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Introduction

by Anthony Hyllis, John P. Cullen, Jerry J. Kasinowski and Richard L. Reinert

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 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 skill capital performance gap threatens our 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 issue 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.

Greg J. Jasnowski

Phyllis Eisen

R. H. Kent

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! 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 80 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 increasingly 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.”

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 percent 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.

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.



The business and economic reality behind Today's Talent Shortages



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 – 5 to 10 percent respectively.

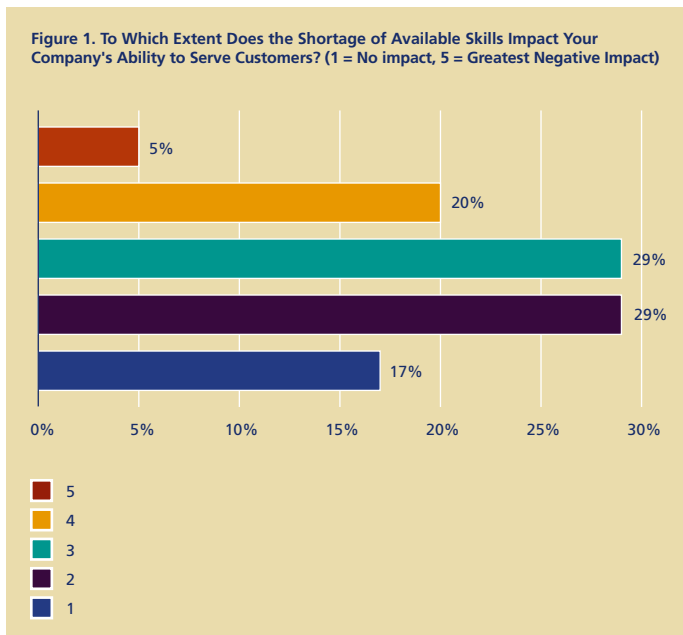
However, while all respondents appear to be impacted, not all segments of the workforce are affected equally. The largest shortages occur for technical skilled employees and engineers, but more than one-third of respondents also claimed shortages of **unskilled production employees**.

10 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. 5 percent of all respondents and 15 percent of respondents with more than 500 employees reported a moderate to severe shortage of scientists and engineers. This shortage is even more acute in certain industry segments such as aerospace and defense with 15 percent of respondents indicating a moderate to severe shortage. 10 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 15 percent of respondents indicated a shortage of qualified human resources information technology finance and education employees 10 percent of respondents report a shortage of qualified sales and marketing employees. Again these results vary little when controlling for size, industry or geography.

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



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

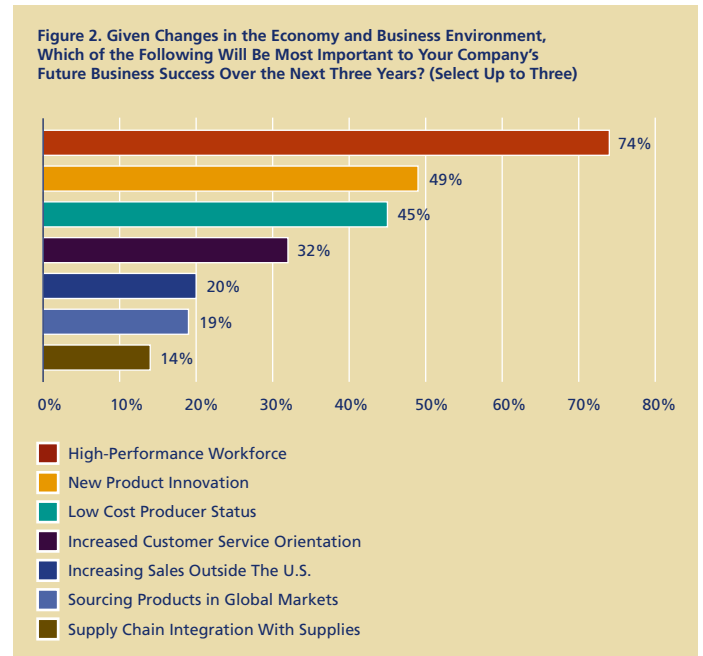
To better understand which skill deficiencies among current employees significantly contribute to negative business performance, the most frequently cited concern is inadequate basic employability skills, including attendance, timeliness and work ethic. Again, this response is consistent with a similarly 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



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.



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.

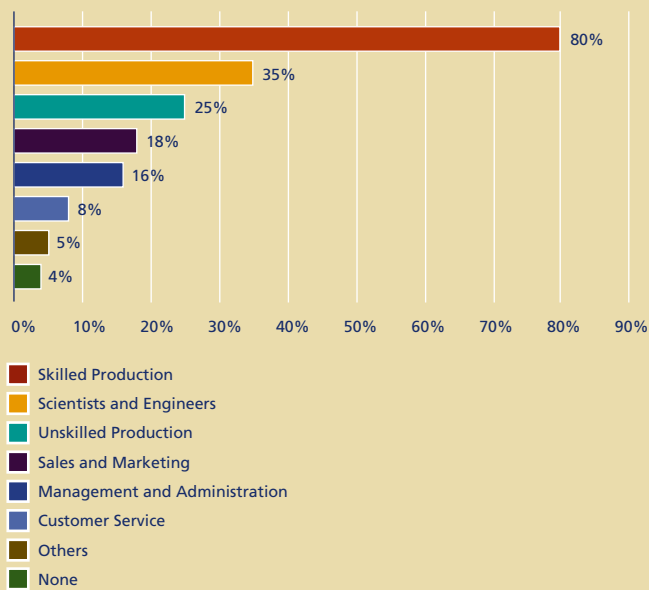
With the many changes to the overall business environment, including the economy and competitive landscape, manufacturers were asked to identify the employee types among whom they anticipate shortages over the next three years. The real pressure point again appears to be the skilled production workers, 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.

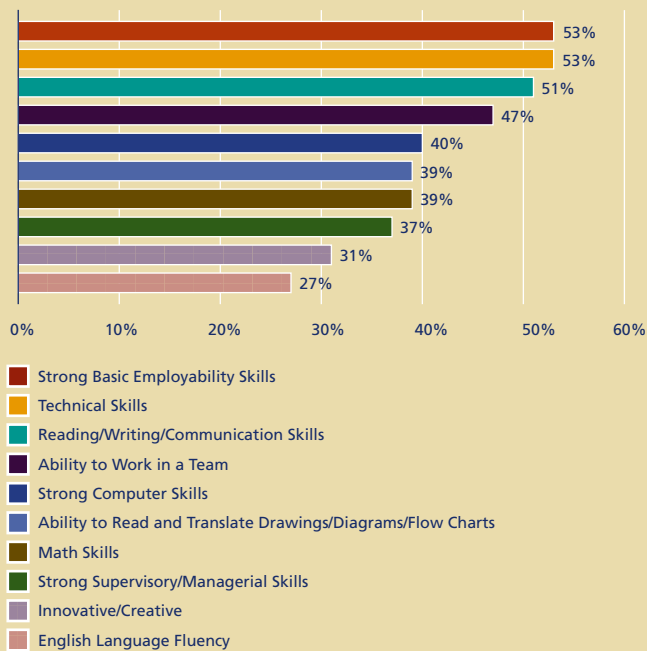


Figure 3. What Types of Employees are Expected to Be in Short Supply Over the Next Three Years? (Select All that Apply)



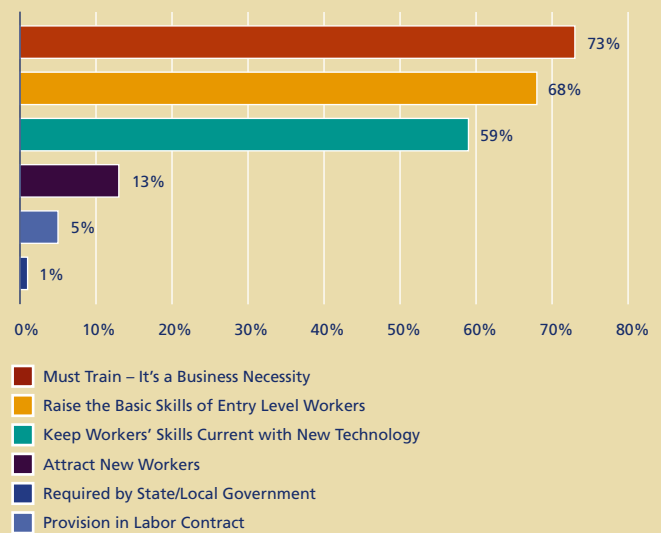
The Skills Gap 2001 report. Following that are reading writing communication skills, where 51 percent of the respondents said they will need more of these types of skills over the next three years. This paradoxical mismatch between the need for the highest skill levels ever and the current need to address 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)



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 3 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.

inally, looking into the future it appears that high-performance work force companies may consist of several different categories of employees. oughly 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 used 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

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 (Gen Xers are in their mid-20s to late 30s and Gen 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)

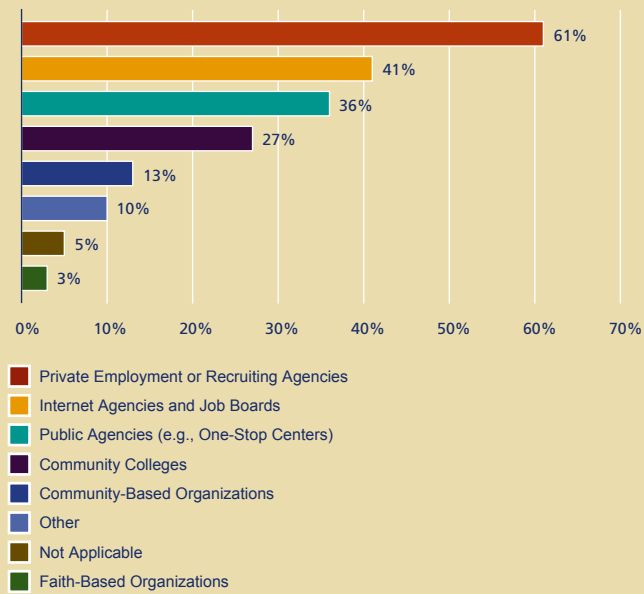


Figure 7. Which of the Following Have Been Used Most Successfully to Retain Current Employees? (Select Up to Three)





“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.”

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)

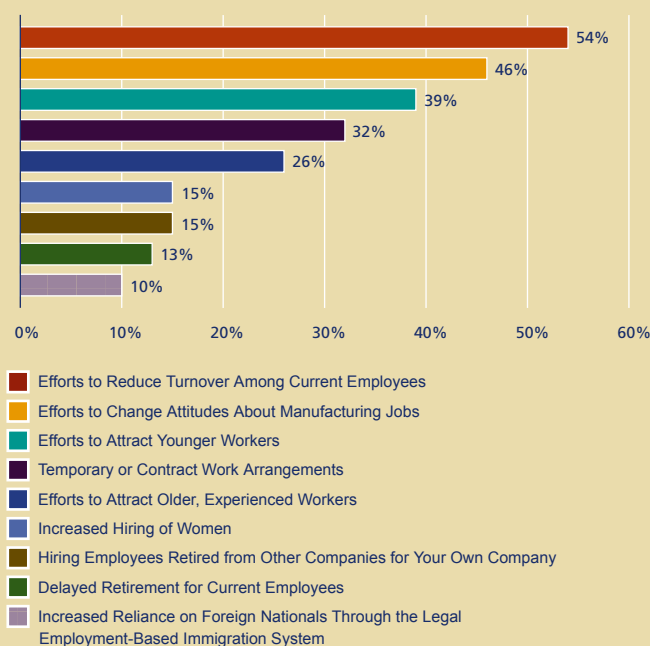
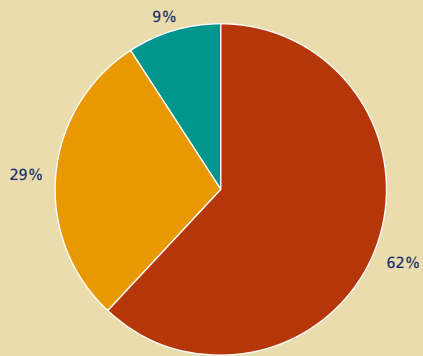
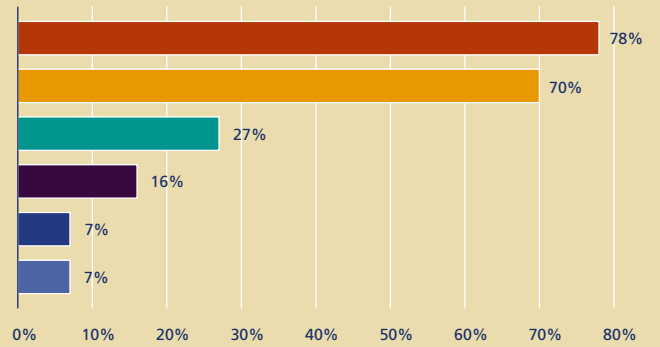


Figure 9. To What Degree Current Workforce is Truly Engaged and Committed to Business Success? (Select One)



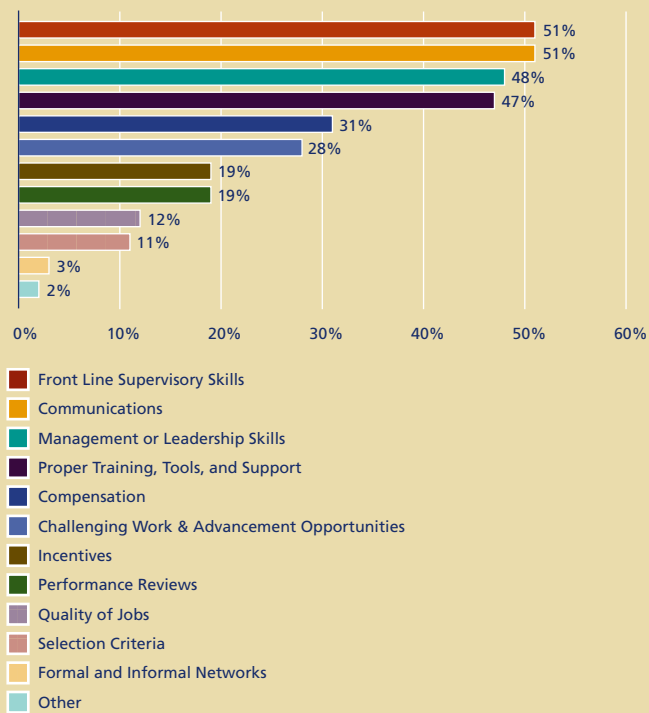
- Moderately Engaged
- Highly Engaged
- Minimally Engaged

Figure 10. What Type of Activities Do You Use Today to Try to Measure Employee Commitment? (Select All that Apply)



- Supervisor Feedback
- Informal Discussions
- Formal Surveys
- Focus Groups
- Nothing
- Other

Figure 11. Which Factors Do You Think Are the Most Important to Maximizing Employee Commitment and Productivity? (Select Up to Three)





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)?

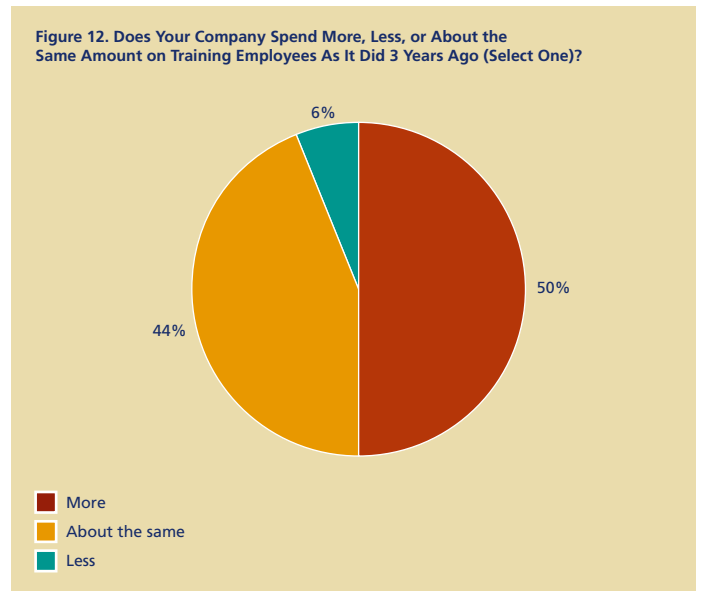


Figure 13. How Do You Allocate Training Budget? (Average of Responses)

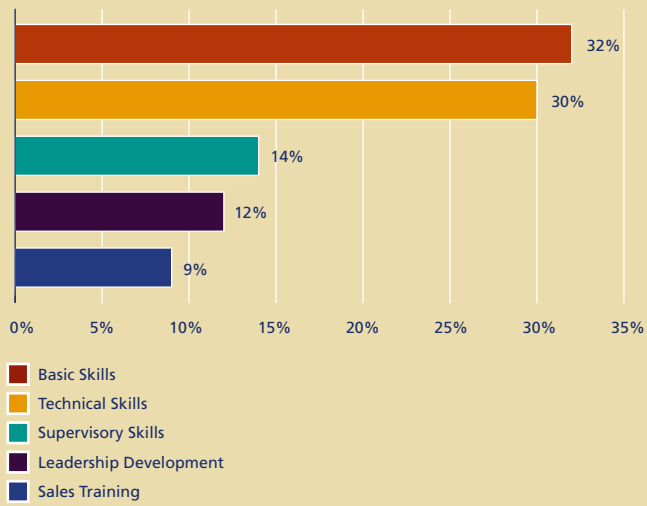


Figure 14. Where Does Your Company Most Often Turn for External Education/training Resources for Current Employees? (Select Up to Three)

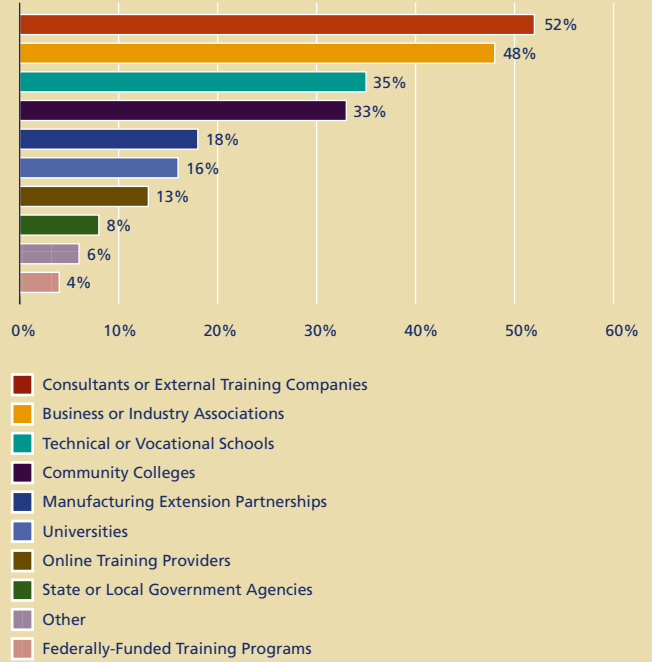
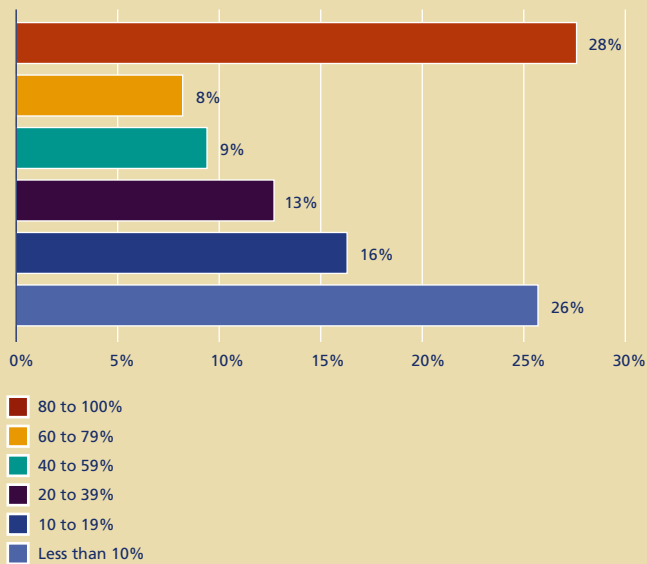


Figure 15. On Average, What Percent of All Employees Receives Formal Training Provided by the Company Each Year? (Select One)



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')

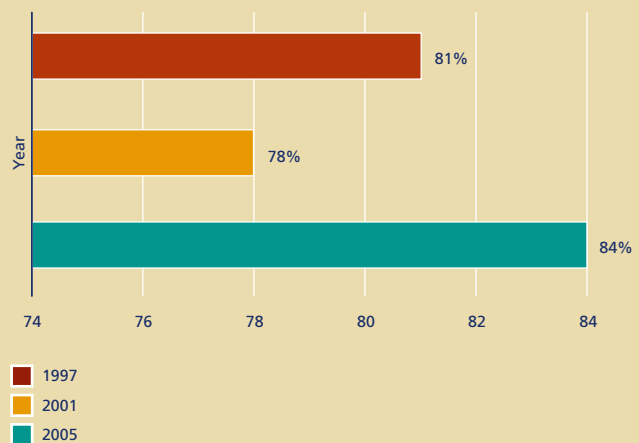


Figure 17. What Are the Specific Deficiencies of the Public Education System in Preparing Students for the Workplace? (Top Three Responses)

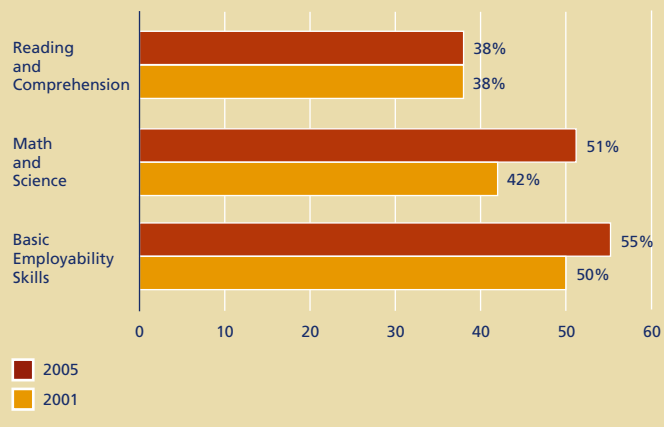
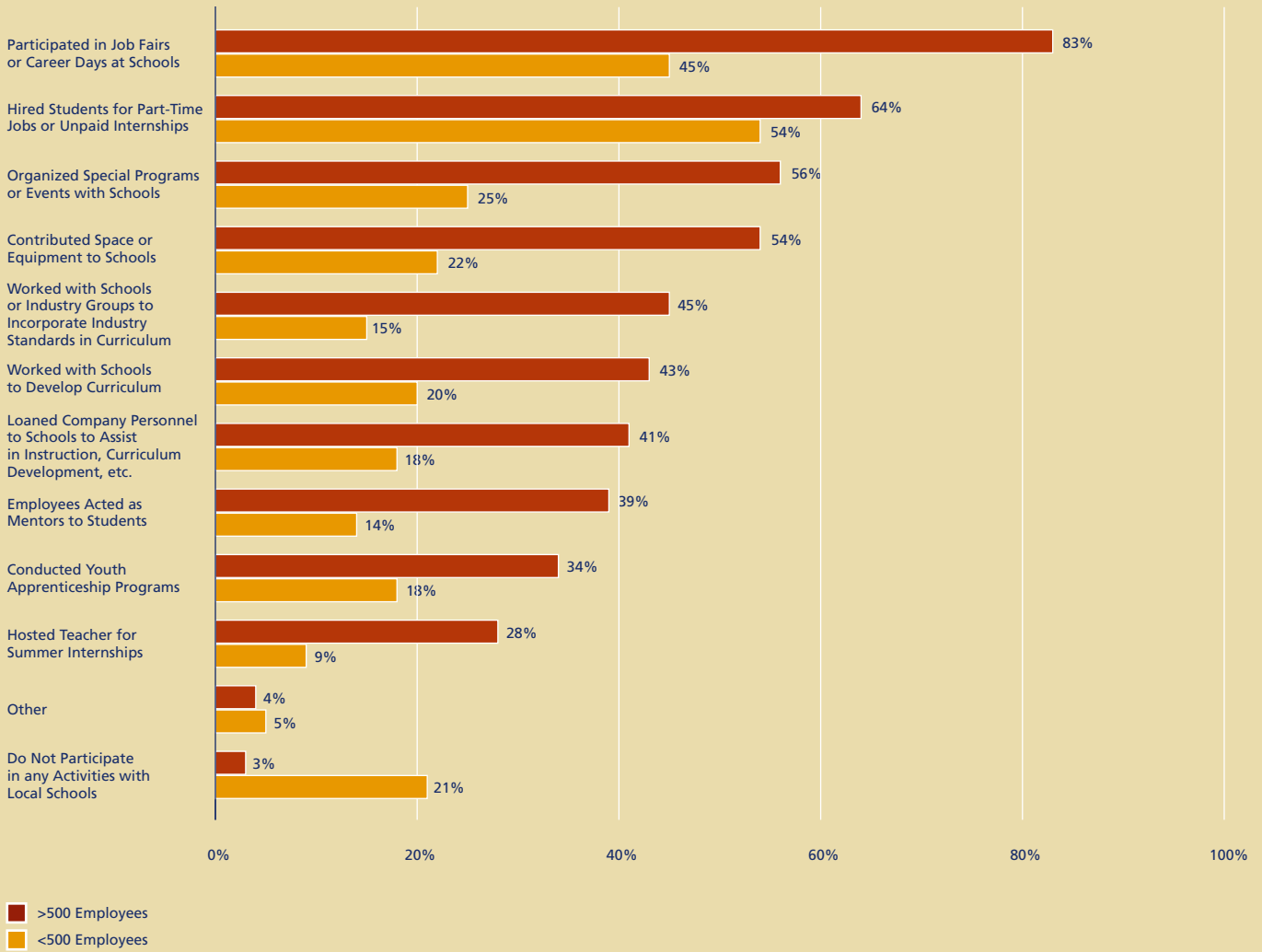


Figure 18. Has Your Company Participated with Local Schools In Any of the Following Activities? – Difference in Frequency Between Large and Small Employers (Select All That Apply)





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.”

Figure 19. How Prepared for a Typical Entry Level Job in Your Company Are Applicants with High School/GED Qualifications?

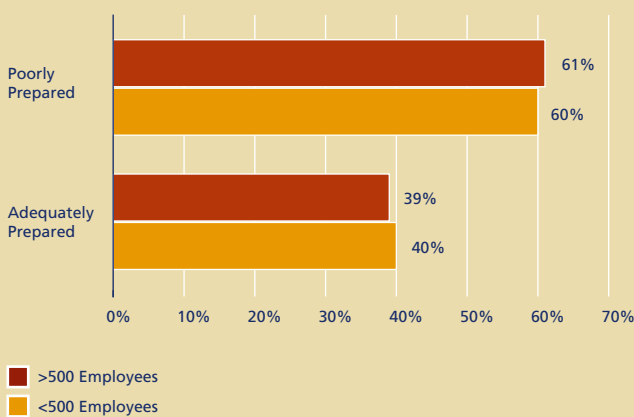




Figure 20. How Prepared for a Typical-Entry Level Job in Your Company Are Applicants With a Certificate From a Two-Year College?

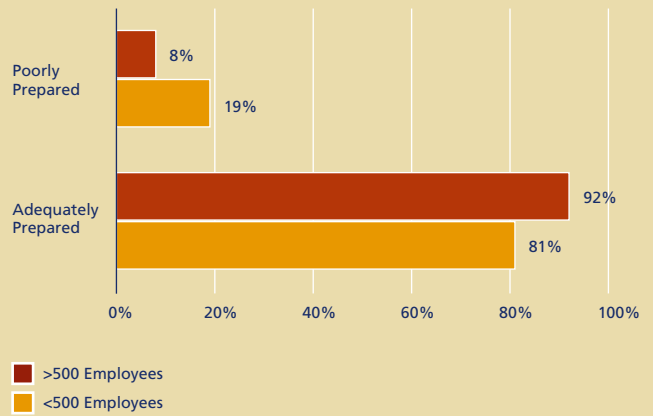


Figure 21. Describe Your Company's Level of Involvement with Your State or Local Workforce System: (Select All that Apply)

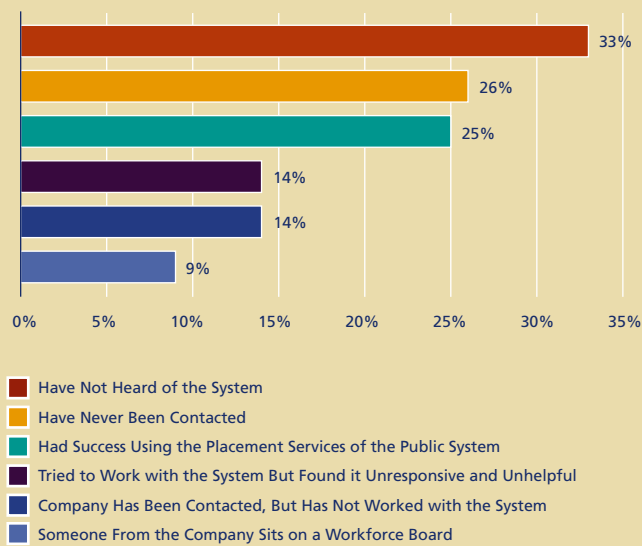
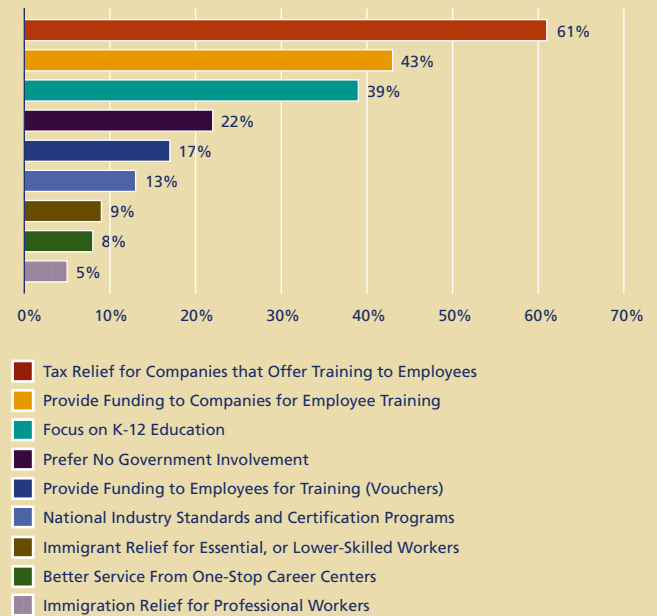


Figure 22. How Should the Federal Government Provide Assistance to U.S. Based Manufacturers in Support of Their Efforts to Attract and Retain a Highly Effective Workforce? (Select Up to Three)



The Path Ahead – Recommendations for an Individual and Shared Responsibility



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 follow 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 work-force 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 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 high-wage 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.

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.com. 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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