
Manufacturing

2005 Skills Gap Report – A Survey of the American Manufacturing Workforce



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Introduction

By Phyllis Eisen, Jerry J. Jasinowski and Richard Kleinert

In spring 2005, the National Association of Manufacturers' Manufacturing Institute/Center for Workforce Success and Deloitte Consulting LLP (Deloitte Consulting) developed the fourth iteration in a series of surveys designed to learn more about how manufacturers plan their human capital strategies and the barriers they encounter in the process.

The results of this survey confirm the skill shortages found in earlier reports. However, the 2005 report goes much beyond earlier findings in detailing the breadth and depth of the skill shortage, the negative impact of the shortages on business operations, and the extraordinary increase in employee performance requirements.

The picture that emerges is both more complex and more disturbing than in the past, because it exposes a broadening gap between the availability of skilled workers and the employee performance requirements of modern manufacturing. Specifically, the research finds:

- Today's skill shortages are extremely broad and deep, cutting across industry sectors and impacting more than 80 percent of companies surveyed.
- Skills shortages are having a widespread impact on manufacturers' abilities to achieve production levels, increase productivity, and meet customer demands.

- High-performance workforce requirements have significantly increased as a result of the skills gap shortage and the challenge of competing in a global economy, according to nearly 75 percent of survey respondents.

In sum, the confluence of the above trends and the increasingly competitive global environment has created an extraordinary gap between the supply of skills available and the performance requirements of the workforce needed for modern global manufacturing. **This human capital performance gap threatens our nation's ability to compete in today's fast-moving and increasingly demanding global economy. It is emerging as our nation's most critical business issue.**

Clearly, this situation calls for urgent action by both public and private stakeholders. If our country is to remain competitive, the issues of education and training reform now must be given at least as much focus as top business concerns of trade, tax, energy, and regulatory reform. As you read through this report, we hope to stimulate your thinking and leave you with an unmistakable sense that your urgent involvement is needed today.

Acknowledgements

The National Association of Manufacturers (NAM), the Manufacturing Institute's Center for Workforce Success, and Deloitte Consulting LLP (Deloitte Consulting) thank the many individuals who contributed to the conceptualization, implementation, analysis, and publication of this report.

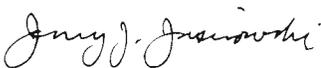
Thanks go to the Center for Workforce Success's Stacey Jarrett Wagner for helping to design the survey, analyze the responses, and manage the project, to Bill Canis, vice president of the Manufacturing Institute and David Heuther, NAM's chief economist, for providing their expert advice, and to Laura Narvaiz, vice president of communications for the Manufacturing Institute for helping us get out our message.

We deeply appreciate all the help and thoughtful analyses and writing provided by the Deloitte Consulting team, without whom this

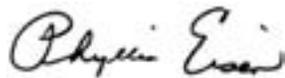
report could not have been developed. While many members of its team participated at various stages, the lion's share of the work was done by Juliet Glassroth, Lauren Mistretta, Leah Reynolds, Burt Rea, and David Rizzo. It was our great pleasure to work with such a talented team. In addition, we would like to thank Linda Segervall for her invaluable contributions.

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Finally, we would especially like to thank Jerry Jasinowski, president of the Manufacturing Institute, John Engler, CEO of the National Association of Manufacturers, and Doug Engel, National Manufacturing Industry Leader, Deloitte & Touche USA LLP, for their support and encouragement as we try to tell the manufacturing story.



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Executive Summary

The vast majority of American manufacturers are experiencing a serious shortage of qualified employees, which in turn is causing significant impact to business and the ability of the country as a whole to compete in a global economy. This is the key finding of the *2005 Skills Gap Survey*.

The problem for U.S. manufacturers is that this challenge is not universal. Countries with rich educational heritages, e.g., India, China and Russia, are graduating millions more students each year from college than the United States.¹ These highly educated individuals are actively participating in the development of innovative new products without regard for historical barriers, such as geography – thanks to technologies such as broadband, inexpensive Internet-ready laptops, and collaborative tools.

With such international talent readily available and significant shortages existing at home, it is clear that the future of American manufacturing may now be at stake.

A Serious, Persistent Shortage

The details behind the talent shortage reveal a stark reality. **More than 80 percent of respondents indicated that they are experiencing a shortage of qualified workers overall** – with 13 percent reporting severe shortages and 68 percent indicating moderate shortages. Also worrisome is the finding that **90 percent of respondents indicated a moderate to severe shortage of qualified skilled production employees**, including front-line workers, such as machinists, operators, craft workers, distributors, and technicians. As expected, the research showed that engineers and scientists are in short supply, with 65 percent of manufacturers reporting deficiencies – 18 percent severe and 47 percent moderate.

In addition to shortages of various types of employees, manufacturers surveyed reported they are also dissatisfied with the skills of their current employees. Among respondents to this national survey, nearly half indicated their current employees have inadequate basic employability skills, such as attendance, timeliness and work ethic, while 46 percent reported inadequate problem-solving skills, and 36 percent indicated insufficient reading, writing, and communication skills.

Significant Business and Economic Impact

The talent shortage being reported is not a theoretical or distant problem. In fact, **83 percent of respondents indicated that these shortages are currently impacting their ability to serve customers.** Specifically, the survey found that skill deficiencies are causing difficulties for manufacturers in terms of their ability to maintain production levels consistent with customer demand (56 percent), to achieve productivity targets (43 percent), and to achieve or maintain target levels of customer service and satisfaction (33 percent).

Clearly, this situation is untenable for America. Although our manufacturing sector has been able to remain vibrant and to compete successfully in a global economy, its ability to do so in the future is predicated on the availability of a highly skilled, innovative, “high-performance workforce.” Without a sufficient supply of these types of employees, the manufacturing sector will suffer – which in turn will have a detrimental impact to the nation’s overall economic health.

The Key to Business Success

Notwithstanding the bleak picture of the workforce situation today, manufacturers surveyed believe that having a high-performance workforce is the most important driver of future business success. Nearly three out of every four respondents selected this as a key to future success.

The second most commonly selected driver of success was “new product innovation” – which is also inextricably linked to employee quality and performance. Surprisingly, “low-cost producer status” ranked only third on the list of most important drivers of future business success, but not far behind in terms of percentages. In past studies, manufacturers have consistently ranked this as their number one response – but perhaps they have come to accept as a given that ongoing pursuit of lean operations and efficiency is essential to success in an incessantly competitive global manufacturing industry. To stay ahead of the pack, successful companies must constantly push the innovation envelope, which requires innovative and high-performing employees. As a result, the new manufacturing mantra may be: “high-performing and innovative, but lean.”

Getting There From Here

While the situation is already posing significant challenges, the basic laws of supply and demand as they operate in the labor market suggest an even more difficult future. On the demand side, employers want more highly skilled employees that are exceptionally engaged and innovative. But basic demographic, social, and educational trends indicate a gloomy supply outlook:

- The exodus of Baby Boomers from the workforce with substantial accumulated skills will reduce the available talent pool
- Changing attitudes about careers and job satisfaction among Generation Yers
- Changing job requirements, necessitating some level of technical skill in almost all jobs and making truly unskilled jobs a thing of the past
- Significant dissatisfaction among manufacturers with the quality of K-12 education and the dearth of adequate career counseling
- Declining percentage of students in U.S. universities studying science and engineering

In addition, **research has shown a direct relationship between manufacturing's negative image – which is tied to the old stereotype of the assembly line – and the decreasing number of young people pursuing careers in the industry.** The good news is that manufacturers are beginning to realize they need to improve this image. A growing number of companies are providing support for NAM's *Dream It. Do It.* campaign that actively seeks to help young adults find careers they can be passionate about in one of manufacturing's many exciting sectors.

Manufacturers also seem to understand what they need to do to remain competitive, with so many clearly viewing a high-performance workforce as the foundation of future competitive ability. The challenge for manufacturers is how to attract, retain, and motivate this high-performance workforce.

Thus, there is a focus on both **reducing turnover among current employees and attracting new workers.** Most manufacturers reported **spending more on training programs** today (as a percentage of payroll) than in 2001 – which is critical because training opportunities are an important component of a strategy to attract, retain, and develop employees.

On the other hand, it is unclear that manufacturers are engaging in the right type of activities and employing the right tactics to attract, develop and retain a high-performance workforce given the realities of the current environment. Much has been written about the changing nature of the employer/employee relationship and the changing picture of what employees want and value, especially among Generation Y employees. While many manufacturers are seeking to provide the right programs and trying out new strategies, often they rely on a rather traditional mix of compensation and benefit plan offerings for recruitment and retention purposes, which may not prove as effective with this new breed of employee.

A Public-Private Collaboration

Clearly, the ability of manufacturers to attract, retain, and develop a high-performance workforce is of major importance to our nation as a whole. This challenge presents a significant opportunity for collaboration between the public and private sectors. Manufacturers are not expecting government to solve the problem for them, but would like encouragement and support for investments in training programs.

Our survey indicates that a very large percentage of respondents either has never heard of the government workforce programs or has never been contacted by Workforce Investment boards. Undoubtedly, increased communication and collaboration are required to better utilize these programs and to improve the effectiveness of the public education system in preparing students for the workplace and future careers.

Recommendations for Individual and Shared Responsibility

The issues associated with the skills gap are numerous and complex. Yet with increased competition from countries around the world, the future success and vibrancy of the American manufacturing industry is now at stake. To hold back further competitive encroachments, all the parties must assume responsibility – including manufacturing companies, the government, educators, and individuals. We believe the urgency of this situation also requires the following actions:

- Educators must emphasize science, math and technology-related programs in K-16 curricula, invest more in effective teacher education focused on science and math, and ensure that programs regarding career opportunities and requirements for graduation are geared for 21st century employment.
- Employers should invest at least three percent of payroll whenever possible to provide training opportunities for their current employees, particularly in areas that will enable them to become a high-performance workforce, learn new methods to attract, retain, develop and motivate employees,
- State and federal government should invest in the capacity of community and technical colleges to prepare individuals for careers in high growth industries such as manufacturing
- State education standards should include career education as measurable criteria for K-12 success
- The Higher Education Act and its funding mechanisms should provide increased access for adult learners
- Individuals must take responsibility for their own careers and employability by earning industry relevant certifications and formal education credentials such as community college and bachelor degrees.



- The public workforce system, companies and their business associations must strengthen their engagement in order to better advise Workforce Investment Boards on rising and declining economic conditions, business investments, skill needs and employment requirements.
- Public/private partnerships should be encouraged to support career awareness campaigns that help individuals understand all the career options available to them. A model for this is The Manufacturing Institute's Dream It Do It manufacturing careers campaign.

The Business and Economic Reality Behind Today's Talent Shortages



In an effort to gain a clearer understanding of the processes and challenges associated with human capital management in the manufacturing sector, the NAM Manufacturing Institute/Center for Workforce Success and Deloitte Consulting LLP (Deloitte Consulting) conducted the fourth in a series of surveys in the spring of 2005. Specifically, the survey was designed to learn more about today's talent shortage and the resulting business impacts, what companies believe they need to provide for future business success, and how companies are seeking to attract, retain, and develop a high-performance workforce.

With media coverage persistently reporting an overall decline in manufacturing employment and layoffs among well known employers, many may be surprised with the key finding from this research. **The Skills Gap 2005 Survey found that the vast majority of American manufacturers surveyed continue to experience a serious shortage of qualified employees that is causing significant impact to business and the ability of the country as a whole to compete in a global economy.**

In fact, **81 percent of respondents answered that they are currently facing a moderate to severe shortage of qualified workers** – nearly unchanged from the 80 percent who reported a moderate to severe shortage with *The Skills Gap 2001 Survey*. More specifically, 53 percent of those responding indicated at least 10 percent of their

total positions currently remain unfilled due to a lack of qualified candidates. This clearly supports the view that the shortage of qualified workers is becoming a persistent challenge and raises important questions, such as “Where is the pain most acute?” and “What are the business and broader economic implications?”

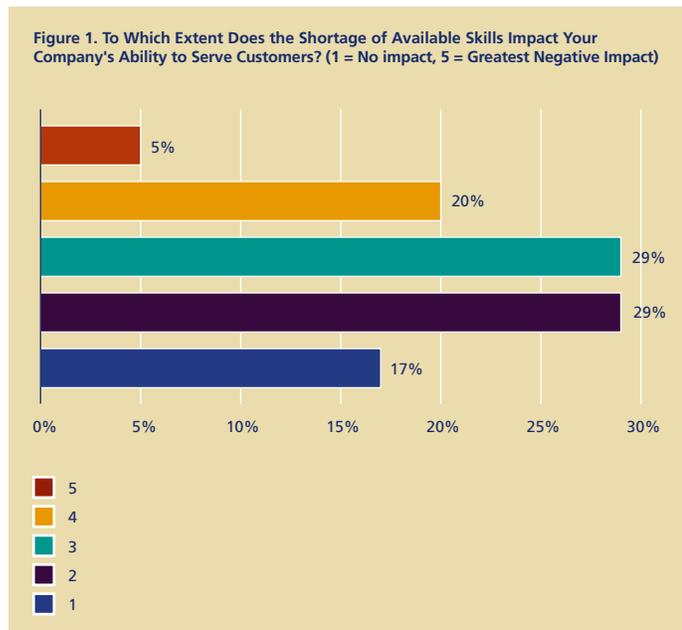
In answer to these questions, survey respondents suggested that the shortage of qualified workers is truly widespread, impacting companies regardless of size, industry, or geographic location. Large employers, defined as those with more than 500 employees, are only slightly more likely to report a moderate to severe shortage of qualified workers than small employers with fewer than 500 employees (85 to 80 percent respectively).

However, while all respondents appear to be impacted, not all segments of the workforce are affected equally. The largest shortages occur for technical skilled employees and engineers, but more than one-third of respondents also claimed shortages of **unskilled production employees**.

- 90 percent of respondents indicated a moderate to severe shortage of qualified **skilled production employees**. This result does not vary significantly when controlling for size, industry segment or region.
- 65 percent of all respondents and 74 percent of respondents with more than 500 employees reported a moderate to severe shortage of **scientists and engineers**. This shortage is even more acute for certain industry segments, such as Aerospace and Defense, with 80 percent of respondents indicating a moderate to severe shortage.
- 39 percent of respondents also indicated a moderate to severe shortage of qualified **unskilled production employees**.

While it is clear that employees with “hard skills” (such as skilled production, scientists, and engineers) are in short supply, the results are less severe for employees with “softer skills.” Thirty-one percent of respondents indicated a shortage of qualified customer service employees; 36 percent of respondents indicated a shortage of qualified human resources, information technology (IT), finance, and executive employees; 44 percent of respondents report a shortage of qualified sales and marketing employees. Again, these results vary little when controlling for size, industry, or geography.

Taken together, these findings add more weight to the frequently voiced concern that the United States is not graduating enough students with technical, engineering and scientific degrees to meet the current demand for employees with these skills.



However, the critical issue is the impact that these shortages are having on business performance. **When asked, "To what extent does the shortage of available skills impact your ability to serve customers?" 54 percent of all respondents indicated a moderate to high degree of negative impact.**

When asked to select the three most significant negative impacts of the shortage of qualified workers on business performance, respondents indicated:

- Maintaining production consistent with customer demand
- Achieving productivity targets
- Achieving or maintaining target levels of customer service and satisfaction

To better understand which skill deficiencies among current employees significantly contribute to negative business performance, the most frequently cited concern is inadequate basic employability skills, including attendance, timeliness and work ethic. Again, this response is consistent with a similarly constructed question in the 2001 survey, and poses an interesting challenge to employers and to the public education system that is expected to prepare most individuals for the workplace.

Among Aerospace and Defense companies, it was noteworthy that the most frequently mentioned response by a significant margin was inadequate problem solving skills – potentially reflecting the more complex nature of working with highly engineered products.

Tomorrow's Outlook: Business Success in a Changing Environment

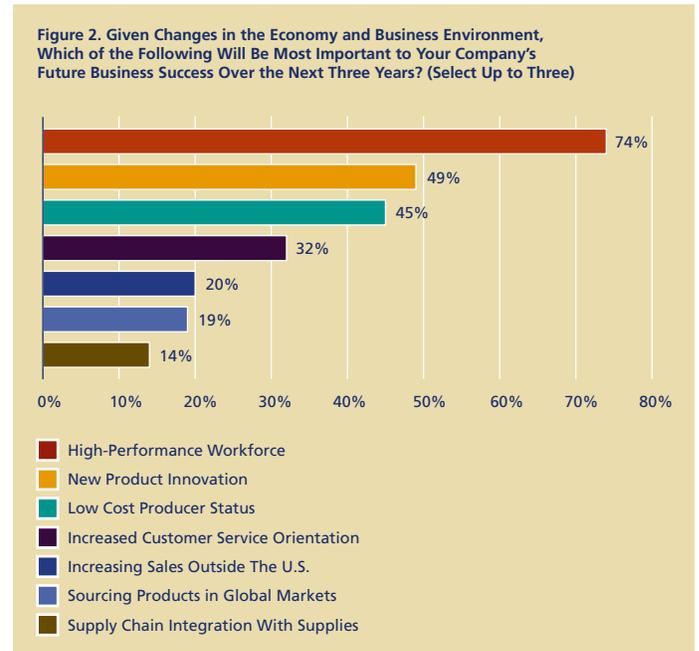


Given the painful realities of the current talent shortage, changes in the economy and business environment, increasing international competitive pressures, and other complex challenges that manufacturers face, respondents were asked to indicate what would be most important to their success over the next three years (Figure 2).

Although many expect that overall employment levels in manufacturing will not rise appreciably, an overwhelming majority of respondents stated that their workforce is the most important factor for future business success – **74 percent of respondents indicated that having a “high-performance workforce” will be key to their business success.**

The second most frequently chosen attribute, selected by 49 percent of respondents, is “new product innovation.” This, too, is directly linked to having a high-performance workforce that can generate the innovative ideas for new products, as well as process innovation.

At the same time, cost pressures remain top of mind for respondents, with 45 percent specifying that “low-cost producer status” will be important to business success over the next three years. When taken together, these findings suggest that “high-performing, innovative, but lean” may become the new manufacturing mantra.



With the many changes to the overall business environment, including the economy and competitive landscape, manufacturers were asked to identify the employee types among whom they anticipate shortages over the next three years. The real pressure point again appears to be the skilled production workers, **with a full 80 percent of respondents anticipating shortages of skilled production workers over the next three years – this is over twice the severity of the next skill shortage category.**

Thirty-five percent of all respondents anticipate shortages for scientists and engineers, with this rising to 46 percent for respondents with 500 employees or more. Following that is the unskilled production worker – a quarter of our respondents said these workers will be in short supply over the next three years. At the other end of the spectrum, it does not appear that employees engaged in management and administration, sales and marketing, or customer service will be in tight supply.

Throughout this report, we have provided brief vignettes of NAM-member companies to illustrate the key points and examples of innovation in workforce initiatives.



Literacy and Training Programs at Bollinger

At Bollinger Shipyards just outside of New Orleans, people who are eager to work can earn more than just a decent paycheck. "We take people who have a desire to learn and teach them to be a welder or a fitter," explains Chuck Fontenot, corporate director of training. "We hire them from landscaping companies and fast food restaurants. We go to churches and into the community and find good people who never had a chance."

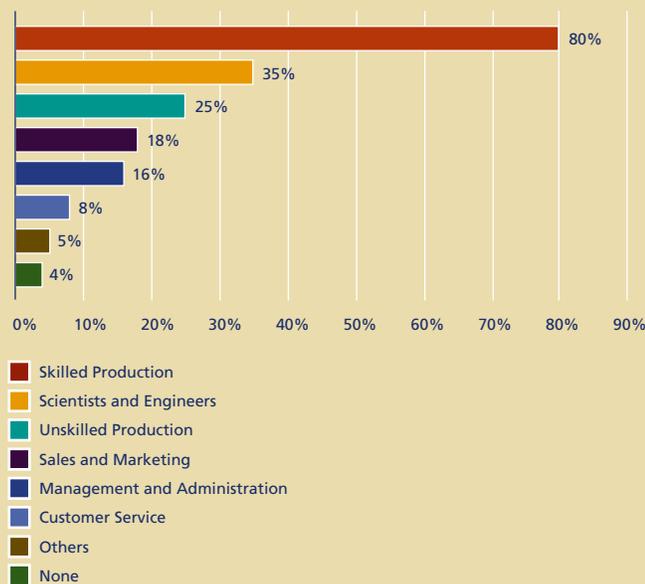


Bollinger provides a paid, five-week training program for each new hire that includes on-the-job and classroom skilled trades instruction, as well as training in "soft skills." "We teach them the life skills they need to sustain a job. Taking care of their money and coming to work each day."

Bollinger recently collaborated with the Literacy Alliance of New Orleans and invited the Alliance to conduct a six-week literacy program with its employees. The results were outstanding, according to Fontenot. "By using the materials the students use every day, she taught a group of our employees how to read in a practical, non-threatening way," Fontenot says.

Bollinger also works with a regional economic development agency to register high-school-age applicants for its apprenticeship program. "We've had this program for several years," says Fontenot. "It starts when they're a junior or senior. They gain school credit for working, but they can't quit school. Right now, we have ten people who've completed the program. We've never had anyone quit the program. One guy became a supervisor, one became a drafter. One guy started out at \$5.00 an hour and now he's making \$55,000 a year supervising other people. This program isn't a cost, it's an investment."

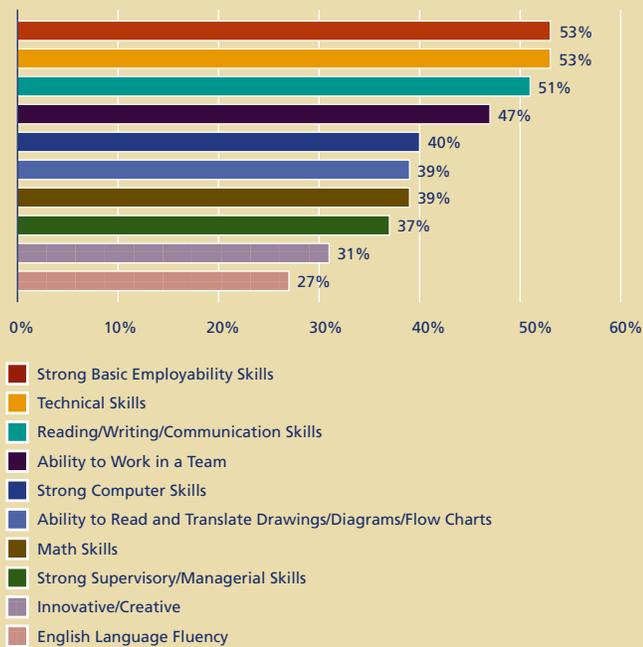
Figure 3. What Types of Employees are Expected to Be in Short Supply Over the Next Three Years? (Select All that Apply)



We next asked respondents to tell us which types of skills their employees will need more of over the next three years. Not surprisingly, technical skills was the area most commonly selected (53 percent). Beyond this, there are a number of related skills that will be needed over the next several years that are characteristic of high-performance workforces, such as the ability to work in teams (47 percent), strong computer skills (40 percent), the ability to read and translate diagrams and flow charts (39 percent), and strong supervisory and managerial skills (37 percent).

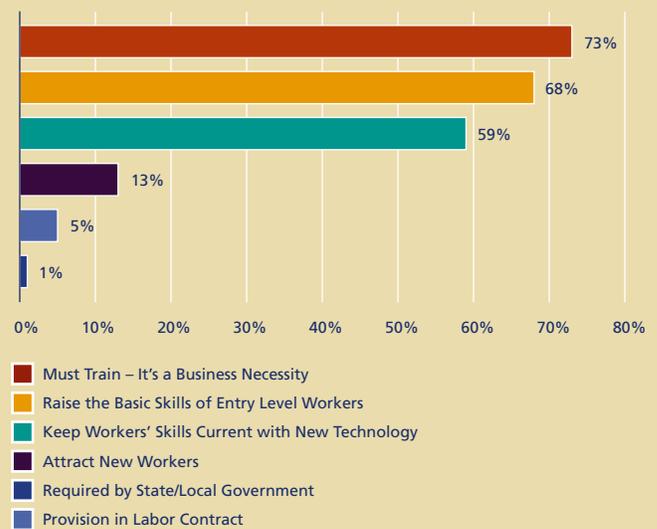
Basic employability skills (attendance, timeliness, work ethic, etc.) essentially tied with technical skills, which is consistent with the area of greatest deficiency seen in today's workforce – and consistent with the *The Skills Gap 2001* report. Following that are reading/writing/communication skills, where 51 percent of the respondents said they will need more of these types of skills over the next three years. This paradoxical mismatch – between the need for the highest skill levels ever and the current need to address basic employability issues and basic skills in general – is particularly vexing given the emphasis companies place on having a high-performance workforce. It also suggests the need for significant change in approaches within the education and public workforce systems.

Figure 4. What Types of Skills Will Employees Need More of Over the Next Three Years? (Check All that Apply)



In an environment of extreme global competition, and given the workforce shortages and skill deficiencies that companies face today, it is not surprising why companies provide training to employees. Seventy-three percent report that they provide training to employees today because it is a “business necessity.” To have a high-performance workforce, companies must create a culture of high-performance workplaces and training is integral to meeting this objective. Characteristics of a high-performance workplace include employee autonomy and involvement in decision-making, the sharing of information and knowledge, rewards for performance and support for employee performance – including training. A very small percentage of respondents that provide training do so because they are required by labor contract or by state or local government.

Figure 5. Why Do Companies Provide Training to Employees Today? (Select Up to Three)



It may not be surprising that a high percentage (73 percent) of respondents report that they have done formal workforce planning to forecast their needs for different workforce segments, considering anticipated shortages of key employee types and the need for increased levels of certain skills into the future. This does, however, raise the question of whether manufacturers have effectively and rigorously forecasted their future workforce needs – to reflect not only upcoming retirements, but also changes in business strategy/emphasis, types of employees needed, skills needed, and the availability of various employee types in the labor market today.

Finally, looking into the future it appears that high-performance workforce companies may consist of several different categories of employees. Roughly one-third of respondents indicated they may increase their utilization of temporary contract workers to attract and retain employees with the skills needed for the company over the next three years. These temporary or contract workers could be highly skilled employees who work on a project basis, but who cannot be justified on a full-time regular basis. Alternatively, it may be that companies intend to focus more on certain types of regular employees who represent their critical workforce segments and to utilize less highly skilled or non-business critical employees under contract or temporary arrangements. This is an area that warrants additional analysis to better understand how manufacturers intend to secure the various types of talent needed to achieve their goals.

New Aspirations, Old Tactics – What’s Working and What’s Not

With manufacturers clearly understanding that change is needed to achieve their goals, respondents provided important insights into several key leverage points – ranging from **recruitment, retention, and benefits strategies to how schools are preparing students for the workplace** – that can positively impact the talent shortage.

The Employer/Employee Disconnect

There is a growing disconnect between what today’s workforce wants and what employers traditionally offer. The phrases used to describe this disconnect are familiar – lack of employee engagement, loss of company loyalty, and the need for a new employer/employee “deal.”

The dramatic changes in the employer/employee relationship became acute in the past decade. Trends such as downsizing, merger mania, and globalization created an ever-shifting work environment that has resulted in negative and cynical views about the workplace. In recent years, organizations that regularly survey the U.S. workforce, such as The Conference Board and The Gallup Organization, have warned that employee opinions about the workplace are at an all-time low. The latest Conference Board research on worker attitudes was conducted in late 2004 and reflects a decline in job satisfaction that is widespread among workers of all ages and income brackets.

Adding to this low worker satisfaction is the huge demographic shift currently taking place – older Baby Boomers retiring, Gen Xers and Gen Yers moving in. Today’s younger generations (Xers are in their mid-20s to late 30s; Yers are 25 and younger) bring a different and more challenging set of expectations to the work world.

Attracting members of the younger generations, while retaining the valuable knowledge and experience of older workers, will be increasingly important to manufacturers over the next five years. Young people bring technology-savvy skills, a global and diverse orientation, and an ability to think in innovative ways that are critical to competitive advantage.

Much has been written about changing employee attitudes and expectations, the erosion of job security, and the new “employee covenant.” Instead of promising lifetime employment, employers offer meaningful jobs and development and growth opportunities through a combination of formal training, career options, and on-the-job experience. Against this backdrop, it is somewhat surprising to note that only 13 percent of respondents indicated that one of the reasons they provide training to employees today is a way to attract new workers.



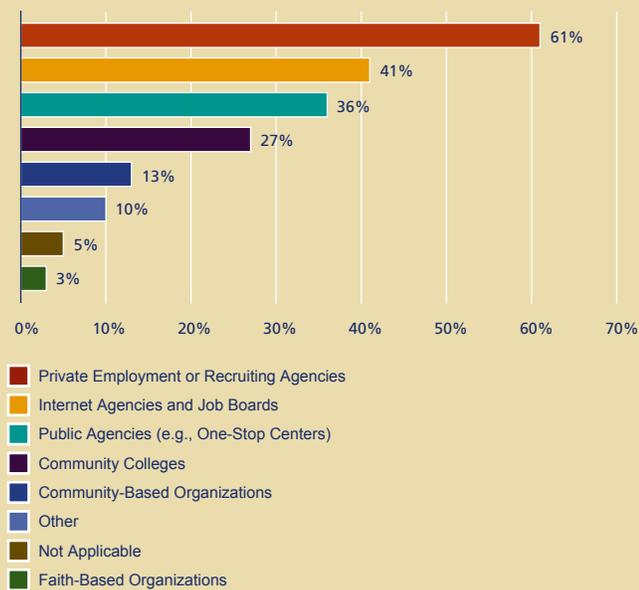
Recruitment Strategies

Despite an emerging desire for building a high-performance workforce and attracting highly engaged employees, the majority of respondents to the survey continue to use mostly traditional recruiting strategies. Manufacturers cited competitive wages, and health care and retirement benefits as their top methods for attracting employees – which for most employees are considered a given rather than differentiators.

Indicating a growing awareness of more effective approaches for attracting employees, the following scored moderately on the survey: flexible work arrangements, tuition reimbursement, employee referrals, and professional development.

Respondents ranked other recruitment techniques, including signing bonuses, on-site services, and stock options or equity, much less favorably – perhaps because they were perceived as ineffective in attracting and recruiting new employees or as impractical given the investments required for implementation.

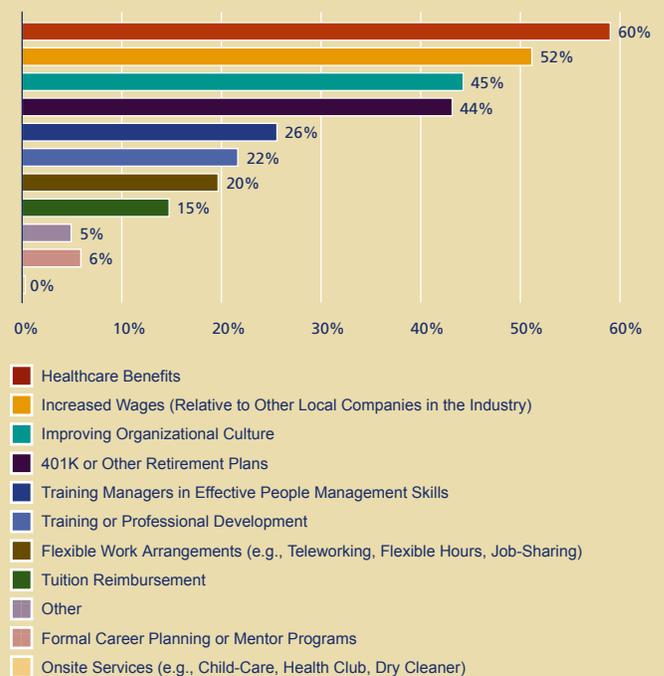
Figure 6. Have Placement Services From the Following Organizations Been Used to Recruit and Hire Employees? (Check the Two Most Used)



U.S. manufacturers have an opportunity to increase the impact of their recruitment strategies by moving beyond the traditional means of attracting employees and including additional dimensions to differentiate their approaches. Of course compensation and benefits must be competitive, but based on what we know employees are looking for – development and training, challenging work assignments, and connection in the workplace – U.S. manufacturers need to improve their recruitment strategies by including and promoting these aspects of the workplace. These efforts will also pay dividends in increased employee retention rates.

In response to how employers are using placement services to recruit and hire employees, traditional private employment/recruitment agencies scored highest by a clear margin. But there are some signs of creativity in recruitment techniques, such as the use of Internet agencies and job boards (41 percent), followed by the use of public agencies and community colleges (36 and 27 percent, respectively). Low responses were received for community-based and faith-based organizations.

Figure 7. Which of the Following Have Been Used Most Successfully to Retain Current Employees? (Select Up to Three)



Retention Strategies

Survey respondents noted the importance of organizational culture, effective managers, flexible work arrangements, training and development, and tuition reimbursement in retaining employees – indicating a growing awareness of what drives employee satisfaction and retention. In particular, the importance of organizational culture for retaining employees shows a dramatic shift in thinking about employer responsibility and the need to create an environment that breaks down barriers to productivity and employee engagement. It also underscores an opportunity to improve recruitment results by better promoting what companies are already doing to retain and engage current employees.

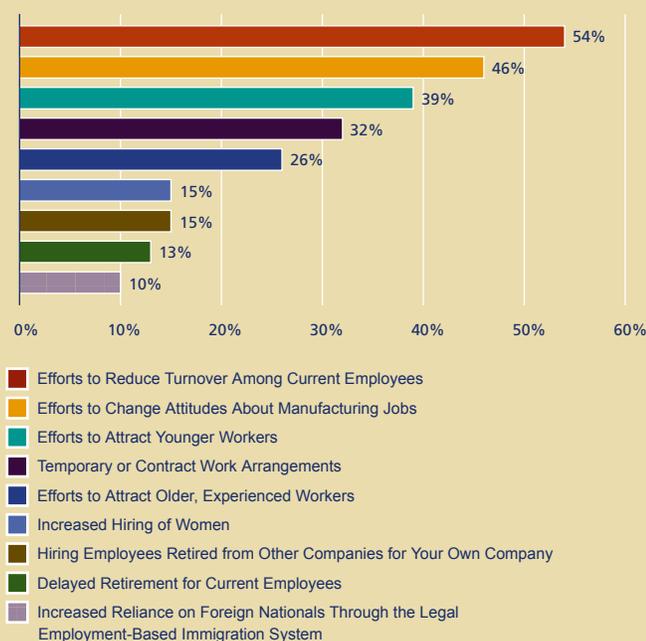
Like the responses for recruitment strategies, survey participants scored compensation and benefits highly as drivers of retention. This traditional view of employee motivators is consistent with the responses for recruitment strategies above. But clearly, there is a movement toward more progressive thinking around how to retain talent and the program elements that need to be implemented.

Low response rates were seen for formal career planning, mentoring, and on-site services as drivers of employee retention.

Looking ahead over the next three years, respondents felt they would address skills-retention challenges by working to reduce turnover, participating in efforts to change attitudes about manufacturing jobs, attracting younger as well as older, experienced employees, and using contract or temporary workers. Low to moderate responses were seen for the following tactics: hiring retired employees, employing more women, delaying retirement, and increasing reliance on legal foreign nationals.

This reaction indicated a willingness to try multiple and non-traditional approaches to dealing with skills retention in the years ahead. Considering the traditional approaches for current recruiting and retention strategies reported above, it is likely that manufacturing employers will need to use new and additional ways to source and retain the skills they require to be competitive.

Figure 8. Considering the Challenge of Attracting and Retaining Employees with the Right Skills for Your Business, Which of the Following Tactics Might You Utilize Over the Next Three Years? (Select Up to Three)



“Battlebots” and Developing Young Talent at E.J. Ajax

To prepare for the future, E.J. Ajax and Sons, a metal stamping company in Minneapolis, is promoting a program called “Battlebots,” designed to attract young people to a career in tool and die. Currently in a dozen high schools in the Midwest, the Battlebots program introduces students to electronics, computer control, fluid motion, welding, working with sheet



metal, and other manufacturing skills, all in the pursuit of building competitive robots.

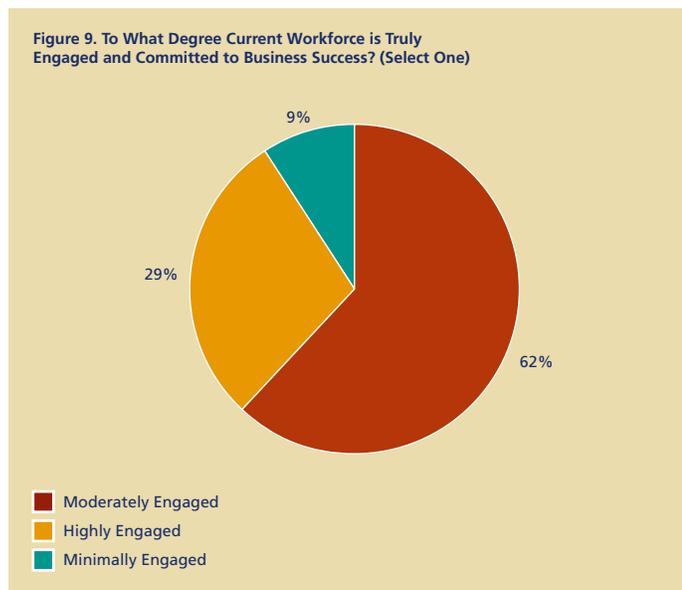
E.J. Ajax realizes that the manufacturing sector is not as popular a career choice for young people as it once was in the United States. But, the company’s leadership has been encouraged recently by growing interest in high schools and on college campuses as a result of the Battlebots program.

E. J. Ajax is also forming an alliance with the University of Minnesota at Crookston (UMC). The university recently introduced a four-year degree program in manufacturing that recognizes the value of previous college coursework and specialized training, as well as work experience. The company currently employs an intern who is attending a two-year program at a Minneapolis technical college and plans to complete his studies through the UMC program, while continuing to work for Ajax.

“One of my biggest challenges in the next three to ten years will be the retirement of my incumbent workforce,” said Erick Ajax, vice president of E.J. Ajax. “A quarter of my workforce is over 50 years old. Our four-year apprenticeship program is a good way to provide a career path for young people and interest them in this highly challenging field. There are some wonderful opportunities for someone who wants to pursue a degree in engineering, robotics, or automation and help the United States compete in the world.”

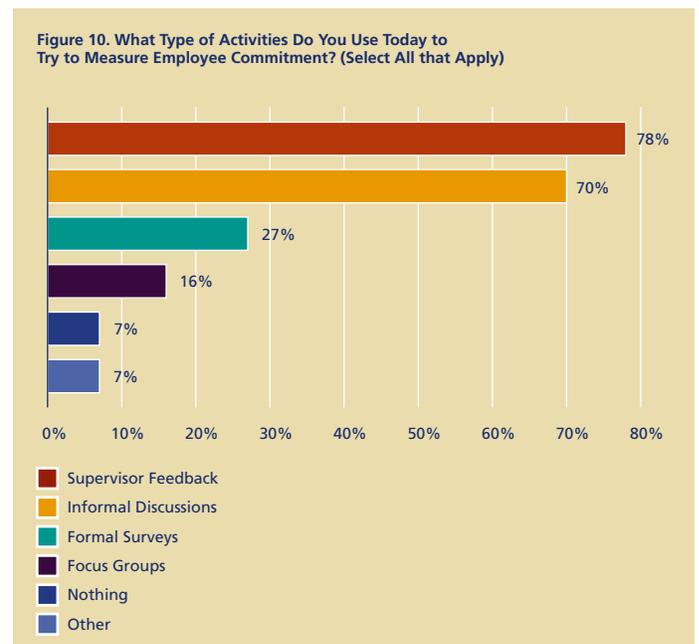
Employee Engagement

In spite of the challenges employers are facing as reported in other parts of the survey, it was disappointing that only 29 percent of employers surveyed perceived their workforce to be highly engaged. If employers expect to have high-performance workplaces, they must do better at motivating all of their employees to be highly engaged. Sixty-three percent of respondents said their employees were moderately engaged and 9 percent said they were minimally engaged. These percentages demonstrate that employers should be concerned about their ability to achieve high performance without a more fully committed workforce.



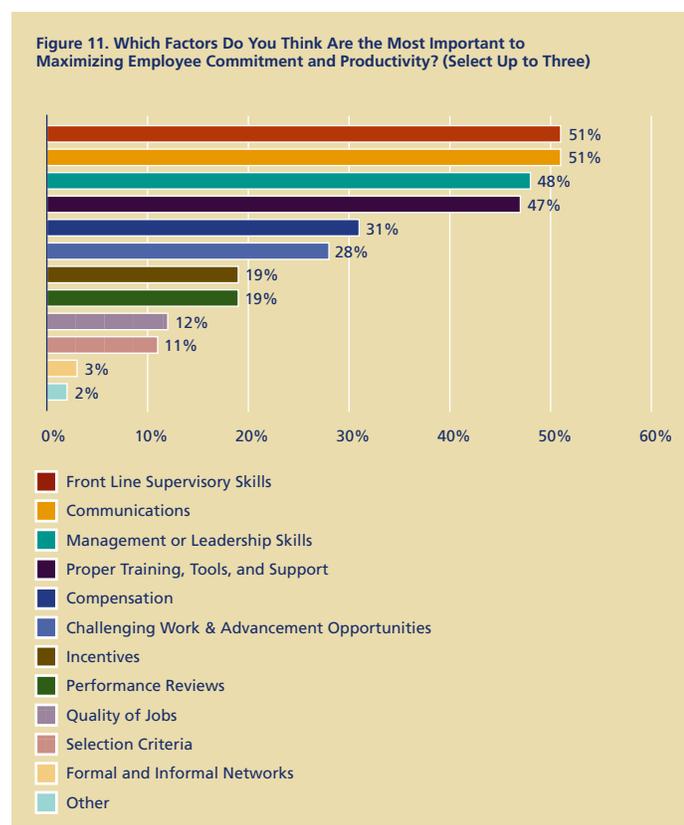
These results may be mitigated by how survey respondents reported that they measured employee engagement. Most methods reported were informal, including supervisor feedback and informal discussions. More impartial measures, including formal surveys and focus groups, received significantly lower scores, indicating an opportunity for employers to connect more objectively with and hear feedback from their employees.

Just as successful manufacturing companies pay close attention to and study what their customers want, these same companies must apply similar rigor to understanding what their employees want and how to motivate them. In short, manufacturers would greatly benefit from learning how to maximize the return on their human capital investments.



Further, the large percentage of respondents who reported their workforce was moderately engaged indicates a significant opportunity to raise the level of involvement among employees. This will help many of the respondents achieve their stated objective to develop a high-performance workforce.

The methods employers reported for maximizing employee commitment showed a strong awareness of what employees value, including high response rates for front-line supervisory skills, management/leadership skills, proper training, tools, support, communications, and other skills that are required for lean manufacturing environments. Compensation was identified as a moderate driver, which indicates a healthy perspective that employee commitment is not just about money. Low responses to several areas offer further opportunities for improving employee commitment, including providing challenging work, advancement opportunities, quality of jobs, incentives, performance reviews, selection criteria, and formal and informal networks. As employers seek to increase engagement and commitment toward developing a high-performance workforce, these opportunities will be critical.



Competitive Wages and Benefits

As noted above, respondents do not see compensation and benefits as their best way to maximize employee commitment. Certainly, these dollars are important in the employee/employer equation, but the reality is that employees quickly take compensation and benefits as a given and look to other aspects of a company's value proposition in making decisions about joining or staying and how much effort to put forth.

The key message for U.S. manufacturers is that competitive wages and benefits are important in attracting and retaining employees, but these are just the starting points for developing a differentiated value proposition for employees. People want more from their work experience than a paycheck. They want transferable skills and experiences that make them valuable to their current employer as well as to the broader market. This comes in the form of challenging work assignments, training and development, advancement and promotion, and rotational assignments. Employees also want respect, recognition, and connection in the workplace, specifically relevant performance management processes and incentives (monetary and non-monetary), formal and informal networks, formal and informal mentoring, and a general sense of community within the workplace.

Training

Manufacturing employers surveyed see training as a business necessity to be delivered just-in-time, and not as a way to attract employees, as noted above in the section on recruiting strategies. Respondents noted moderate value for training as a retention tool. At the same time respondents reported that their spending on training is increasing – and not just for executives, but across all employee groups. Employers are placing emphasis on specific job skills in offering training to their employees.



Running a Lean Enterprise at Whirlpool Corporation

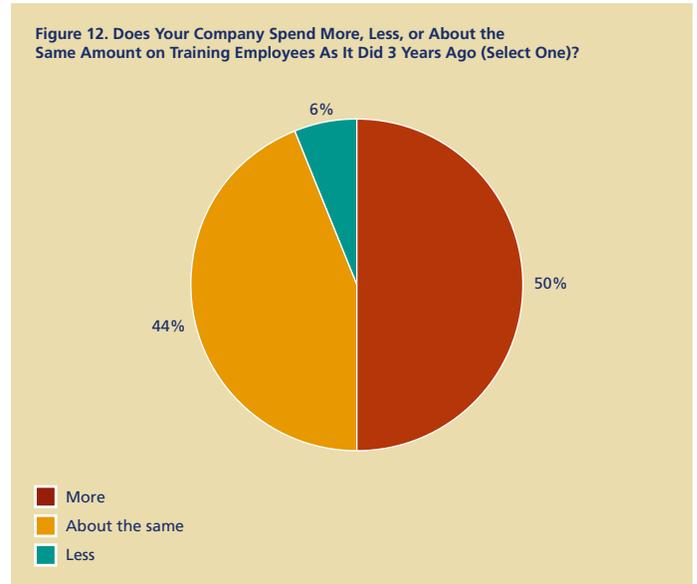
At Whirlpool Corporation, every plant around the world conducts what is called a Lean Focused Event, or LFE. The LFE involves representatives from all areas of the plant – operators, hourly workers, process engineers, industrial engineers, quality controllers, and product designers – to form a work team that examines an existing process and develops a better, more “value-added” way to do it.

“Lean means eliminating waste and non-value-added labor or activity,” explains J.C. Anderson, senior vice president for North American Operations at Whirlpool. “Lean isn’t just about increasing labor productivity. It includes quality enhancement, more strategic inventory control, better use of space, and ergonomic benefits.”

An LFE team focuses on a particular area that needs improvement. The team’s first step is to examine the current state and map out the current process. Then the team envisions the future state by asking, “What would be the ideal way to do this?” The most important step is creating a “migration path” for making the change. All the necessary actions and resources for successfully making the change are documented. The LFE team then makes a presentation to the plant manager, for review and approval to proceed with the team’s recommendations.

“We practice CI [continuous improvement] on our LFE processes as well,” says Anderson. “An LFE tomorrow will be better than the one we did yesterday.”

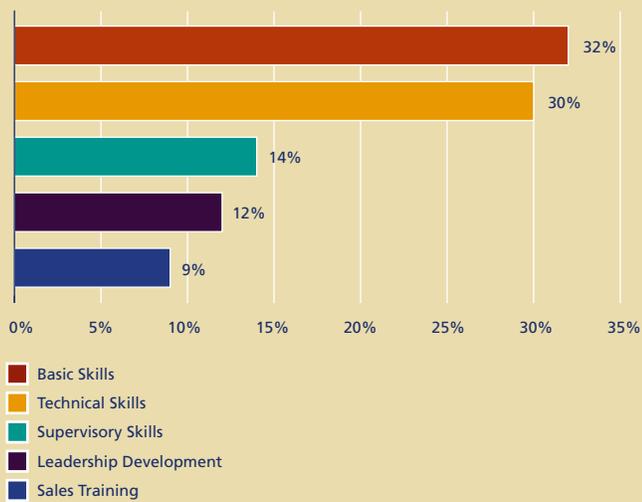
Figure 12. Does Your Company Spend More, Less, or About the Same Amount on Training Employees As It Did 3 Years Ago (Select One)?



The types of training that respondents reported they are most focused on delivering to employees are technical and basic skills training. Specifically, the most important training programs were reported as those supporting specific skills for a particular job.

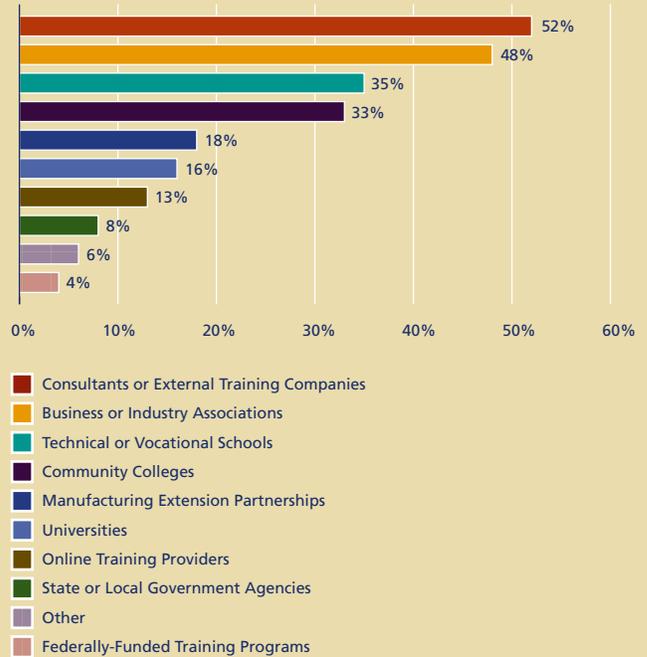
The next tier of responses was training for problem solving, teamwork, leadership, computer skills, basic or advanced mathematics, basic reading and writing, and interpersonal skills – all standard skills for high-performance workforces. However, only moderate to low responses were seen for supervisory skills, leadership skills and sales training. Still lower responses were reported for customer service training, certification training, tuition reimbursement, formal apprenticeship programs, English as a second language, and GED assistance.

Figure 13. How Do You Allocate Training Budget? (Average of Responses)



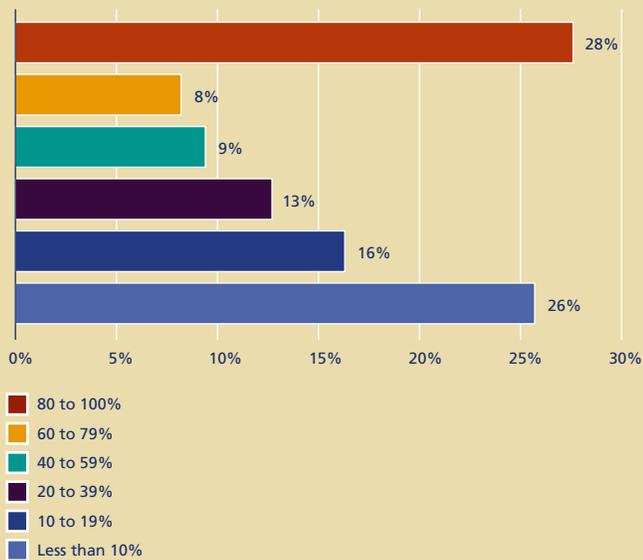
Survey respondents reported that the leading external training providers were training companies, consultants, business or industry associations, technical or vocational schools, and community colleges. Moderate to low responses were received for manufacturing extension partnerships, universities, online providers, state or local government agencies, federally funded programs, unions, and community or faith-based organizations. Based on the relatively low response reported for online training providers, this may be an opportunity for manufacturers to further leverage this flexible and cost-effective channel.

Figure 14. Where Does Your Company Most Often Turn for External Education/training Resources for Current Employees? (Select Up to Three)



Although the surveyed companies are spending more for training, on average, than companies responding to previous Skills Gap surveys, the majority of companies (64 percent) surveyed formally train less than 60 percent of their workforces. The decision whether or not to provide training to all employees may be driven by short-term cost pressures that companies are facing or by a lack of recognition by some regarding the beneficial performance, retention and attraction impacts of training and development investments. Given the gap between employee desires and current programs, it is believed that U.S. manufacturing companies will advance toward their goal of building a high-performance workforce by taking a longer-term investment view of the value of training and development.

Figure 15. On Average, What Percent of All Employees Receives Formal Training Provided by the Company Each Year? (Select One)



Culture as a Driver of Market Competitiveness

Almost half of the survey respondents (46 percent) reported that improving their organizational culture is a priority, while three-quarters of respondents (74 percent) reported their need to build high-performance workforces over the next three years. The challenge for most of the survey respondents in achieving these goals seems to be finding ways to overcome the traditional views of what drives employee attraction, engagement, and retention beyond pay and benefits.

As discussed above, the perspective that respondents reported in the survey is traditional regarding recruitment, engagement, and retention. There is an emerging sense that leadership, management effectiveness, and the overall employee experience are critical to employee satisfaction and commitment, but for the most part respondents see dollars and benefits as their main tools. Competitive wages and benefits have always been a cornerstone of attracting top employees in the United States since the 1950s. Half a century later, a number of

manufacturers are still maintaining the status quo of compensation, seeing it as the primary driver of employee attraction and retention.

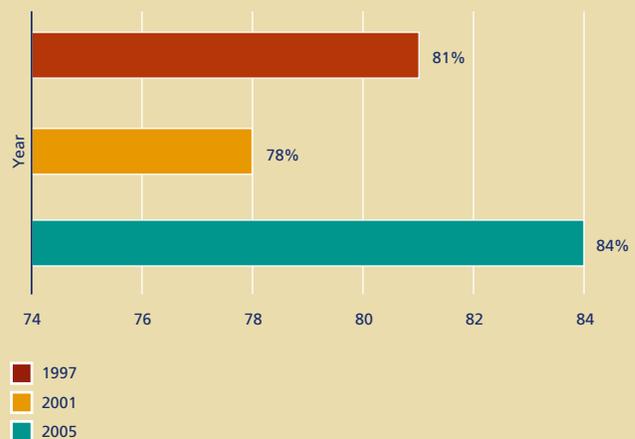
So how can U.S. manufacturers build high-performance cultures within their companies? Moving beyond traditional ways of motivating employees by implementing some of the engagement approaches discussed above is a start. But, culture is pervasive and often slow to change. Change can happen based on **leadership’s ability to guide people toward new behaviors and actions, reinforce and reward those new behaviors until they are embedded in the culture, and measure progress toward those goals** – both individually and as an organization. “What gets measured, gets done” and so it is for culture and behavior as well.

Public Education’s Role in the Solution

Manufacturers are seeking help in closing the skills gap and they view the public education system as having the potential to be a significant part of the solution. The results of this survey indicated, however, that many opportunities exist to improve the public education system and to increase the level of collaboration with employers.

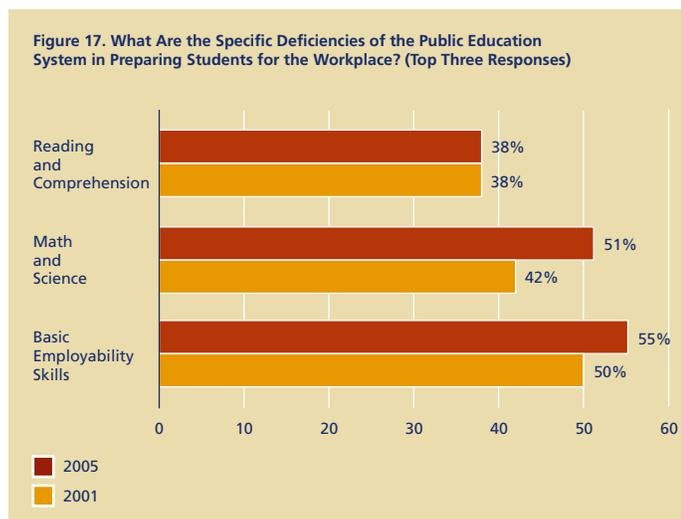
When asked whether K-12 schools are doing a good job preparing students for the workplace, 84 percent of respondents indicated “no.” This compares with 78 percent indicating “no” in 2001, and 81 percent in 1997.

Figure 16. Are K-12 Schools Doing a Good Job Preparing Students for the Workplace? (Those Responding ‘No’)



Over the past eight years, which have included noteworthy educational reforms, employers of all sizes have yet to see an improvement in the ability of public education institutions to prepare students for the workplace. When controlling for industry segment, it is noteworthy that Aerospace and Defense reported “no” 93 percent of time – eight percentage points higher than the next highest segment, Process Manufacturing. Again, given the skill requirements of working with highly engineered products, it may not be surprising that the response was so high in Aerospace and Defense.

When asked to elaborate on the specific deficiencies of the public education system in preparing students for the workplace, the top three most frequently cited responses were: basic employability skills (attendance, timeliness, work ethic, etc.) at 55 percent, math and science at 51 percent, and reading and comprehension at 38 percent. As Figure 17 illustrates, these same top three responses appeared in the 2001 report.

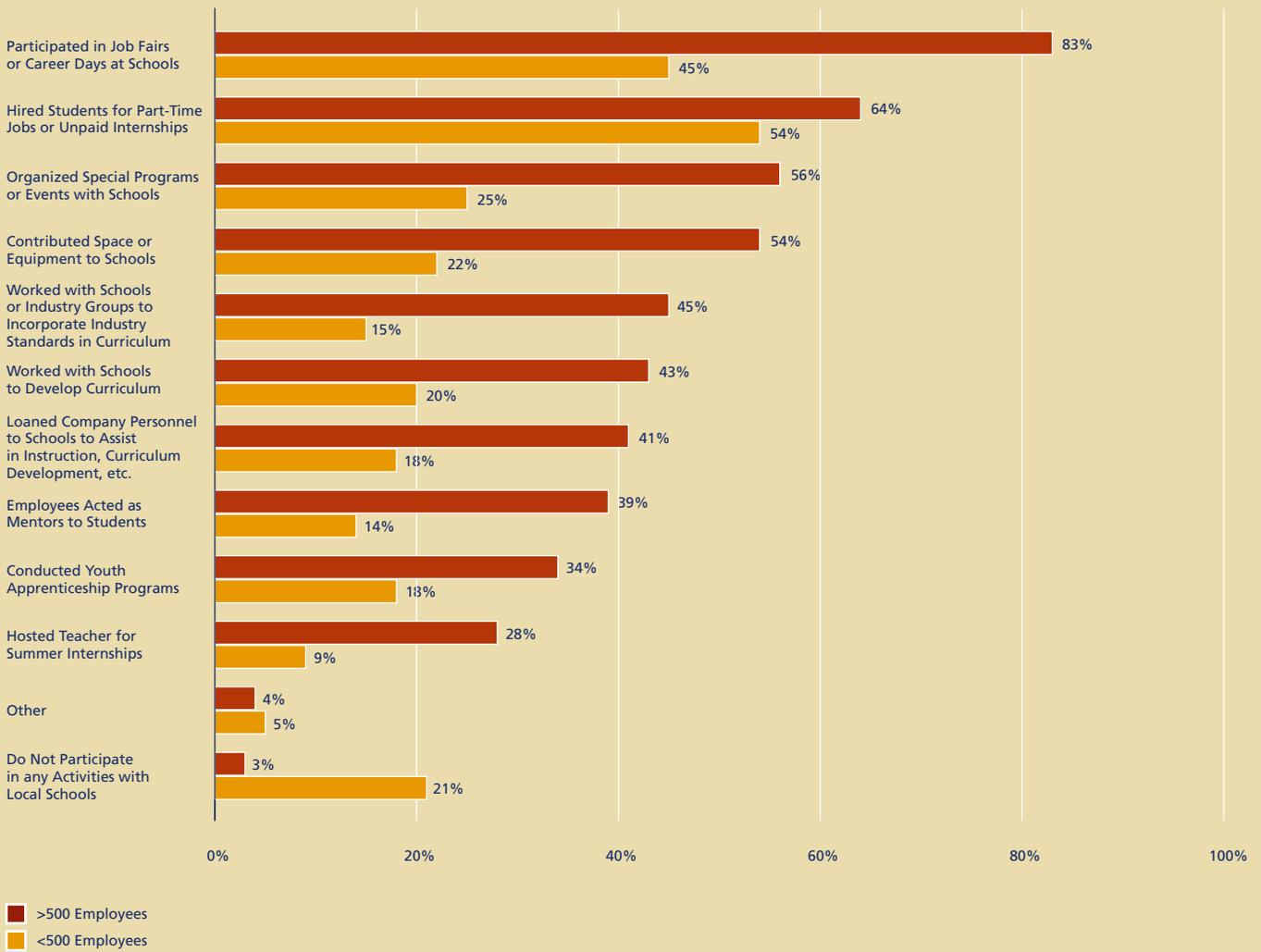


As with the 2001 survey, employers continue to cite basic employability skills as the single most frequent deficiency among employees. This, of course, presents an interesting challenge to the public education system and society overall. Even if schools perform well in their traditional role of increasing math, science and reading comprehension skills, this would not address the top, pressing concern of employers – the need for attendance, timeliness, and work ethic.

Given that traditional approaches are inadequately addressing these urgent issues, additional dialogue between manufacturers and the public education system is required regarding standards and expectations and the role that schools are playing in the preparation of students for the workplace. This effort should focus on better understanding the policies and practices that may have hindered schools in turning out students ready to work – from the types of teachers and career counselors that are hired, to disincentives that are in place holding students back even when they are qualified for advancement, limited parental interest in education, and a lack of school board awareness in changing workplace skill requirements.

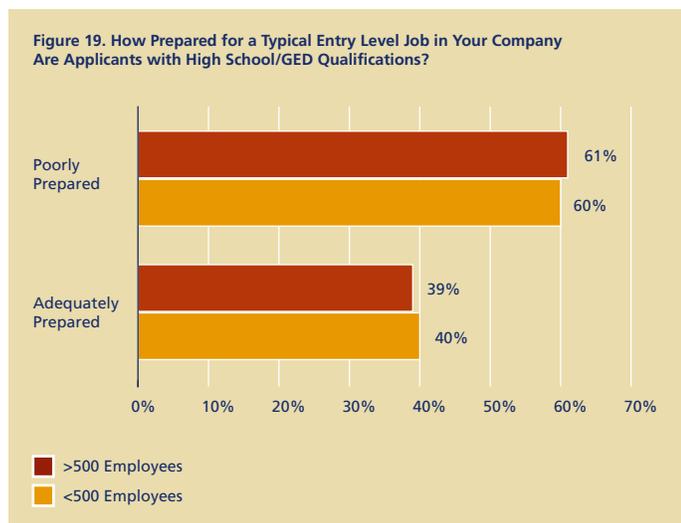
When asked what they themselves are doing to address the skills gap via the public education system, 32 percent of respondents indicated that they are participating in state or local business organizations that promise educational reform. However, companies are not attempting to achieve reform only from the “outside.” They also are working directly with schools on a number of fronts, such as participating in career days, hiring students for internships, and having employees act as mentors to students. The frequency of respondents’ participation in these activities is shown in Figure 18.

Figure 18. Has Your Company Participated with Local Schools In Any of the Following Activities? – Difference in Frequency Between Large and Small Employers (Select All That Apply)



Possibly the most important finding from the response to this question is that large employers, those with more than 500 employees, participate in these activities at a rate of two to three times that of the smaller employers, those with less than 500 employees. Given the impact small companies now have in maintaining overall levels of manufacturing employment, and the extent to which small companies draw their candidates from their local communities, it appears important to increase the level of direct interaction between small companies and their local schools.

Part of the reason that companies are not achieving their potential in directly collaborating with public education may be an incomplete understanding of the potential benefits. When asked why companies are participating in activities directly with the schools, the most frequent response is as part of their community outreach/citizenship activities. However, in a broader sense, most of the top responses, by both large and small companies, can be viewed as contributing to an increased pipeline of qualified and interested new talent into the workplace.



Reducing Turnover and Training New Talent at Behlen

Ten years ago the turnover among welders at Behlen Manufacturing was more than 100 percent per year. "We've introduced gain sharing and profit sharing programs as well as a safety bonus. We also cross-train our welders to give them flexibility," explained Duane Matson, training coordinator for Behlen. "This gives employees a wider range of responsibilities."

Behlen is also making an effort to attract new hires that have exposure to welding and the skilled trades. "This is harder to do today than in the past," explains Matson, "since many high schools have eliminated their industrial training programs."



The "2 + 2 Machine Tool" program, offered in conjunction with the local community college, gives Behlen the opportunity to bring high school age students into after school internship programs in the tool and die area. "We teach the students various welding processes, like wire welding. Wire welding is a process that's used all over the country and the world. It's a very marketable skill," says Matson.

Behlen produces fencing, gates, horse and cattle pens, and steel frames for industrial buildings. They also make smaller items, such as park benches, bike racks, and grain bins.

"Our turnover in the welding area is 45 percent right now," says Matson. "Some of that is because people come into welding and then transfer to other positions. Still, we are in considerably better shape than we were several years ago. Our turnover rate company-wide is 30 percent. We attribute a lot of that success to employee training, as well as the gain sharing and other productivity enhancing programs we've implemented."



Leaders and Employees Develop a Lean Focus at Wainwright

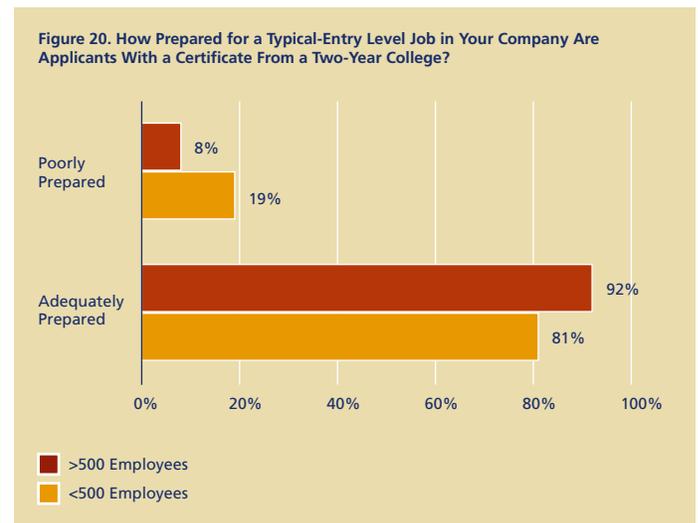
At Wainwright Industries in St. Peters, Missouri, having the last name “Wainwright” does not keep you from rolling up your sleeves and joining the team, especially if the topic is lean manufacturing.

A recent lean manufacturing goal at Wainwright involved dramatically increasing the number of parts welded each week. A cross-functional team was assembled, including a floor operator, plant operations people, a team facilitator, and the president of Wainwright. The objective was to increase production to 3,000 parts each week. “At first, the group didn’t think we could do it, even with three shifts,” says Fay Aubuchon, training coordinator at Wainwright. “Then, we started asking, ‘What’s keeping us from making this goal?’”

The group decided to invite specialists from the plant to examine the situation. A maintenance specialist found a machinery problem that was causing a delay. Repairing that issue raised output by 200 parts per week. Another specialist recommended preventative maintenance that resulted in fewer production delays. The press room specialists worked with the team to revise how the part was being made. An engineer helped the team revise the manufacturing process to increase speed. “We achieved our goal because we kept asking, ‘What can we do better?’” says Aubuchon.

“A high-performance team is only as good as everybody on the team. You have to have respect for each other and all be focused on the same objective – from Nelson Wainwright to the people who keep the floors clean,” says Aubuchon. “Our leadership is just as committed as the workforce. To have leaders who will come out on the floor and work with you, that’s pretty amazing.”

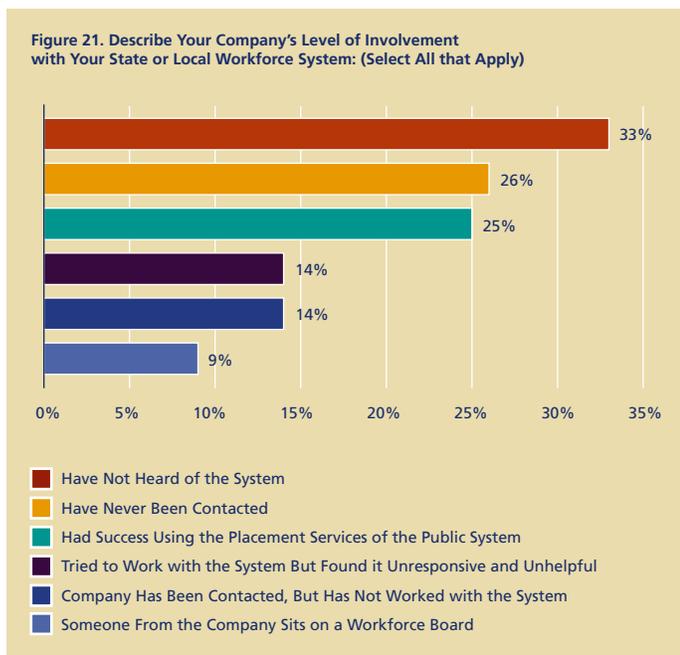
One significant reason that only about a third of respondents (27 percent) see local schools as a potential pool of new talent may be because they do not believe local schools are graduating students who are prepared to accept even their entry level positions. When asked, “How prepared for a typical entry-level job in your company are applicants with the following qualifications?” only 40 percent responded that graduates with a high school degree are prepared (Figure 19). This does not appear to be the case, however, for local community colleges, with 81 percent of the respondents indicating that a two-year degree or a job-related, industry certification is adequate for their entry-level positions (Figure 20).



Government Involvement

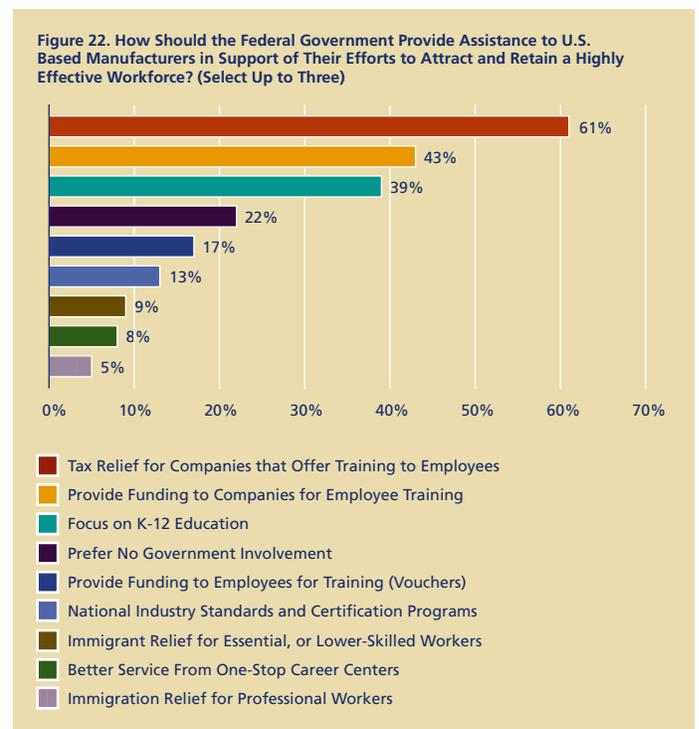
The Workforce Investment Act of 1998 gives state and local officials new authority and flexibility for using federal job-training aid. Under this initiative, public systems provide training, job-search and placement assistance, adult literacy and other labor-market services through one-stop centers. The governor of each state appoints a State Workforce Investment Board, which must have a majority of business members and be chaired by a businessperson.

Relatively few of our respondents have had substantial interaction with the state or local government workforce system. When asked about their involvement, 33 percent report they have not heard of the government workforce system, and 26 percent indicated they have never been contacted.

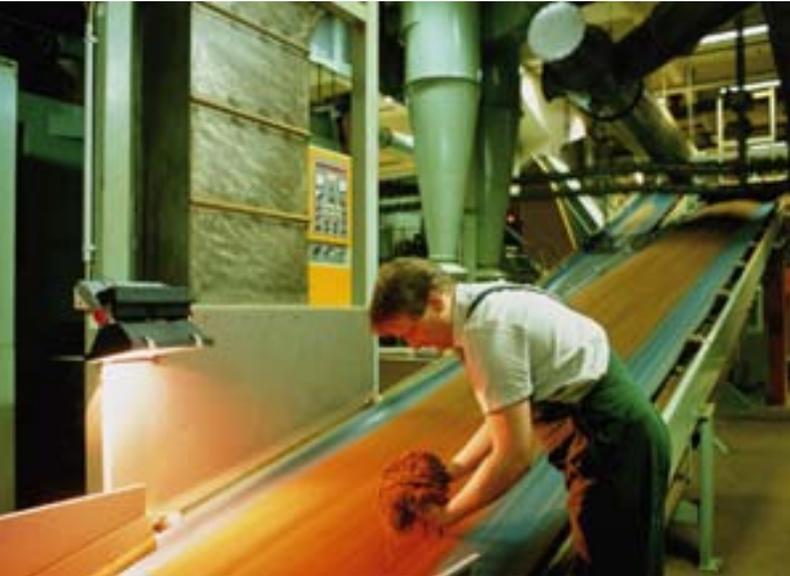


In large part, it appears the limited involvement with the Workforce Investment Board stems from a lack of knowledge with the system – 53 percent have never been asked to serve on a local Board and 40 percent do not know about any Workforce Boards in their area.

U.S. manufacturers believe the federal government can be most helpful in supporting their efforts to attract and retain a highly effective workforce by providing incentives for these companies to offer training programs. Tax relief for companies that provide training to their workers is the most valued support (61 percent), followed by direct reimbursement to companies for employee training (43 percent). Finally, 39 percent of respondents believe the federal government should focus on K-12 education.



The Path Ahead – Recommendations for an Individual and Shared Responsibility



Over the last decade the *Skills Gap Surveys* have recorded an alarming trend: **the largest manufacturing country in the world can barely find the skilled employees it needs to remain competitive in a global economy.** The 1990s and the recession of 2000-2003 were a proving ground for manufacturers – they were forced to adopt lean manufacturing processes, utilize new technologies, develop new products and new niches, and adapt to an extremely competitive global business environment. In the process of making these changes, manufacturers came to understand the true requirements of the new manufacturing workforce. They also came to see that their employees would need more sophisticated skills than those needed in the past and that workers did not necessarily have the right kinds of skills needed for manufacturing's current and future challenges.

This year's report continues to peel back the layers of aspiration versus reality regarding the talent shortage and underscores its very real business and economic impacts. What this report hopefully makes abundantly clear is that the talent shortages and skills gaps outlined in this report are neither theoretical nor distant problems. **Today, these issues are having a negative impact on the business operations of 83 percent of companies surveyed.**

The inescapable conclusion is that the ability of manufacturers to attract, retain, and develop a high-performance workforce is of major importance to our nation as a whole. This challenge presents a significant opportunity for collaboration between the public and private sectors. Manufacturers are not expecting government to solve the problem for them, but would like encouragement and support for investments in training programs.

It is also obvious that the issues associated with the skills gap are numerous and complex. To provide for the future viability and vibrancy of the American manufacturing industry, each stakeholder must assume responsibility – including manufacturing companies, the government, educators, and individuals. Specifically, we believe the urgency of this situation requires the following actions:

Employers must understand the importance of human capital as a business investment. Similar to the other aspects of their business, employers need to look at their human capital as an investment rather than as expenditure. If employees are engaged through a strategy of career ladders, incentives, competitive wages and benefits, and supportive working conditions, they will stay – research bears this out. *As a result, we recommend that employers invest at least 3 percent of payroll whenever possible in training supports for their current employees.* The key is to be proactive in understanding the types of workers needed now, the types needed going forward, what they value as incentives, and how to motivate them to reach their workplace potential.

Employers must implement new and non-traditional approaches to dealing with skills retention challenges. This includes efforts to reduce turnover, participate in efforts to change attitudes about manufacturing jobs, utilize contract or temporary employees, and tap under-utilized talent pools among older, female, immigrant, and non-traditional workers.

Employers must help the general public and public sector to understand what companies need. Companies need to become more engaged in public education, working with educators on curricula, holding field trips and career fairs for students, providing internships and apprenticeships and generally giving community schools opportunities to learn about manufacturing. Companies also need to work with their local public workforce system, advising Workforce Investment Boards on rising or declining economic conditions, business investments, skill needs, and employment requirements. In addition, public/private partnerships should be encouraged to support career awareness campaigns that help individuals understand all the career options available to them. A model for this is The Manufacturing Institute's Dream It Do It manufacturing careers campaign.

Educators must produce graduates familiar with the world of work and the skills needed to be effective in it. Business/education collaborations are critical to help familiarize the teaching and counseling professions with the needs of business. Teachers and career counselors should engage in business externships, and certificate and associate degree programs in community colleges, and technical schools should be updated to the new 21st century skill requirements. And because K-12 education is where it all begins, *math and science should be emphasized in K-12 curricula with a focus on technology and innovation. State education standards should include career education as measurable criteria for K-12 results under the No Child Left Behind Act.*

Education and workforce policies must reflect the need for lifelong learning. Community colleges and technical schools should receive targeted public funding for workforce development because they are often the training provider of choice for employers. *In addition, the Higher Education Act and its funding mechanisms should include a focus on the adult learner and lifelong learning.* And, current legislation should be reauthorized to support lifelong learning.

Individuals must take responsibility for their employability. This is the millennium of the free-agent worker – a person who can go anywhere and do anything with the right kind of education and training. Individuals must accept their role in keeping their skills current and should understand that the value they bring to the workplace is contingent upon their commitment to lifelong learning – to keep their skills and their knowledge current.

Clearly, good jobs require a high level of skill and reap good wages that support families, communities, and the nation. The nation's competitiveness depends upon the manufacturing sector and the upwardly mobile jobs it provides. If manufacturers cannot find the skilled people they need here in the United States, jobs and industries will move to where they can find the skills.

The fact is that the rules of the competitive race have been changed forever. With inexpensive access to Internet, broadband, and collaboration technology, historical barriers like geography no longer prevent small companies and skilled individuals from around the world from participating in local markets. As Craig Barrett, CEO of Intel said, "You don't bring three billion people into the world economy overnight without huge consequences, especially from three societies (like India, China, and Russia) with rich educational heritages."²

This means that we are now facing an entirely new level of competition with no guarantees that the U.S. manufacturing base will remain strong. Plainly said, unless solutions to the skills gap issues are acted upon with great focus and determination, this country will likely be left behind in the global competitive race.

Glossary

Critical Workforce Segments

Specific groups of employees, based on skill type and role in the company, who are most central to the company's business strategy. They are responsible for a large portion of the company's value proposition. Typically, special efforts should be made to develop, retain, and engage these critical workforce segments.

Employee Commitment

Employee commitment is a somewhat subjective term that refers to the degree to which employees are willing to expend "discretionary effort" on behalf of the company. This is contrasted by employee behavior that seeks to deliver the minimum to "get by" and collect a paycheck. High employee commitment exists when workers think about and take action to improve the business processes they support, putting the customer first. These employees are engaged and actively contribute to the company's performance improvements because they understand the overall business and their role within it. Committed and empowered employees act like owners of the business.

High-performance Workplace

A work environment that uses such practices as teamwork, extensive training, regular appraisals and performance feedback, flexible job descriptions, and extensive communication to improve workforce performance. There is disagreement among organizational development specialists as to exactly what constitutes a "high-performance workplace." However, there is widespread agreement that there are four primary dimensions: employee autonomy and involvement in decision-making, support for employee performance, rewards for performance, and the sharing of information and knowledge.

Skilled Production Worker

A skilled production worker is the highest level production technician within the manufacturing environment. A skilled production worker is able to operate manufacturing equipment in more than one process and is capable of recognizing process improvement opportunities. His/her knowledge of manufacturing equipment and processes is sufficient to understand and resolve moderately complex production issues, provide preventive maintenance, and make routine repairs. The skilled production worker applies advanced problem solving and analytical thinking skills to troubleshoot non-routine production issues.

Training

Training can take several forms. Traditional instructor-led training often takes the form of classroom-style presentation, either on-site or as part of an off-site seminar or community college/vocational school. This is typically the most expensive type of training delivery, but offers high levels in interaction with the course instructor and the other participants.

Online or computer-based training is another form of instructional delivery. Whether Web- or CD-ROM-based, this training can be highly cost-effective and flexible. Students can start, stop, and work at their own pace through the training as their comprehension and schedule permits and can easily refer to materials. In addition, they do not have to travel to a particular location to attend training and results can be tracked centrally.

Methodology

The survey was designed to capture qualitative and quantitative answers regarding the U.S. manufacturing workforce, current skills and skill deficits, types of skills training offered, where it is delivered and by whom, as well as special needs and solutions.

Surveys were sent to 8,000 NAM members and Deloitte³ clients who were identified as CEOs, COOs, presidents, or senior executives of human resources. The survey was intended to gather employers' information about their workforces; we did not survey their workers.

More than 800 responded with input regarding the availability of qualified employees, recruitment, retention and training practices, drivers for future business success, and the business impact of labor and skills shortages. The data were entered into an SPSS database, and edited and reviewed to confirm validity. The respondents were parsed into industry groups according to NAIC codes and, in some cases, the groups were combined to provide for more robust cross-tabulations. We also ran cross-tabulations using groupings such as size, regions, and top ten manufacturing states. The majority of the companies participating in the survey were defined as small to mid-size companies with fewer than 500 employees.

This report includes the results of the survey, analysis of the responses and our recommendations. In addition, we have provided several brief vignettes of NAM-member companies to illustrate key points of the report.

Assumptions and Inferences

To gather data for the survey, we used the membership database of the National Association of Manufacturers, but had no way to fully ensure that we would receive a representative sample of all manufacturing across all industries. Thus, while our data are valid, we cannot make inferences about all manufacturing industries, but rather across manufacturing broadly. We believe that these data are suggestive of developments and trends in the manufacturing workplace.

If you have comments or questions about this survey, please feel free to contact the National Association of Manufacturers' Manufacturing Institute/Center for Workforce Success at manufacturinginstitute@nam.org. To order additional copies of the report, please visit www.nam.org/bookstore.

Endnotes

¹ Thomas L. Friedman, *The World Is Flat: A Brief History of the Twenty-First Century*, Copyright 2005.

² Ibid.

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About The National Association of Manufacturers

The Manufacturing Institute is the research and education arm of the National Association of Manufacturers, building intellectual support and raising understanding among policymakers, the media, educators and potential workers about manufacturing's contributions to the quality of American life, the challenges facing the sector and its excellent career opportunities. Visit the web site at www.nam.org/institute for more information about manufacturing and the economy.

The National Association of Manufacturers is the nation's largest industrial trade association, representing small and large manufacturers in every industrial sector and in all 50 states. Headquartered in Washington, D.C., the NAM has 10 additional offices across the country. The NAM's mission is to enhance the competitiveness of manufacturers by shaping a legislative and regulatory environment conducive to U.S. economic growth and to increase understanding among policymakers, the media and the general public about the vital role of manufacturing to America's economic future and standard of living.

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