and the West, with its vulnerability to any downturn in the high-tech sector.

- For all respondents, the most serious shortages specifically identified are in production and direct support fields (Figure 2): entry-level production employees (63 percent call their need “moderate or serious”); craft workers (77 percent call their need “moderate or serious”); operators (75 percent call their need “moderate or serious”); and machinists (75 percent call their need “moderate or serious”).

- Perhaps surprisingly, NAM members are not as concerned about a shortage of computer programmers, information technology (IT) technicians, IT professionals, plant managers and most other salaried personnel. For example, only 49 percent of respondents said they have a “moderate or serious” need for IT technicians.

In May 2001, the National Association of Manufacturers, The Manufacturing Institute’s Center for Workforce Success and Andersen surveyed NAM members about workforce issues.

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- Perhaps surprisingly, NAM members are not as concerned about a shortage of computer programmers, information technology (IT) technicians, IT professionals, plant managers and most other salaried personnel. For example, only 49 percent of respondents said they have a “moderate or serious” need for IT technicians,
a significant percentage but substantially less than those citing a shortage of production workers. (Note: this is not equivalent to saying that manufacturers, large and small, do not need a computer-literate workforce. An increasing number of factory jobs require expertise in working with automated equipment within automated processes. In their written comments, many respondents mentioned the need for “shop-floor computer” skills as distinct from IT skills.)

- Larger companies report a greater deficiency of skills of almost all job categories (except in three categories—operators, entry-level production employees and sales/marketing professionals) in their available workforce.

When we elicited the same information in our 1997 survey, NAM members expressed similar concerns. At that time, however, they were relatively more anxious about finding engineers and computer programmers.

Today, engineers are still in short supply. Nearly two-thirds of respondents said they have a “moderate” or “serious” need for engineers, but 45 percent said they have “no shortage” of computer programmers at present. Two-thirds cited problems finding machinists, compared to 45 percent in 1997.

![Figure 2: Availability of qualified candidates by job category](image-url)

<table>
<thead>
<tr>
<th>Job Category</th>
<th>No shortage</th>
<th>Moderate shortage</th>
<th>Serious shortage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry-level production employees</td>
<td>37.1%</td>
<td>46.7%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Operators</td>
<td>24.7%</td>
<td>54.8%</td>
<td>20.5%</td>
</tr>
<tr>
<td>Machinists</td>
<td>24.7%</td>
<td>34.1%</td>
<td>41.2%</td>
</tr>
<tr>
<td>Craft workers</td>
<td>23.2%</td>
<td>34.4%</td>
<td>42.5%</td>
</tr>
<tr>
<td>Technicians/electricians</td>
<td>24.9%</td>
<td>41.1%</td>
<td>33.9%</td>
</tr>
<tr>
<td>Engineers</td>
<td>34.8%</td>
<td>45.2%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Plant managers</td>
<td>49.4%</td>
<td>35.6%</td>
<td>15.0%</td>
</tr>
<tr>
<td>Computer programmers</td>
<td>45.4%</td>
<td>37.9%</td>
<td>16.7%</td>
</tr>
<tr>
<td>IT professionals</td>
<td>45.6%</td>
<td>36.2%</td>
<td>18.2%</td>
</tr>
<tr>
<td>IT technicians</td>
<td>51.0%</td>
<td>36.7%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Sales and marketing professionals</td>
<td>48.0%</td>
<td>42.8%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Human resource personnel</td>
<td>66.6%</td>
<td>30.1%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Accounting and finance professionals</td>
<td>63.6%</td>
<td>33.7%</td>
<td>2.7%</td>
</tr>
<tr>
<td>General managers</td>
<td>50.8%</td>
<td>38.3%</td>
<td>10.9%</td>
</tr>
<tr>
<td>Scientists/R&amp;D workers</td>
<td>52.4%</td>
<td>34.0%</td>
<td>13.6%</td>
</tr>
</tbody>
</table>
Filling the pipeline with skilled technicians

Each year, the auto repair and service industry faces a shortage of 60,000 trained technicians. To help close this gap, Toyota Motor Sales, USA (TMS) joined with the Los Angeles Urban League to establish the Los Angeles Urban League Automotive Training Center (ATC), a non-profit, state-of-the-art facility that provides vocational training in a real-world environment.

“Our mission is to prepare professionals to succeed at all levels and types of retail operations,” says James E. Press, TMS executive vice president and chief operating officer. “The ATC is creating a talent pool, helping fill the pipeline with qualified service and management candidates—not only for our own dealers but for the entire automotive industry.”

Since 1993, TMS has invested more than $7 million in the ATC. Having established employment partnerships with more than 60 automotive service companies throughout Los Angeles County, the ATC has earned an outstanding reputation for recruiting, training, and placing workers. More than 860 students have graduated from the program, which maintains a job placement rate of 80 percent.

“This is a place where good things happen to people who want to embark on a career in the automotive service industry,” says Willie James, employment advisor of the Automotive Training Center. Because of the center’s success, TMS plans to support another center in the East.

Helping young people acquire skills for life

When Saint-Gobain bought the Norton Company in 1990, it also acquired a progressive, successful community venture called “Skills for Life.” The program, which combats drop-out and literacy problems in public schools, is a collaboration of the company’s local plants, Mass. Job Training, Inc. (a non-profit organization), and participating school districts.

“In the beginning, we asked each other, ‘How can we put our organizations, skills, resources and knowledge together to help at-risk students?’” says Dottie Wackerman, vice president, communications, for the company’s U.S. and Canadian business. “Our goal is to help kids stay in school, graduate and become productive adults.”

The answer is individualized, self-paced, computer-based instruction in core skills, from academic basics such as reading, writing, math and English as a Second Language (ESL), to the functional competencies necessary for the workplace. The program’s targets are middle- and high-school students, deemed likely to drop out based on indicators such as low academic achievement and poor attendance.

Saint-Gobain’s investment provides for computer labs in the schools. The first program (in Worcester, Mass.) was so successful—the drop-out rate plummeted from 21 percent to 11 percent in one year—that Saint-Gobain has introduced Skills for Life in other plant communities, including Brownsville, Texas and Niagara Falls, New York.
Why are manufacturers rejecting job applicants?

Nearly half (48 percent) of survey respondents reject up to one-half of the applicants for all job openings (exempt and non-exempt). Thirty percent of the respondents reject 50–75 percent of the applicants. And 17 percent reject more than 75 percent of the applicants.

Here are the reasons named most often for rejecting applications for hourly production workers (Figure 3):

- A remarkable 69 percent cite “inadequate basic employability” skills (attendance, timeliness, work ethic, etc.). This reason was named twice as often as any other. A significant number of manufacturers also identified this as the most serious workforce issue they will face in the next 5–10 years.

- The second most-reported reason (eliciting a 34 percent response) is “insufficient work experience.” This is a significant improvement from the 1997 survey, when more than half (56 percent) of respondents cited “insufficient work experience” as the reason for rejecting a job applicant.

- The third most-reported reason is inadequate reading and writing skills, cited by 32 percent of the respondents. The main reason responding manufacturers reject applicants for salaried professional positions is insufficient work experience, with 47 percent of the survey respondents giving it paramount importance.

Figure 3: Most common reasons the company rejects applicants*
Palmer Tool Company

Headquarters: Camden, Tenn.
Nature of business: custom metal fabricating and machining.
Number of facilities: 2
Number of employees: 100
Company contact: Bill Horne, (731) 584-4681

On-site training provides technical skills and more

A small operation located in rural west Tennessee, Palmer Tool Company is fulfilling its need for skilled workers by growing its own.

“Our work is skilled-labor intensive,” says Bill Horne, president. “Rarely do we find a person with the exact skills we need. Even experienced people need to be trained in our processes, culture and values. We find it pays off to make the long-term investment in training.”

Palmer Tool Company thinks education is so critical to a company’s and an industry’s success that training is a line item in the annual budget. “Training is too important to be caught up in overhead. Even if times get tight, companies should defend every single training dollar,” says Horne.

The Palmer Tool Company also works with the local public school system to attract “bright youngsters with a good attitude” through its Faculty in the Factory program, a business-education partnership. For one week each year, educators from the elementary and secondary schools work directly with employees in Palmer’s plant, from the front office to the welding and machining departments. With the hands-on experience they gain, teachers return to the classroom, ready to deliver relevant information about modern manufacturing processes and career opportunities.

Miles Fiberglass & Composites, Inc.

Headquarters: Portland, Ore.
Nature of business: manufactures a variety of products, including one-of-a-kind, custom-made items, using open molding, vacuum bagging, press molding and resin-transfer molding (RTM) processes.
Number of facilities: 2
Number of employees: 90
Company contact: Lori Luchak, (503) 775-7755

100% trained workforce means better first-time quality

Since Miles Fiberglass & Composites, Inc. started a mandatory, yet self-directed, training program for its employees, rework has dropped dramatically, from 313 hours per month in 1996 to 190 hours per month in 2001. During the same time period, labor efficiency jumped from 63 percent to 82 percent, and employee turnover dropped significantly.

“In our industry, the processes are unique, so all training is on-the-job,” says Lori Luchak, marketing manager. “We replaced the old ‘buddy’ system with a formal program of ‘train the trainer’ in the best way to complete each step within every process.” The courses were designed by a local high-school chemistry teacher who was hired through the Business Education Compact, a non-profit organization that places teachers in business internships for the summer.

Employees can choose to become certified in up to 12 processes. To complete all the training would require about two years, after which point the worker would be highly skilled in the industry. Also, each additional certification brings a monetary benefit.

“We succeeded in achieving our initial objective—to reduce rework through a better understanding of our processes—but we’ve also done much, much more,” says Dan Bellanger, production manager. “The program gives each employee more control over his or her future.”
Excel Corporation

**Headquarters**: Fort Morgan, Colo.

**Nature of business**: processes fresh beef, pork and fully prepared meats. Excel Corporation is a wholly owned subsidiary of Cargill, Inc.

**Number of facilities**: 50 worldwide, including processing plants, sales offices and distribution centers.

**Number of employees**: 20,000 in the United States, Canada, Australia, China, Honduras, Japan, Korea and Taiwan.

**Company contact**: Shirley Penn, (970) 867-1575

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**Turnover drops 23 percent among trained workers**

More than 65 percent of the 2,000 workers in Excel Corporation’s Fort Morgan, Colo. plant are immigrants. Many have the technical skills to process 4,000 head of cattle every day, but lack the skills to communicate effectively. As a result, Excel faced a challenge common in its industry: high employee turnover. The solution? A progressive, on-site program, in cooperation with Morgan Community College, for teaching English as a Second Language (ESL).

“In 1992, we had 40 students and a box of books,” says Russ Weimer, associate human resource manager. “Now, we have 260 participants. Our intent was—and still is—to reduce turnover and prepare employees for promotion.” The program now offers courses in computers, citizenship preparation and other basic skills.

Success is evident in the program’s results. Seventy-five percent of supervisors report improved communication among the program participants; 55 percent see an increase in safety practices; and 55 percent say that employees who have completed the program pay more attention to quality and productivity, and thus have more opportunity for promotion. Among participants, turnover has dropped 23 percent.

“The program has had an impact above and beyond improving retention,” says Shirley Penn, the workplace education director at Morgan Community College who works out of Excel’s offices. “It has helped turn our workplace into a community.”

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ExxonMobil

**Headquarters**: Irving, Tex.

**Nature of business**: refines, produces and markets petroleum and chemical products.

**Number of facilities**: thousands

**Number of employees**: 99,600

**Company contact**: Lynn Russo, lynn.b.russo@exxonmobil.com

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**One-to-one contact makes training personal in a global company**

How does a large company foster a sense of commitment to each new employee? For ExxonMobil, the solution is a flexible program that includes training, peer support, professional development, mentoring and networking. “After we recruit an employee, we accept the challenge of making that person feel at home in our large organization,” says Steve Simon, president of refining and supply. “One-to-one relationships help recruits succeed in a new work environment.”

A program that is modular and adaptable fits the needs of each location—from refinery and chemical plants to local sales offices. Some of ExxonMobil’s sites are small, with 50–100 workers; others house several thousand employees. In some cases, a work group shares a single objective; in others, employees from different business units work together daily.

At the foundation of the program is a “tool kit” that allows managers to customize the program to the individual employee and to the local site or business unit. The kit brings together the elements of many programs—including guides for formal and informal training, mentoring programs and networking tools—that help the new employee succeed. With this tool kit, a manager can ensure each new employee gets the right type of attention and each site gets a program that fits its business.

Kimberly Johnson has been working at a large ExxonMobil facility for 10 months: “The network helped me connect with folks at the same point in their career as I am; people I would never have met in my day-to-day job. It really helped me understand the organization.”
Regarding managerial skills, 40 percent of the survey respondents said that their salaried professionals lack innovation and/or creativity. Other top responses were poor supervisory/managerial skills (37 percent), inability to work in a team (31 percent) and poor project management skills (28 percent).
Impact of skills gap on operations

These findings—shortages in technical skills, a decline in work ethic, or deficiencies in reading and writing—matter because manufacturers say they impact operations (Figure 5).

Without enough adequately skilled workers, the survey respondents said they have a hard time maintaining production levels to meet customer demand (60 percent), implementing new productivity improvements (40 percent) and implementing a quality improvement process (28 percent). A significant shortfall in any of these areas can drive a business, already operating on a competitive edge, out of the global game.

On this issue, the difference between small and large companies is apparent. Relative to large manufacturers, small companies claim greater damage in their ability to maintain production levels (62 percent, compared to 49 percent for large companies) and in implementing productivity improvements (43 percent, compared to 27 percent for large companies).

Figure 5: Area in which the company experienced the most difficulty, due to labor shortages or employee skill deficiencies*

*Each respondent selected up to three reasons for each category.
During the 2001 skills gap, one small manufacturer in Mentor, Ohio, made a significant difference. Roger Sustar, president of the Fredon Corporation, said, “If every company did what we do, there’d be no shortage of skilled workers in this country.” Fredon Corporation acts as a friend to education, through programs like its sponsorship of a Boy Scouts of America Learning for Life initiative. This initiative helps young men and women investigate various career opportunities, spending mornings at the plant, making cannons (non-firing) of bronze, brass and aluminum. Each year, a promising student is offered a job with the company and a tuition-reimbursement opportunity for training at the local community college. In 10 years, more than 150 young people have completed the cannon program. Among these, eight have joined the company. All the students who participate have an advantage over their peers and are heavily recruited by local manufacturers.

Ohio Stamping and Machine, Inc. is another example of companies closing the skill-and-experience gap through training. Jeff Powell, safety and training manager, says, “A trained worker is efficient and effective—two qualities U.S. companies need to compete globally.” In an industry where the skilled workforce is approaching retirement, Ohio Stamping and Machine is closing the skill-and-experience gap in new employees through training. In a recent initiative funded through a grant from the state of Ohio, the company implemented a metalworking curriculum and installed a lab at Springfield-Clark Joint Vocational School. The program proved so successful that the curriculum is now offered to recent high-school graduates, and it may soon be offered to juniors and seniors. More than 60 participants—both adults and recent high-school graduates—have completed the course. One-third of the participating graduates have been offered employment at Ohio Stamping and Machine.

Another successful initiative is the company’s summer program, in which newly hired high-school graduates begin a job that includes four hours at work and four hours in the lab each day. The new hire improves his or her skills rapidly, and Ohio Stamping and Machine gets another valuable worker.
Finding and keeping skilled people

The top three strategies used to recruit and retain employees are paying competitive wages, providing 401(k) plans and offering expanded health care benefits (Figure 6). In 1997, survey respondents gave similar answers.

While these inducements are fundamentally necessary, they do not necessarily ensure a stable workforce. In fact, when money (in its many forms) is the only incentive, workers still tend to change jobs, looking for increases in income, however slight. Eighty-one percent of respondents said their highest voluntary turnover rates are among hourly employees, and 53 percent said that when workers leave voluntarily, they do so for higher salaries (Figure 7). Other research, however, indicates that investments in the form of training may increase the bond between employer and employee.

Few respondents have explored flexible work environments, but smaller companies seem more willing to consider and offer these arrangements—for professional employees if not for hourly workers.

To find suitable employees, 60 percent of participating manufacturers use public agencies; 35 percent recruit at local community colleges; and 30 percent work with community-based organizations. Large companies are somewhat more likely to use these resources or strategies.

In 1997, only a small number (12 percent) of survey respondents said they planned to institute hiring programs for non-traditional workers. Today, 19 percent would hire...
high-school dropouts; 23 percent would hire people moving from welfare to work; 28 percent would hire immigrants; and 13 percent would hire former offenders (Figure 8). Of those who hired employees from among these groups, 31 percent were satisfied with the results. Large companies report slightly higher satisfaction rates (36 percent versus 30 percent) than small companies.

**Figure 8:** The recent labor shortage increased the company’s willingness to recruit and hire*

*Each respondent selected all choices that applied.

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**Precision Metalforming Association**

**Headquarters:** Independence, Ohio  
**Nature of business:** a full-service trade association representing the $41 billion metalforming industry of North America.  
**Number of members:** 1,600 companies located in 30 countries, predominantly in the United States and Canada.  
**Association contact:** Karen Kittle, (216) 901-8800

**Preparing the workforce of the future**

Industry associations can play a key role in promoting education and training for their members. In every survey the Precision Metalforming Association (PMA) has conducted since 1991, members have indicated that workforce development is one of their top priorities. PMA created the Precision Metalforming Association Education Foundation (PMAEF) in 1996, to focus its efforts in this area.

“Our job is to help members develop and deliver the training they need, locally,” says Dave Sansone, executive director (PMAEF) and director of training and education (PMA).

Knowledge sharing is one of the association’s prime objectives. PMAEF brings together members with successful training programs so they can share with others. Members looking to start a program get a head start on developing one that works.

Other initiatives are designed to attract high-school students to the industry; encourage members to serve on local school advisory committees; promote the implementation of industry skill standards; and help members improve the image of manufacturing in their communities.

“We need to promote the message that manufacturing is not dirty, dark, dangerous and dead-end,” explains Karen Kittle, director of membership and development for the foundation. “The foundation Web site (www.pmaef.org) was designed to attract and inform students, parents and educators, and to demonstrate the value and importance of a career in metalforming.”
Good news about training: more manufacturers are doing more of it

More than half (52 percent) of survey respondents said they are spending more on training employees than they were in 1997 (large companies are a little more likely to be spending more); 39 percent are spending about the same (Figure 9). Sixty-one percent of the respondents said they spend one percent or more of payroll on training for both hourly and managerial employees; one-third (33 percent) spend two percent or more; and 17 percent spend three percent or more.

Twenty-one percent of respondents provide training to 80–100 percent of their employees. About one-quarter (28 percent) of respondents said they provide training to less than 10 percent of their employees. Overall, nearly 30 percent of both hourly workers and salaried employees spend 21 or more hours in training per year.

Most training (62 percent) is done in-house. Among the 43 percent who use outside sources (Figure 10), the top three sources for outside training are vocational/technical schools (46 percent); business associations (46 percent); and community colleges (45 percent). This is the first time that business associations such as NAM-member affiliates at the national, state and local levels were rated among the top sources for training. This reflects the changing role of associations and the value they can provide to their members with regard to workforce-development issues. State and local governments are not seen as a primary source, nor are faith-based organizations. Only five percent use online training providers. Portable certificates are important, with nearly 80 percent valuing them “moderately to highly.”
As with the 1998 survey, the perceived need to keep pace with technology is apparent, with 63 percent of the respondents citing this as their top reason for offering training.

Courses or programs that teach specific skills for a particular job are offered by nearly two-thirds (64 percent) of the manufacturing companies that responded to the survey (Figure 11). Sixty-one percent offer tuition reimbursement for undergraduate or graduate programs, and 40 percent offer continuing education for technical or professional personnel. Despite respondents’ indication that lack of basic employability, communication and academic skills is a problem among current employees, only 15 percent of respondents offer English as a Second Language (ESL), 16 percent offer basic math and less than one in 10 (nine percent) offer basic reading and writing.

Large companies tend to provide more training opportunities to their employees. Of the respondents that said there is a union at their company, only four percent said the union provides training opportunities to employees.

Figure 11: Education or training opportunities offered to employees*

<table>
<thead>
<tr>
<th>Education or training opportunities offered to employees</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>English as a second language (ESL)</td>
<td>14.5%</td>
</tr>
<tr>
<td>General Equivalency Diploma (GED)</td>
<td>9.3%</td>
</tr>
<tr>
<td>Basic reading and writing</td>
<td>8.6%</td>
</tr>
<tr>
<td>Basic math</td>
<td>15.8%</td>
</tr>
<tr>
<td>Advanced math</td>
<td>7.0%</td>
</tr>
<tr>
<td>Tuition reimbursement for undergraduate or graduate programs</td>
<td>60.6%</td>
</tr>
<tr>
<td>Problem-solving</td>
<td>25.1%</td>
</tr>
<tr>
<td>Verbal communication</td>
<td>19.0%</td>
</tr>
<tr>
<td>Customer service</td>
<td>28.7%</td>
</tr>
<tr>
<td>Computer skills</td>
<td>54.3%</td>
</tr>
<tr>
<td>Interpersonal skills</td>
<td>22.9%</td>
</tr>
<tr>
<td>Diversity awareness</td>
<td>13.3%</td>
</tr>
<tr>
<td>Specific skills for a particular job</td>
<td>64.2%</td>
</tr>
<tr>
<td>Formal apprenticeship programs</td>
<td>19.7%</td>
</tr>
<tr>
<td>Teamwork/leadership</td>
<td>33.5%</td>
</tr>
<tr>
<td>Continuing education for technical/professional personnel</td>
<td>39.6%</td>
</tr>
<tr>
<td>Certification training for various technical degrees/licenses</td>
<td>37.1%</td>
</tr>
<tr>
<td>Other</td>
<td>8.1%</td>
</tr>
</tbody>
</table>

*Each respondent selected all choices that applied.
Manufacturers’ views on public education

Manufacturers are looking for help in solving the skills shortage crisis in today’s workforce.

More than three-quarters (78 percent) of respondents believe that public K–12 schools are not doing a good job in preparing students for the workplace (Figure 12). In 1997, 81 percent said the same. Clearly, not much has changed in the attitude toward our public school system.

From schools, manufacturers would like to see an emphasis on teaching basic employability skills; one-half (50 percent) of respondents think schools are not doing an adequate job teaching these skills (Figure 13). Between 30 to 40 percent of respondents said schools could do a better job with the basics: reading, writing, math and problem-solving.

Survey respondents were split in their views on standardized testing in public schools. Thirty-nine percent think annual, mandatory state-standardized testing would make a difference in preparing students for the workplace. (Among large companies, this number jumps to 55 percent.) Twenty-eight percent think it would not. The remaining one-third of respondents said they don’t know if standardized testing would better prepare students.

Most respondents (78 percent) participate in activities with local schools, with the most cited choices being hiring students for part-time jobs or internships and participating in job fairs or career days at schools. (Note: In every category of such activity, large companies are far more involved than small ones.) In addition to
Relatively few manufacturers know about the potential role of the public workforce development system, funded by the federal government and implemented by states and local communities. While almost one-quarter of respondents had successfully used the public training system, another quarter of the companies participating in the survey have never even heard of it. Sixteen percent had tried to work with the public training system but found it non-responsive. Only seven percent of respondent companies said one of their employees serves on a workforce board.

The role of government

We asked the respondents how the federal government should provide assistance to U.S.-based manufacturers in support of their efforts to attract and retain a highly effective workforce (Figure 14). The top two responses were tax relief for companies that offer training to employees (54 percent) and direct funding to companies for employee training (34 percent).

Perhaps due to the shortage of production workers, 23 percent of respondents said they favor greater immigration relief for hourly production workers. Only 10 percent of respondents said the same regarding professional/technical workers.

Figure 14: Ways that the federal government should provide assistance to U.S.-based manufacturers in support of their efforts to attract and retain a highly effective workforce*

<table>
<thead>
<tr>
<th>Assistance Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immigration relief for hourly production workers</td>
<td>22.3%</td>
</tr>
<tr>
<td>Immigration relief for professional/technical workers</td>
<td>10.2%</td>
</tr>
<tr>
<td>Tax relief for companies that offer training to employees</td>
<td></td>
</tr>
<tr>
<td>Direct funding to companies for employee training</td>
<td>53.6%</td>
</tr>
<tr>
<td>Direct funding to employees for training (vouchers)</td>
<td>33.9%</td>
</tr>
<tr>
<td>Direct funding to training providers</td>
<td>10.8%</td>
</tr>
<tr>
<td>Increased funding for disadvantaged worker training</td>
<td>6.6%</td>
</tr>
<tr>
<td>National industry standards and certification programs</td>
<td>5.9%</td>
</tr>
<tr>
<td>Prefer no government involvement</td>
<td>13.0%</td>
</tr>
<tr>
<td>Other</td>
<td>32.9%</td>
</tr>
<tr>
<td>Other</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

*Each respondent selected up to three reasons.

What can the NAM do? Improve manufacturing’s image.

When asked where the NAM and Center for Workforce Success should concentrate their efforts, the majority of respondents (66 percent) said improving the image of manufacturing should be a top priority. The second most popular issue—with 46 percent—is training or re-training current workers. Other top responses were promoting business/education partnerships (44 percent), promoting industry-based occupational standards (29 percent) and improving the public workforce system (25 percent).
What we learned
Our perspective on the survey findings

Certain powerful economic, social and demographic forces underlie and contribute to the persistent skills shortages in the manufacturing workforce. These same forces will continue throughout the next two decades.

The relentless advance of technology: New technologies, primarily computers and the Internet but also new materials and new processes, have infused manufacturing—from design to production, inventory management, delivery and service. These technologies increase both productivity and product quality. In most respects, manufacturing jobs are technology jobs, and workers at all levels must have the degree of technical competencies required by their equipment and processes. The bar is continuously rising. Current workers must be continually re-skilled, and new workers must be technologically prepared if the U.S. economy is to retain its competitive edge.

The good news is that manufacturers have been aggressively training and educating their employees in new technology skills during the past five years. The survey was clear: Less than 45 percent said they need employees with computer skills and IT workers.

Demographic imperatives: In many companies, the average age of machinists is late 50s; the Baby Boom generation of skilled workers will be retired within the next 15–20 years. What is less obvious is that the native-born U.S. population has, for all practical purposes, achieved zero population growth. As a result, current and near-term growth in the labor force will come almost entirely from immigrants and their children. Some of these immigrants are skilled; many are not. Demographic experts predict we will need up to 12 million skilled workers before 2020, despite an increase in 18–24 year olds through 2015. This is a numbers game with serious consequences unless we fill our workforce pipeline now.

Global pressures: Manufacturing is an important foundation of the U.S. economy, and U.S. workers are the most productive in the world. Nonetheless, in a global economy, manufacturers face unprecedented challenges. Even small companies in rural areas might now compete with, sell to or receive supplies from companies and markets half-a-world away. To continue to succeed, U.S. manufacturers must compete less on cost than on product design, productivity, quality and responsiveness to customer needs. These
competitive mandates put a high premium on the skills, morale and commitment of workers.

The nation's fixation on four-year college attendance: An educated citizenry and workforce are a nation's greatest asset, and education is a key to personal and economic fulfillment. But manufacturers are not alone in pointing out that a fixation—among high-school teachers and counselors, students and parents—on four-year university education immediately following high school makes young people shun other attractive options, leaving alternative career and work paths starved for attention and resources. Further, while nearly three-quarters of high-school graduates go on to some form of post-secondary education, 60 percent do not receive a bachelor's degree. While manufacturers strongly support a strong university system as well as work-based learning and internships, they also point out that many satisfying, remunerative jobs in the future will require a training certificate or an associate degree beyond a high-school diploma. These options deserve equal time from school guidance counselors and curriculum designers and equal consideration by students and parents.

A more serious skills gap looms

Experts project that, recession or not, by 2020 the U.S. will face a dramatic shortage of employees with the kind of skills necessary for U.S. business to compete in a complex, technology-driven global market. These are the skills needed by modern manufacturing as well as other sectors. Experts also agree that we will face a labor shortage that may make the 1990s pale by comparison.

We are surprised that respondents to the survey indicated that many of their professional staff lack the creativity and innovation so long a hallmark of the American workforce. We do not see this as a trend, but as a wakeup call.

The challenge before us is how to close the gap. One way is to have more U.S. workers, native-born or immigrant, receive the right amount and level of training and education to enter and succeed in the workplace. Or, more immigrants with the requisite skills could come to the U.S.

Don’t let the short-term be the enemy of the long-term

We would be remiss if we did not acknowledge the economic slowdown that had already begun when the survey was taken, which deepened considerably over the summer and was sharply exacerbated by the events of September 11, 2001. At this writing, hundreds of thousands of additional workers have been laid off and businesses in many sectors are closing. We cannot know at this point when recovery will begin.

The gap identified by this survey and discussed in this report is the result of long-term forces. They will yield only to long-term solutions. Right now, ailing businesses need to be helped by taxation policies that promote economic growth; the unemployed need access to traditional channels of unemployment compensation and other supports. But while these short-term responses are necessary right now, long-term solutions must also be forthcoming if the U.S. hopes to achieve a real and lasting solution to the skills shortage.

For example, we need to improve our technical training systems and attract people to jobs—challenging careers in manufacturing with high pay and full benefits—that require an education level between high school and a four-year college.

A long-term vision of a skilled and productive workforce is what is required today—from the government and educational system, from every manufacturing company, and from every CEO and employee making the things that make America work. The U.S. economy has always rested on a bedrock of manufacturing; this remains so in a global economy. The choices made today will affect the competitive strength of the U.S. tomorrow and well into the future.
What we advise
Steps to take today

This report appears as the nation is entering a conflict whose course and end are unknown, and the U.S. economy is in a downturn. The impact of these events on the American workforce remains to be seen. At the NAM, we are confident that the economy will bounce back and manufacturing will again lead a new economic boom. In the meantime, as a nation we have much to do with regard to workforce issues.

Workforce development must be a high priority for both the public and private sectors. The skills shortages identified in this report are serious, and the forces creating them could deepen to a crisis as this decade progresses.

For this reason, the NAM has developed the following recommendations for both the public and private sectors. Some are similar to our past statements on these subjects, but are modified by our new findings and perspectives. Some are new, called forth by these unusual and unfamiliar times.

Employer training

The NAM continues to urge employers to increase their commitment to, and investment in, education and training of their employees. We recommend at least three percent of payroll costs be spent to help employees meet the workforce skill requirements of the 21st century. We are pleased that respondents to this survey indicated they have increased their spending on training over the past three years. Given our workforce challenges, we still ask them for more. We know they will respond.

The public job-training system

Employers are disappointed that the Workforce Investment Act of 1998 has been slow to fulfill its potential as a broad human resource development system responsive to employer needs. The forthcoming reauthorization of this legislation must address its lags in performance and strike a better balance between being a “second-chance” education and training system for those who are ill-prepared and being a system that also promotes the skills needed by employers competing in a technologically driven global economy.
Adult literacy

Adult literacy must be a top priority and political leaders should use the bully pulpit to give it the attention it deserves. The Bush Administration has made literacy a priority for young students; the same must be done for adults. According to the U.S. Department of Education, 90 million adults (both native born and immigrants) in the U.S. need greater literacy skills to succeed in the workplace; currently, the public sector serves only 3 million. It is not about more funding; it is about using those dollars effectively. Strong consideration should be given to removing the barriers to success for those in need, such as using the workplace and the home for delivery of service. Also, attention should be given to e-learning tools that have proved effective in improving literacy skills.

Education

We continue to support educational standards and testing that provide essential goals and accountability to the educational process. We caution, however, that they should not be pursued to the point where other equally worthy elements are driven out of curriculum. Manufacturers want well-rounded high-school graduates who can read, write, calculate, solve problems, work in teams and have strong employability skills. They want graduates familiar with the world of work and with varied career and post-secondary education options. Hence, we urge that business/education partnerships continue and expand, with appropriate state and local supports. We urge, too, that employers support such activities, including providing internships that bring educators and students into the workplace.

The nation’s community and technical colleges need to expand certificate and associate degree programs and ensure that they are effective and attuned to local workforce needs. We also urge that our university system, the finest in the world, be more attuned to changing workforce needs, new technologies and global educational challenges.

Immigration

We should not let the crisis of the moment derail immigration policies that are critical to the nation’s meeting its workforce needs. Tighter controls and administration can go hand-in-hand with a continued and expanded visa program for immigrants with the skills needed by the economy. At the same time, we need special programs targeted at meeting the language and skill deficiencies of the many immigrants now legally in this country who are a growing part of our workforce.

Tax policies

We continue to support tax policies that encourage individuals to take more responsibility for their own learning during the course of their career. We also continue to support federal student loans for part-time students who continue to work while attending post-secondary education. In addition, tax incentives should be targeted toward small- and medium-sized employers to provide training and education opportunities for their employees. That’s where most Americans work and it is in these companies where resources are the thinnest. In addition, given the acknowledged importance of business associations in this survey and their high value as training organizations, we urge that some public funding through the Workforce Investment Act be directed toward such business intermediaries to promote training for entry-level workers.

Making manufacturing a preferred career option in this decade

Finally, we at the National Association of Manufacturers pledge to work with our member firms and affiliated associations and with local schools and colleges to make manufacturing a preferred career option in this nation by the end of this decade. We will do this through initiatives that inform old and young workers, students, parents and educators about the exciting careers, high pay, outstanding benefits and attractive retirement programs awaiting them in modern manufacturing. We will urge other associations to begin programs such as GetTech, an exciting multimedia awareness and school-based program that urges young students to take science and math and explore great jobs in technology and manufacturing. This initiative, in partnership with the U.S. Department of Commerce, U.S. Department of Labor and U.S. Department of Education, is an exemplary public-private partnership.
The National Association of Manufacturers—18 million people who make things in America—is the nation's largest industrial trade association. The NAM represents 14,000 members (including 10,000 small and midsized companies) and 350 member associations serving manufacturers and employees in every industrial sector and all 50 states. Headquartered in Washington, D.C., the NAM has 10 additional offices across the country.

Andersen is a global leader in professional services. It provides integrated solutions that draw on diverse and deep competencies in consulting, assurance, tax, corporate finance, and in some countries, legal services. Andersen employs 85,000 people in 84 countries, and is frequently rated among the best places to work by leading publications around the world. It is also consistently ranked first in client satisfaction in independent surveys. Andersen has enjoyed uninterrupted growth since its founding in 1913.

The Center for Workforce Success is the workforce development affiliate of the National Association of Manufacturers’ Manufacturing Institute. Its mission is to find and promote workforce solutions for manufacturers in a global economy and to make manufacturing a preferred career choice.