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MANUFACTURING Institute

The skills gap in U.S. manufacturing 2015 and beyond

Sponsored by The Manufacturing Institute and Deloitte

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Is U.S. manufacturing prepared to meet the talent needs of 2015 and beyond?

A strong manufacturing industry is fundamental to our nation's economic prosperity. Since the industrial revolution, manufacturing has contributed to higher export potential, better standards of living, and more jobs. Investments in manufacturing have a strong multiplier effect for the broader economy, too. Every dollar spent in manufacturing adds $1.37 to the U.S. economy, and every 100 jobs in a manufacturing facility creates an additional 250 jobs in other sectors.[1,2] In short, manufacturing matters.

Current macro-economic conditions indicate the global and the U.S. economies will experience low to moderate growth over the next two years. The International Monetary Fund (IMF) expects the global economy to grow by 3.3 to 3.8 percent in 2014 and 2015, respectively. They also project the U.S. economy to grow by 2.2 to 3.1 percent, and manufacturing production to grow by 3 to 4 percent during the same period.[3]

A brighter economic future may lie ahead, and as a result, many U.S. manufacturers are optimistic they will regain momentum. Despite this favorable outlook, they will likely face some familiar, yet significant, challenges. Not least among these is talent. This is not new – for years, manufacturers have reported a sizeable gap between the talent they need to keep growing their businesses and the talent they can actually find. Beyond today's talent issues though, what do manufacturers need to address for future years? And, what is the trajectory of the skills gap over the next decade?

The Manufacturing Institute and Deloitte embarked on their third Skills Gap study seeking to answer these pressing questions. The following report reveals the issue is growing and is exacerbated by a number of factors that brings manufacturers to an inflection point that must be addressed in order to ensure viability and success of American-based operations as well as the nation's economic prosperity as a whole.

The skills gap is widening

Over the next decade, nearly three and a half million manufacturing jobs likely need to be filled and the skills gap is expected to result in 2 million of those jobs going unfilled.[4] There are two major contributing factors to the widening gap – baby boomer retirements and economic expansion. An estimated 2.7 million jobs are likely to be needed as a result of retirements of the existing workforce, while 700,000 jobs are likely to be created due to natural business growth.[5] In addition to retirements and economic expansion, other factors contribute to the shortage of skilled workforce, including loss of embedded knowledge due to movement of experienced workers, a negative image of the manufacturing industry among younger generations, lack of STEM (science, technology, engineering and mathematics) skills among workers, and a gradual decline of technical education programs in public high schools.[6]

Over the next decade nearly 3 ½ million manufacturing jobs likely need to be filled. The skills gap is expected to result in 2 million of those jobs going unfilled.

The impact is significant

With CEOs and manufacturing executives around the world identifying talent-driven innovation as the number one determinant of competitiveness,[7] it stands to reason the implications of such a shortage are significant and can have a material impact on manufacturers' growth and profitability. For example, 82 percent of executives responding to the Skills gap survey indicate they believe the skills gap will impact their ability to meet customer demand, and 78 percent believe it will impact their ability to implement new technologies and increase productivity. In addition, executives indicate the skills gap also impacts the ability to provide effective customer service (69 percent), the ability to innovate and develop new products (62 percent), and the ability to expand internationally (48 percent).

Filling jobs is no easy task

Eighty percent of manufacturing executives reported they are willing to pay more than the market rates in workforce areas reeling under talent crisis. Still six out of 10 positions remain unfilled due to the talent shortage. This clearly indicates there are not a sufficient number of workers in manufacturing to fill these positions. Additionally, executives reported it takes an average of 94 days to recruit employees in the engineer /researcher/ scientist fields and an average of 70 days to recruit skilled production workers. Facing these numbers, it comes as no surprise why manufacturers report the most significant business impact of the talent shortage is their ability to meet customer demand.

Adding to manufacturers' challenges to fill jobs is the issue of overcoming industry perception. The Public Perception of Manufacturing series conducted over the past six years by The Manufacturing Institute and Deloitte consistently reveals that while Americans consider manufacturing among one of the most important domestic industries for maintaining a strong national economy, they rank it low as a career choice for themselves. Moreover, only 37 percent of respondents in the 2015 study indicated they would encourage their children to pursue a manufacturing career. Interestingly, however, those with high industry familiarity[i] tend to have more favorable perceptions, and they are twice as likely as those with no familiarity to encourage their children to pursue a manufacturing career. Thus, manufacturers need to engage people through community, educational, and government programs in order to improve the perception of the U.S. manufacturing industry.

To address the skills gap, manufacturers not only have to find workers with the skills required to meet today's and tomorrow's advanced manufacturing requirements, they must also develop and engage their existing workforces. Seven out of 10 executives reported shortages of workers with adequate technology, computer, and technical training skills. The executives see developing their workforces as the most effective way to remedy the problem, with 94 percent agreeing internal employee training and development programs are among the most effective skilled production workforce development strategies, and 72 percent agreeing involvement with local schools and community colleges is effective. This reflects an understanding of the multidimensional nature of the skills gap as manufacturers see the need to develop the talent pipeline both in their companies and communities.

What now?

Creating a supply of workers with manufacturing skills – engineering, skilled trades, and production – will be critical to the future competitiveness of companies and the industry as a whole. Manufacturing organizations should take the lead in managing the talent crisis by designing strategies that not only optimize talent acquisition, and deployment, but also contribute to developing manufacturing skills in their communities. For example, workforce planning is important. But, on its own it's not enough to deliver what manufacturers need. Fresh approaches in areas such as employer branding can generate big results when pursued in tandem with more traditional approaches. Similarly, many manufacturers are using a number of the same tactics to talent development that were being employed a decade ago. New performance tools and formal processes should be playing a larger role in any manufacturer's talent management plan.

The manufacturing industry can't solve all of its talent challenges on its own. Manufacturers should build robust community outreach programs, design curriculums in collaborations with technical and community colleges and continue to invest in external relationships that help attract talent. The National Association of Manufacturers Task Force on Competitiveness and the Workforce emphasizes the importance of engaging with key stakeholders and taking a holistic approach as well. In their "Guide for Building a Workforce-Ready Talent Pipeline in Your Community" publication, they point out that creating a sustainable manufacturing workforce development program requires systemic change and ongoing commitment from the manufacturing community.[8]

"Growing a talented workforce helps ensure manufacturing will continue to be the bedrock of our economy and competitiveness."

Jay Timmons,
President and CEO,
The National Association of Manufacturers

The federal government and state governments also play an active role in mitigating the talent shortage. For example, the U.S. government has supported state-wide apprenticeship programs, provided grants to community colleges, and distributed tax credits and loans to companies that hire skilled workers. The industry, in its own capacity, continues to engage with state-sponsored local schools, community colleges, and apprenticeship programs. None of these solutions on their own will close the gap, but together, manufacturers, educational institutions, communities, and government can provide a foundation to mitigate the skills gap over time.

While the results of this survey may appear dire, in reality each of these challenges is surmountable. The U.S. has among the largest and strongest manufacturing industries in the world, and has demonstrated its ability to innovate and adapt time and time again. Now it's time to show the world once again why there is no better place for manufacturing than the United States.

[i] Respondents having 'High industry familiarity' are those who have worked in the manufacturing industry; 'No familiarity' refers to those who have not worked in the manufacturing industry at all.


STOP

The widening skills gap

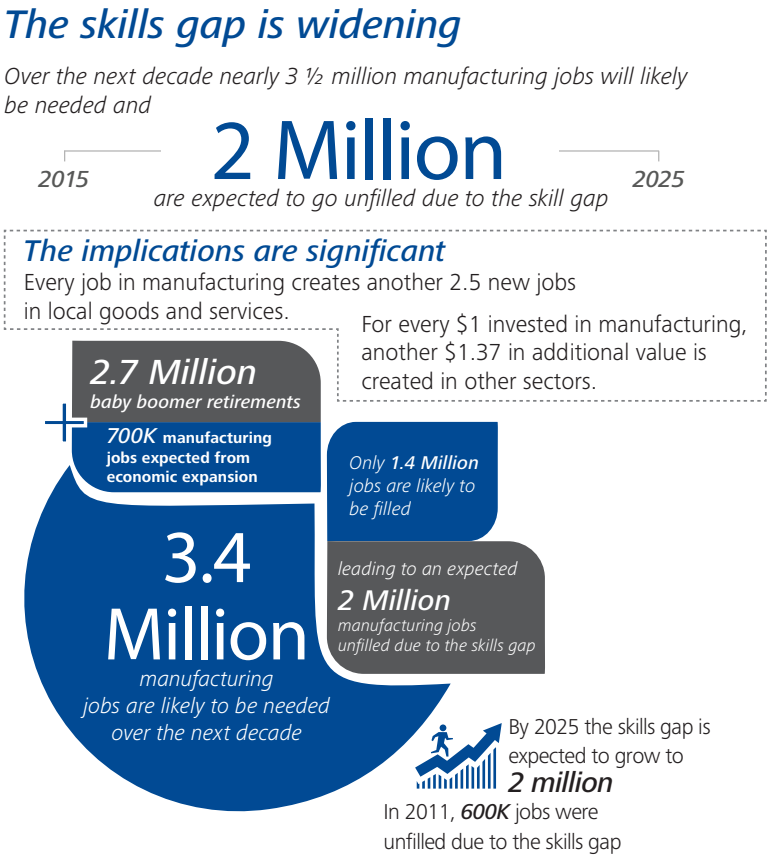
The skills gap issue is not new to the U.S. manufacturing industry. Several prior studies confirm manufacturing executives are concerned about attracting, training, and retaining talent to drive innovation and growth agendas in their organizations.[9] The sentiment remains the same today. Our current study reveals an overwhelming majority (84 percent) of executives agree there is a talent shortage in the U.S. manufacturing sector.

Not only is there a shortage today, but our study indicates there is a more pressing, longer term issue confronting manufacturers. The skills gap is widening, and over the next decade, 3.4 million manufacturing jobs will likely be needed.[10] In addition, our study estimates 60 percent of these positions are likely to be unfilled due to the talent shortage. As a result, only 1.4 million out of 3.4 million positions are expected to be filled, implying that the U.S. manufacturing sector is likely to suffer a shortfall of 2 million workers over the next decade.

Methodology

The U.S. manufacturing industry will add nearly 3.4 million jobs in the next decade to meet both future domestic and international demand. According to a recent Gallup study, the average retirement age of U.S. workforce is 64 years. Assuming that an employed person who is 64 years of age is to retire, it is likely that approximately 2.7 million jobs (22 percent of existing workforce) would be created due to the same number of workers who will retire from the manufacturing workforce between 2015 and 2025. Moreover, as manufacturing firms expand their operations over this 10-year period, they will need an additional 700,000 workers to meet the demand. With such a huge workforce requirement, it is likely that the industry is going to face difficulties in finding the qualified talent. Manufacturing executives in our survey are worried that around 60 percent of current open positions in their businesses are unfilled due to lack of skilled workers. However, applying the 60 percent shortage to our projected 3.4 million jobs results in a skills gap number of 2 million workers over the next decade – a far more daunting issue the Industry faces.

Figure 1: Skills gap in the U.S. manufacturing industry, 2015-2025



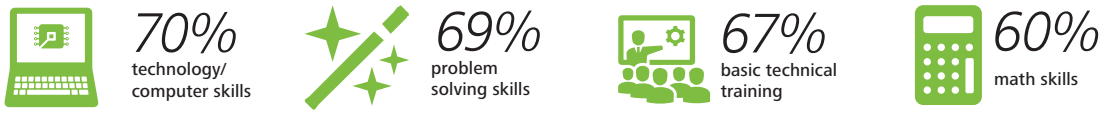
Source: Deloitte analysis based on data from U.S. Bureau of Labor Statistics and Gallup Survey.

Future forward

The changing nature of work

Many industries, not just manufacturing, are feeling the talent crunch. It's been widely reported that high school students have demonstrated a lack of proficiency in math and science. But when we asked executives what they considered to be the most serious skill deficiencies, technical and computer skills topped the list. It was followed by a lack of problem solving skills, basic technical training, and math skills (figure 2). And overall, less than half of the manufacturing executives surveyed indicate their employees have sufficient basic employability skills (attendance, timeliness, etc.) and the ability to work well in a team environment. The skills gap problem comes into sharper focus when considering the increasingly technical nature of manufacturing work. Many manufacturers have redesigned and streamlined production lines while increasingly automating processes. While some remaining job roles will require less technically skilled workers, ironically, these trends and innovations actually demand more skilled workers.

Figure 2: Skills in which manufacturing employees are most deficient



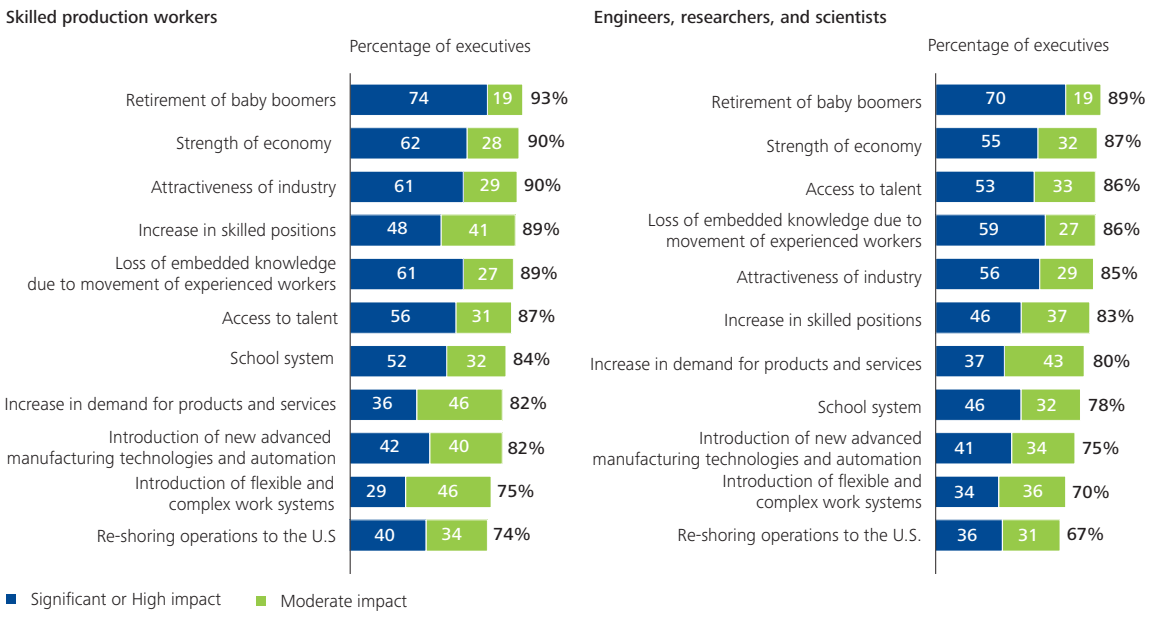
Note: Percentage indicates the percentage of executives who did not opt for "Extremley sufficient" or "Sufficient"

The changing workforce

The changing nature of work, the ensuing need for improved workforce skills, and the imminent retirement of baby boomers (born between 1946 and 1964)[11] has become a focal point for companies as they consider the resulting business impact. Retaining, hiring, and developing a skilled workforce will be increasingly difficult in the face of aging demographics (figure 4). As more and more older and experienced employees retire, finding younger talent to replace them will become increasingly difficult, not to mention the loss of all their embedded knowledge, thereby exacerbating the talent crunch.

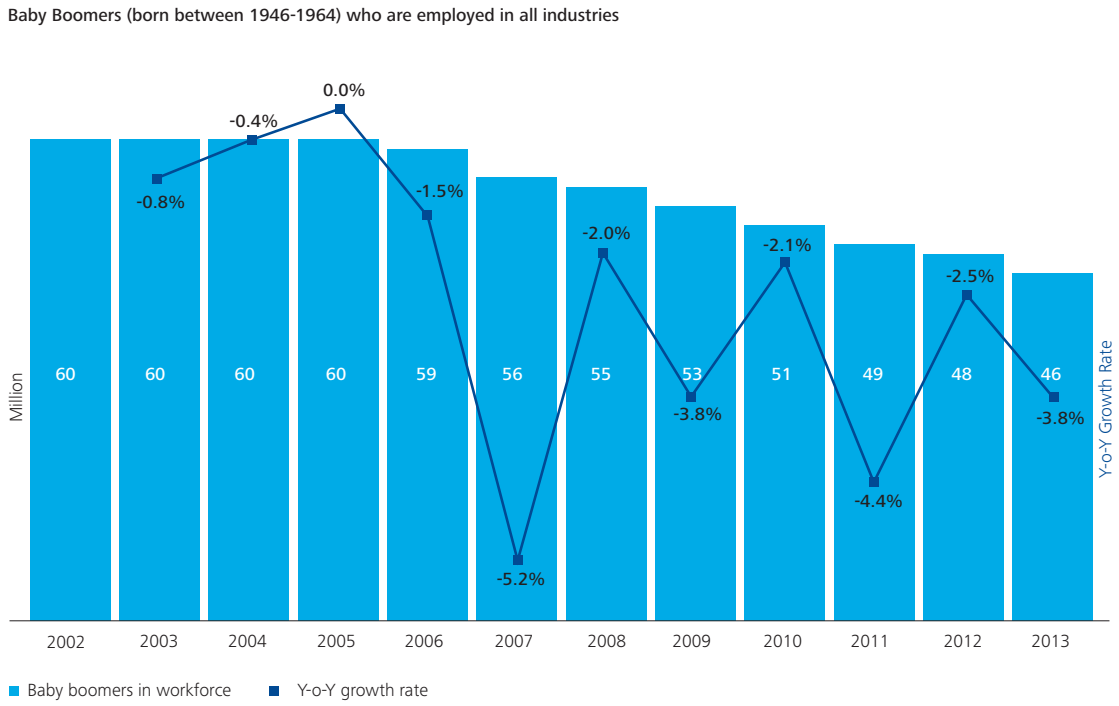
The anticipated retirement exodus could seriously hurt manufacturers. The areas of skilled production (machinists, operators, and technicians) will be the hardest hit according to manufacturing executives. Considering skilled production occupations account for over 50 percent of the total manufacturing workforce, worker shortages in this category will present a significant challenge to companies. Manufacturers are also feeling the pinch when it comes to highly specialized and innovative employees, such as scientists and design engineers. Their shortage could affect new manufacturing processes and new product development (figure 3).

Figure 3: To what extent do the following factors contribute to the future talent shortage?



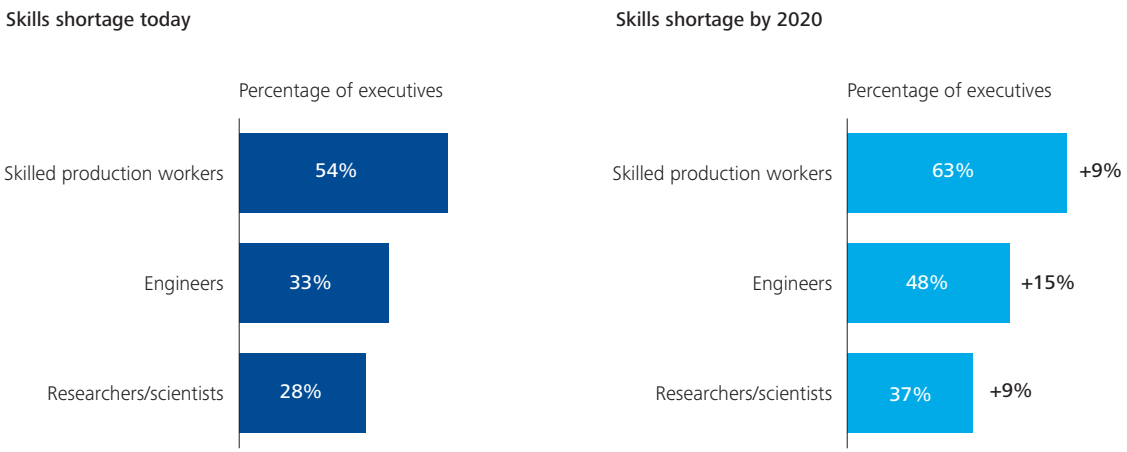
Note: "Significant impact" and "High impact" responses have been summed together.

Figure 4: Baby boomers employed in all industries, 2002-2013



Source: Deloitte analysis based on data from U.S. Bureau of Labor Statistics.

Figure 5: Skills shortage in different workforce categories: 2014 and 2020



Note: "Severe shortage" and "High shortage" responses have been summed together.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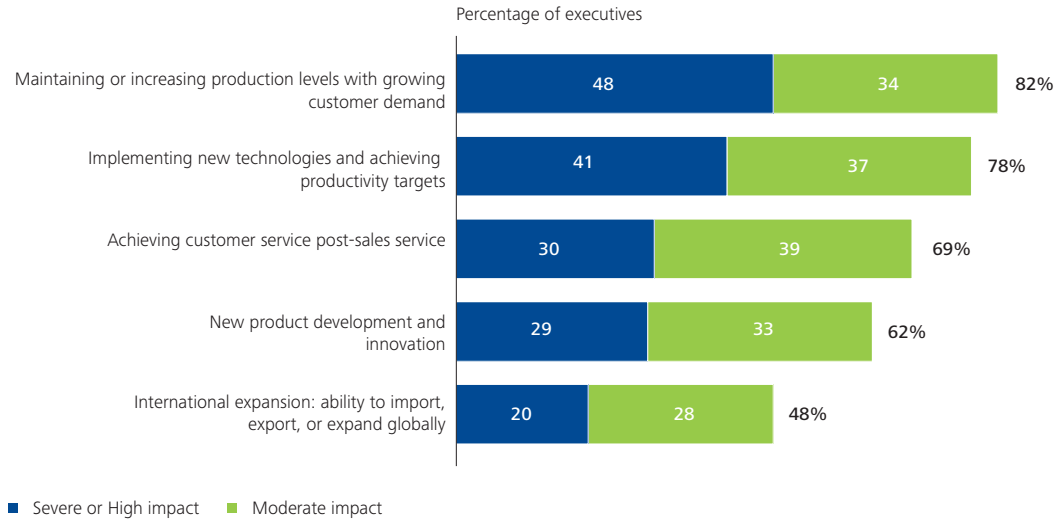
The business impact

The effects of the talent shortage are expected to be felt in functions throughout manufacturing companies. When asked which business areas will be affected most due to the talent shortage, more than three-fourths of manufacturing executives believe the greatest impact of the skills shortage will be in maintaining or increasing production levels (in line with customer demand) and implementing new technologies while achieving productivity targets (figure 6). As manufacturers struggle to support their strategic, business, and production plans with insufficient human capital, they tend to stretch their existing resources. In fact, current data suggests the average annual working hours in manufacturing is 17 percent more than in all private industries (figure 7). In addition, the use of frequent or forced overtime in order to maintain base production levels is not only economically unviable in the long term, but also suppresses productivity.[12] In an era where many companies have spent significant time and resources to streamline operations, improve the ability to meet customer demand, and implement the latest technologies, this result highlights the effort that should be considered by most manufacturers to combat the expected severity and impact of future skills gaps.

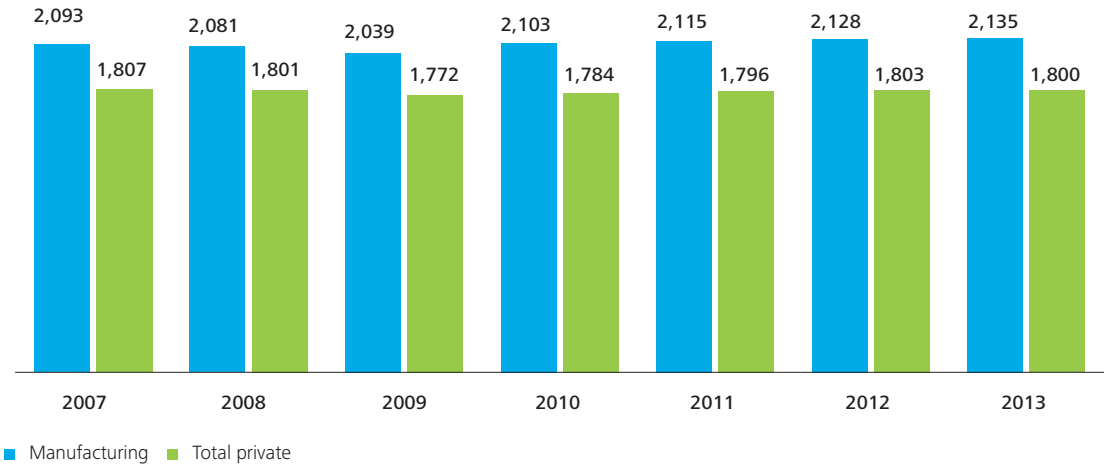
Figure 6: Which business areas will be affected most due to talent shortage?



Note: "Severe impact" and "High impact" responses have been summed together.

Figure 7: Average annual working hours per employee, 2007-2013

On an average, annual working hours in manufacturing is **17 percent** more than in all private business



Source: Deloitte analysis based on data from U.S. Bureau of Labor Statistics.

The economic impact

A recent study estimates an average U.S. manufacturer is potentially losing11 percent of its annual earnings (EBITDA) or $3,000 per existing employee due to the talent shortage.[13] Yet another study paints a bleaker picture: a loss of an average $14,000 per open position that goes unfilled.[14] Given that more than 50 percent of U.S. companies are planning to increase their domestic production levels by at least 5 percent in the next five years,[15] the lost earnings figure presents an alarming precedent.

The skills shortage needs to be managed and tackled given the serious economic implications it has not only on an organization's growth and margins, but also on the U.S. economy as a whole. Manufacturing firms should continue to capitalize on talent strategies that are working and explore innovative ways to augment their existing efforts. The solutions are not short term either. A thoughtful approach to recruiting, managing, and developing talent is essential to create a long-term winning strategy.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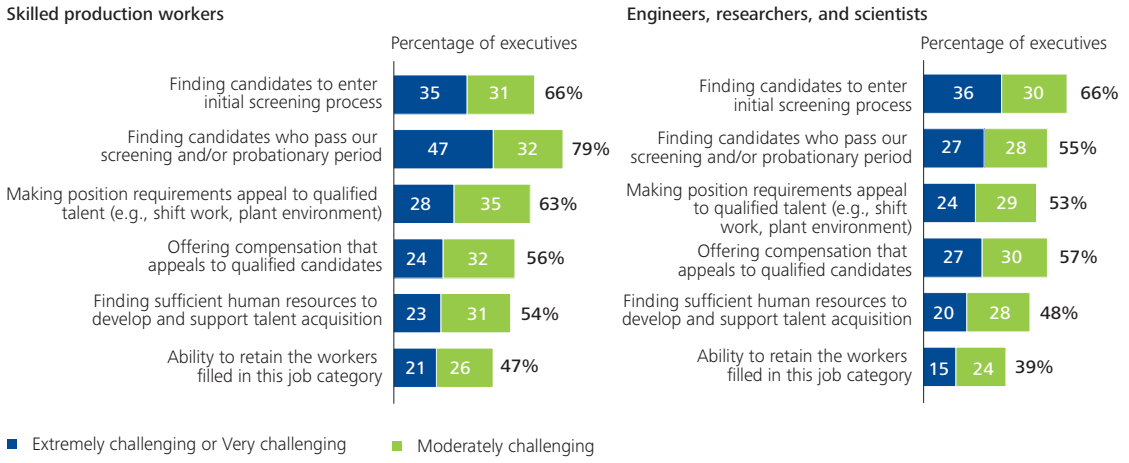
Recruitment challenges

The negative image of the industry, coupled with scarcity of STEM talent in high schools, makes recruiting the right candidates challenging for manufacturing companies. The wage paradox adds to the conundrum, as well. Although manufacturers indicate they have the propensity to pay more than market rates, they are still often unable to find the right talent.

Not only are manufacturers facing various recruiting challenges, but these challenges are compounded by additional differences from one workforce category to another. For example, our study indicates the biggest challenge during the recruitment process for skilled production workers is to find candidates who pass the probationary period, while for engineers, researchers, and scientists it's to find candidates who are eligible to take the initial screening tests (figure 8). Therefore, while it may be relatively easier to scout for eligible candidates interested in skilled production positions, many of these candidates are not able to clear the basic screening or probationary period. Whereas for engineers, researchers, and scientists, simply finding the right candidate due to the smaller supply pool is the toughest hurdle. As different workforce categories present varied recruiting challenges, manufacturers need to develop customized recruitment strategies in order to reduce skills shortage in each of these workforce categories.

Figure 8: What are the major challenges faced during recruitment of skilled and highly skilled workers?



Note: "Extremely challenging" and "Very challenging" responses have been summed together.

Diminishing STEM talent in schools

According to the 2013 STEM Connector report, student interest in pursuing a STEM career has been on the rise in the last 10 years, with 25 percent of students genuinely interested in having a STEM career.[16] However, for three out of five students graduating from high school, this interest diminishes over their schooling years.[17] In addition, apprenticeship programs that combine on-the-job learning with mentorships and classroom education fell 40 percent in the U.S. between 2003 and 2013.[18] However, that does not mean demand for STEM workers has diminished over the years. On the contrary, in STEM occupations, the job postings outnumbered the unemployed by almost 2 to 1 during 2009-2012, and employment in STEM occupations is expected to grow by 17 percent through 2018, faster than overall employment.[19] Higher than normal demand for STEM workers, but lower supply, leads to a compounding skills problem with time.

If you pay more, will they come?

An average manufacturing worker in the U.S. earned $77,506 in 2013 – 20 percent higher than what an average worker earned in other industries.[20] In addition, four out of five U.S. manufacturing companies surveyed are willing to pay more than current market rates to hire and retain skilled workers in order to tackle talent shortage (figure 9). However, while paying higher wages to attract the skilled workers may help attract talent, it likely isn't enough to single-handedly solve the talent issue. Compensation increase can yield only marginal improvements in attracting workers but manufacturers also need to improve the perception of the industry in it being "clean and safe" and "high-tech" rather than "dirty and dangerous."

Today's modern manufacturing environment

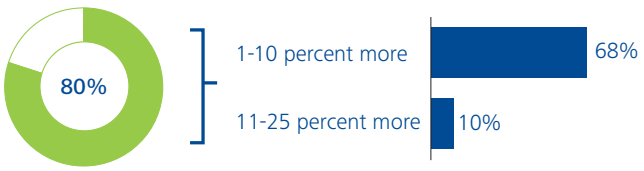
21st century manufacturing facilities have ushered a new wave of manufacturing with an amalgamation of technologies from advanced robotics to fully integrated production systems. With smart manufacturing or Industry 4.0, manufacturers are moving towards a new level of interconnected and intelligent manufacturing system which incorporates the latest advances in sensors, robotics, big data, controllers, and machine learning.[21] This allows every aspect of the plant to be constantly accessible, monitored, controlled, designed, and adapted for real-time adjustments. The greater digital interconnectedness between various parts of the supply and production chains, as well as the higher reliance on automation in these smart factories, is going to make manufacturing ultra-efficient, ultra-sophisticated, and ultra-productive.

To keep pace with the evolution of these "smart" machines requires highly skilled and nimble workers to manage the increasing complexity and shorter mind-to-market product cycles. Today's modern manufacturing workers need a variety of skills. Strong problem-solving skills can equate to the ability to autonomously adjust robots and production systems real-time. Math skills can translate into applied competencies in measurement and spatial reasoning. Technical skills have practical application in areas such as metallurgy, and technical system operations such as fluid power electrical controls. Understanding algorithms and advanced computing can translate into the ability to develop advanced technologies such as 3D-modeling and advanced robotics. Overall, as product development and manufacturing systems become more interwoven and cycle times shorten, workers need to have higher levels of STEM and analytical skills in order to influence design changes as well as production efficiency.

The sophistication of today's (and tomorrow's) factories places greater onus on new and existing workers to increase their skillset, and to come to the table with the STEM skills necessary to operate in an advanced manufacturing facility. And with the skills gap becoming an increasingly troublesome trend, manufacturers must act now in order to reap the benefits that smart manufacturing, alongside a smart skillset, can provide.

Figure 9: Willingness to pay more for tackling talent shortage

80 percent of executives are willing to pay more to tackle the talent crisis but the extent of compensation increase differs



Note: Remaining 2 percent of executives are willing to pay more than 25 percent.

The importance of overcoming perception issues

In a poll conducted by the Foundation of Fabricators & Manufacturers Association, 52 percent of all teenagers said they have no interest in a manufacturing career. Of the 52 pecent who did not have interest in manufacturing, around two-thirds (61 percent) perceived a manufacturing career entailed a "dirty, dangerous place that requires little thinking or skill from its workers and offers minimal opportunity for personal growth or career advancement."[22] In the most recent "U.S. public opinions on manufacturing" study conducted by The Manufacturing Institute and Deloitte, Gen Y (ages 19-33 years) respondents ranked manufacturing as their least preferred career destination.[23] In addition, only a third of respondents indicated they would encourage their children to pursue a career in manufacturing.[24] Job stability and security was the most common reason given as to why respondents would not encourage someone from a younger generation to pursue a career in manufacturing. However, industry familiarity really makes a difference in overcoming perception issues. While overall manufacturing remains less popular than other industries as a career choice (ranked fifth out of seven provided industries, and dead last for Gen Y), respondents with high manufacturing industry familiarity rank it higher as a career choice (third out of seven). Similarly those with high manufacturing familiarity have more positive views toward manufacturing overall and are more than twice as likely to encourage their children to pursue manufacturing careers.

To overcome perception issues, many manufacturers have engaged in initiatives that promote the industry as a viable career choice, thus creating a higher level of familiarity. For example, more than 1,600 manufacturing events, with an estimated 250,000 attendees, were recently hosted as part of Manufacturing Day. The efforts' mission is to increase positive perception of the industry and ensure ongoing prosperity of the industry,[25] something the industry sorely needs in order to attract the number and level of talent required. The Manufacturing Institute also sponsors a network of companies and organizations committed to changing the perception of manufacturing through its Dream It Do It program. In 2013, this network engaged over 250,000 students through summer camps, ambassador programs, and local competitions.

To reshore or not to reshore?

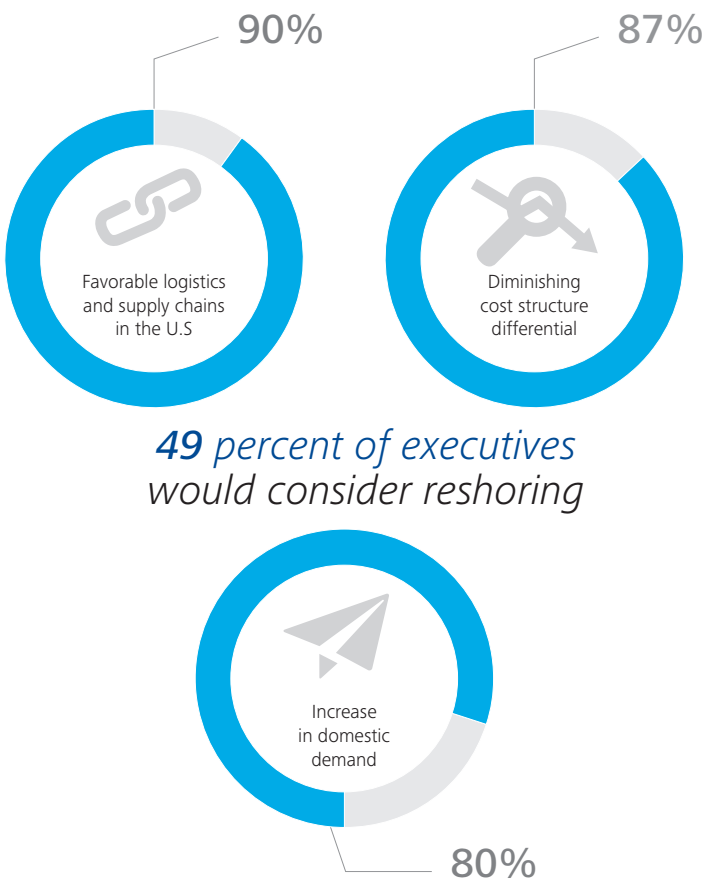
Nearly half of the U.S. manufacturing companies we surveyed would consider reshoring at least part of their operations by 2020 (figure 10). Reasons for considering reshoring include favorable local logistics and supply chains, diminishing cost structure differential, and increase in domestic demand.

Increasingly, manufacturers are finding the financial incentives previously driving offshoring are diminishing. The wage differential is rapidly decreasing between developed and developing countries. For example, China's wages have increased at a compounded annual growth rate (CAGR) of 17 percent from 2001 to 2013. Likewise, wages in India have increased at an annual rate of 20 percent during the same period (figure 11). On the other hand, wages in the U.S. grew by only 3 percent. When the decreasing wage differential is combined with the "hidden costs" of offshoring such as duty, freight, packaging, carrying cost of inventory, added supply chain complexity, as well as the potential innovation impact of separating engineering from manufacturing, U.S. manufacturing companies find it increasingly favorable to reshore operations back to America. Proximity between R&D and production functions greatly benefits manufacturing companies through streamlining processes, reducing product development time and cutting intangible costs. Thus, the case is mounting for manufacturers to bring back operations, as well as jobs, to America as long as they can find the workers.

The challenges of reshoring are potentially less obvious, but equally real. Companies that have already reshored have faced hurdles in stabilizing the new workforce, addressing the organizational skills gap, localizing the supply chain, altering the capital to labor ratio, and contemplating product design.

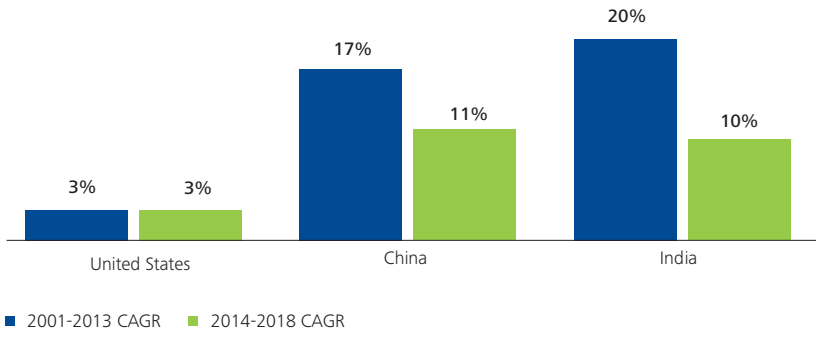
Given almost half of executives would consider reshoring their manufacturing operations back to U.S., demand for skilled workers is likely to further increase. Difficulties in finding the qualified talent may push manufacturers to automate their factories and replace people with machines. However, automation requires highly skilled personnel to operate, though fewer in number. In both cases (i.e., whether companies automate or not), manufacturers require skilled workers in their plants. Therefore, it is in the best interests of manufacturers and government to continue to invest in skills development programs that mitigate this challenging issue.

Figure 10: What factors drive consideration to reshore?



Note: Percentage indicates the percentage of executives who opted for "Moderate influence" to "Extremely high influence."

Figure 11: Average wage increase 2001-2018



Source: Economist Intelligence unit

Closing the gap

Manufacturers have a significant role in solving the manufacturing skills gap. Manufacturing companies must adopt a holistic approach to talent management, improving their ability not only to find skilled employees, but also to develop and deploy their workforce to meet their business goals. Developing high-potential employees and creating more flexibility can increase the supply of talent within a company's walls. However, manufacturing companies cannot do it alone: manufacturers are part of a larger ecosystem of players that must work together to solve the skills gap.

"We cannot fully realize the renaissance of U.S. manufacturing unless and until we solve the manufacturing skills gap. Manufacturers are the key to solving this problem. By aligning together and clearly defining their needs—and speaking with one voice, they can work with secondary and post-secondary schools and government to create a system that attracts, develops, and retains skilled manufacturing talent."

Dr. Charles (Chip) Blankenship,
President and Chief Executive Officer, GE Appliances & Lighting

Help build the talent pool and optimize practices for attracting skilled workers

Executives rated word-of-mouth and staffing agencies as top sources of recruitment for skilled production workers, and external search firms and internship programs as the top sources of recruitment for engineers, researchers, and scientists (figures 12 and 13). These approaches may have worked in the past, but manufacturing companies can use better techniques to maximize their ability to attract new employees.

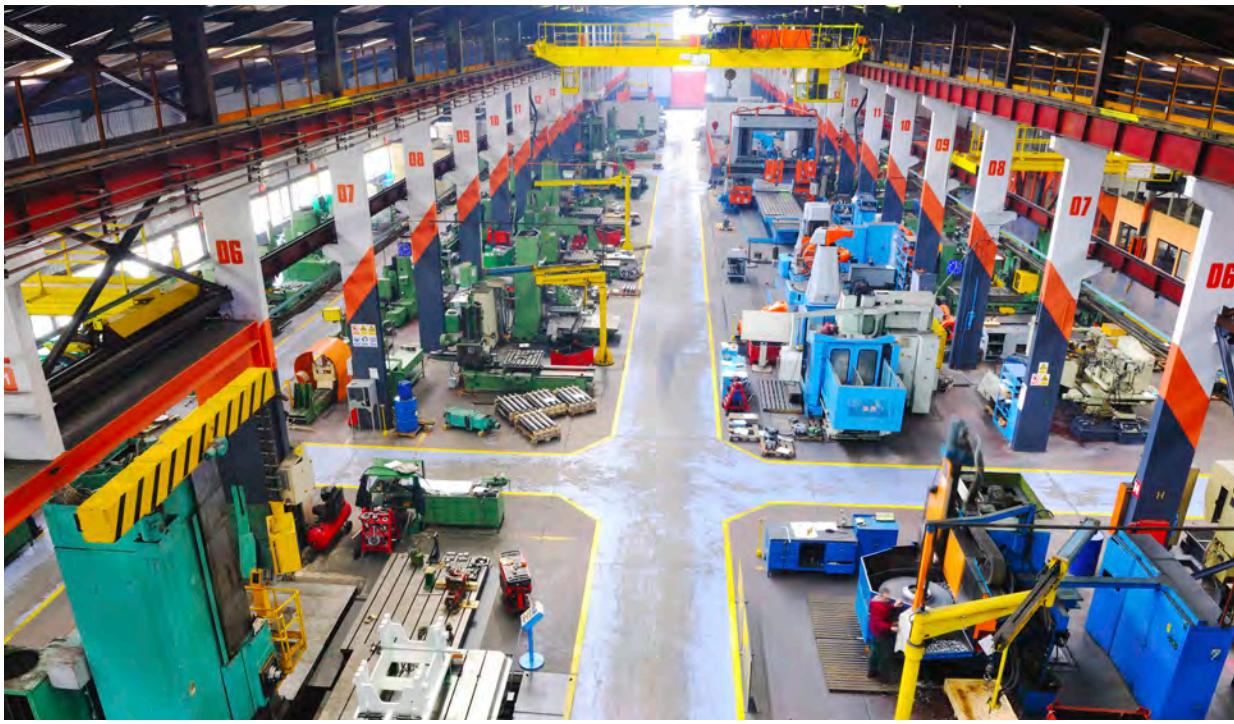


Figure 12: Identify which of the following are your company's top sources of employee recruitment for skilled production workers, including the effectiveness of each.

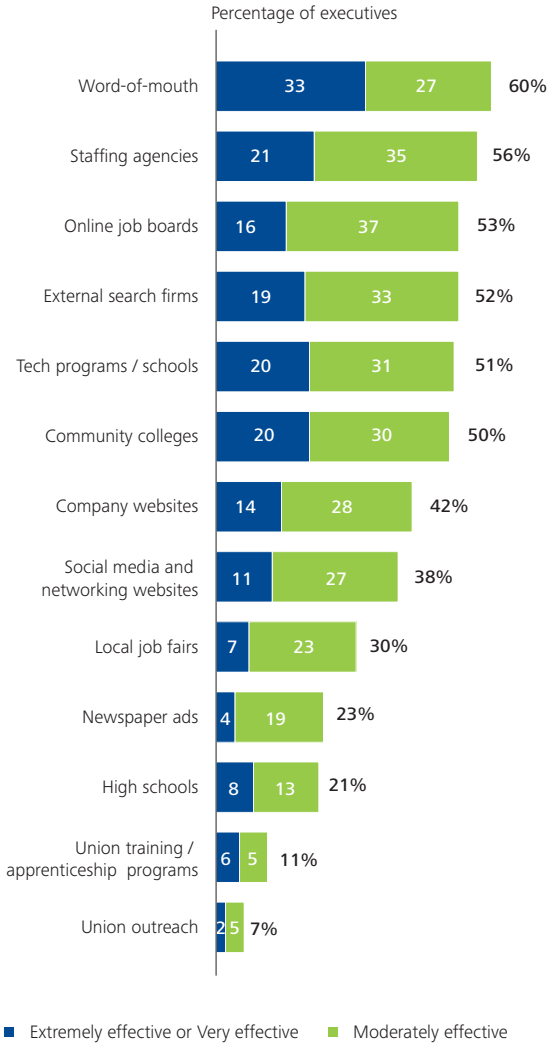
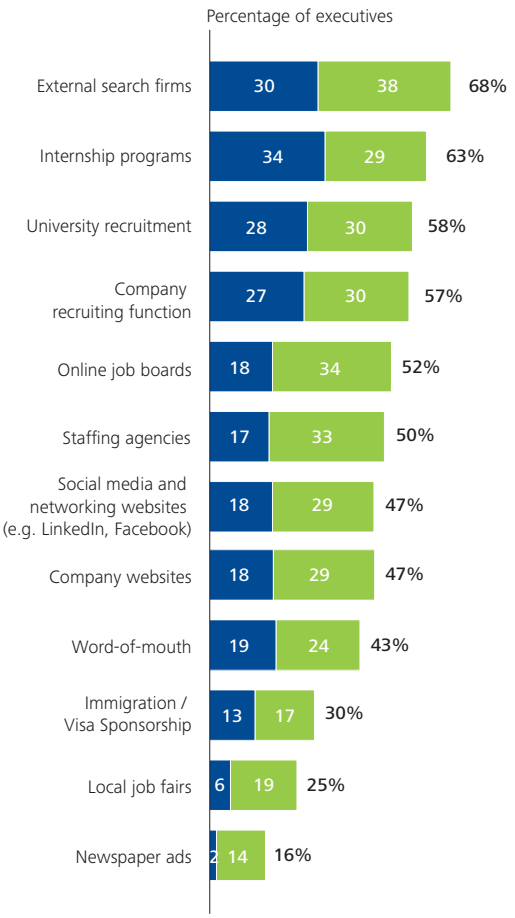


Figure 13: Identify which of the following are your company's top sources of employee recruitment for engineers, researchers, and scientists including the effectiveness of each.



Note: "Extremely effective" and "Very effective" responses have been summed together.

In addition, manufacturing companies can work with partners to create a stronger pool of prospective candidates. Multiple approaches can improve the speed and quality of recruiting strong candidates.

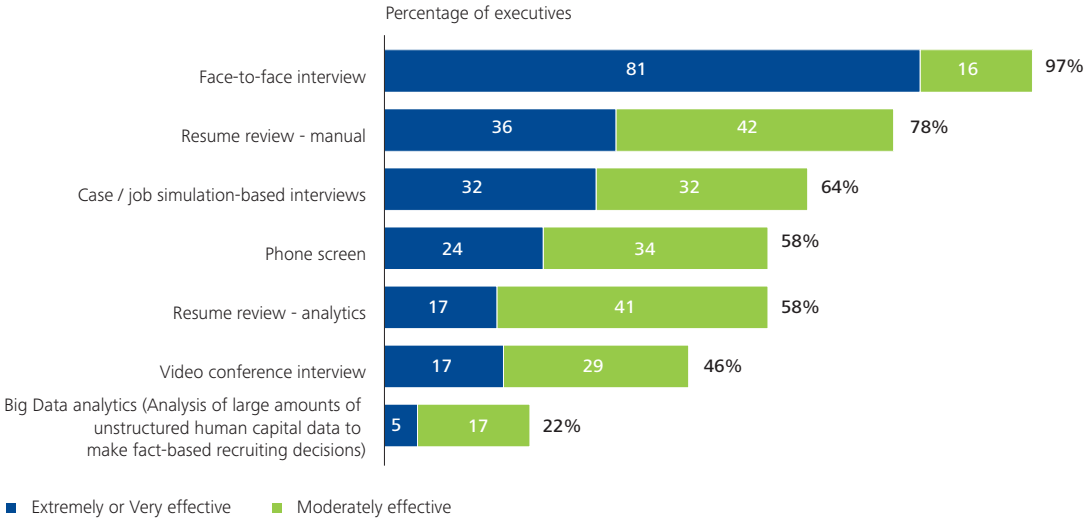
- **Engage in STEM initiatives early to build the pipeline**
  Executives indicated that involvement with local schools and community colleges, as well as external training and certification programs, help them in closing the gap. Manufacturers can also engage local high schools and elementary schools to build interest in STEM skills and skilled trades to begin building a pipeline early on. Additionally, they can collaborate with non-profit organizations like The STEM Academy and Project Lead the Way that are leading providers of K-12 STEM education. Together with the internal training programs, these externally focused approaches keep a steady stream of qualified candidates job-ready and will help address the development needs of the existing workforce. The U.S. government is also actively building the pipeline of prospective manufacturing employees by partnering with state and local communities and organizations to fund education, apprenticeship programs, and workforce programs. Over the last several years, nearly $1 billion in grants have gone to community colleges to support the creation or expansion of manufacturing education programs and another $100 million is now available to establish apprenticeship programs.[26]

- **Develop an integrated communications strategy**
  HR and business executives must collaborate with the marketing function to develop campaigns to attract prospective candidates. The Internet has transformed the way people learn about companies and apply for jobs, so applicants often have a strong sense of a company's employment brand without even stepping into an office. Candidates with high-demand skills have choices, so it's important, now more than ever, that companies think about advertising more than just open positions. For example, Deloitte's research on millennials shows millennials value opportunities for personal development, an ability to be relatively entrepreneurial, and a chance to make a difference.[27] Deloitte's 2014 millennials study found that 78 percent of millennials say their decision to work at a company was influenced by how innovative the company is.[28] Demonstrating new technologies – including 3D printing, robotics, and advanced analytics – can help attract millennials to the manufacturing industry. Flexibility is also an increasingly important feature to many prospective employees, and both men and women often value more personal time and flexible work arrangements to higher pay.[29] By creating and selling compelling value propositions, manufacturers can attract and recruit top candidates. States have also sought to increase the attractiveness of manufacturing through new programs. For example, Wisconsin's Youth Apprenticeship program integrates school-based and work-based learning to develop the skills needed in Wisconsin's industries.[30] Students start the program in their junior or senior year of high school and complete it prior to graduation, so students can start learning about the industry and the potential for a future career early.

Enhance candidate-screening practices to select and deploy employees

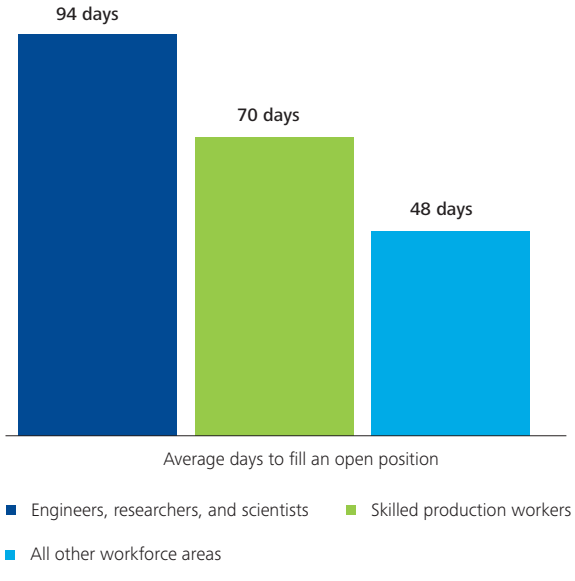
When asked which methods were the most effective for selecting new candidates, 97 percent of executives indicated face-to-face interviews were the most effective at narrowing candidates (figure 14). Face-to-face interviews and resume reviews can be highly effective in selecting new candidates, but they can also be time consuming. Executives in our survey indicated it takes about three months to fill up an open position in the engineers, researchers, and scientists workforce category (figure 15).

Figure 14: Identify from the following the most effective methods your company uses for narrowing candidate selections.



Note: "Extremely effective" and "Very effective" responses have been summed together.

Figure 15: What is your average time to fill an open job position in each category?



There are several approaches that can help manufacturing companies improve their ability to select strong candidates in a more efficient manner.

- **Look inside the walls:** Many candidates within an organization are overlooked for positions for which they could qualify, and organizational structures can make it difficult for employees who are interested in a new role to transition. Companies can harness this untapped potential to close the skills gap by thinking about their employees as a cluster of competencies – some being presently utilized and some latent. This requires additional sophistication around how employee skills are measured, tracked, and managed across internal talent economies. To be successful, these practices must also be combined with the removal of organizational structures, policies, and silos that inhibit the movement of employees across business units, functions, and facilities. When manufacturing companies begin to source more positions from inside their walls, they help create a culture of development and growth.

- **Do not look for the needle in the haystack:** Sometimes search criteria can be too focused on specific skills and experience and not enough on competencies and potential, limiting the realm of possible candidates. Many more candidates may have the majority of competencies to adapt and fit a need than it may seem at first. For example, well-qualified engineers, researchers, and scientists with experience working in Silicon Valley may not have experience working in manufacturing, but have many of the competencies required to be successful in manufacturing.[31] Using analytics to identify the profile of successful employees and assessing prospective candidates against those profiles can also help manufacturers more easily find candidates with the right skills.

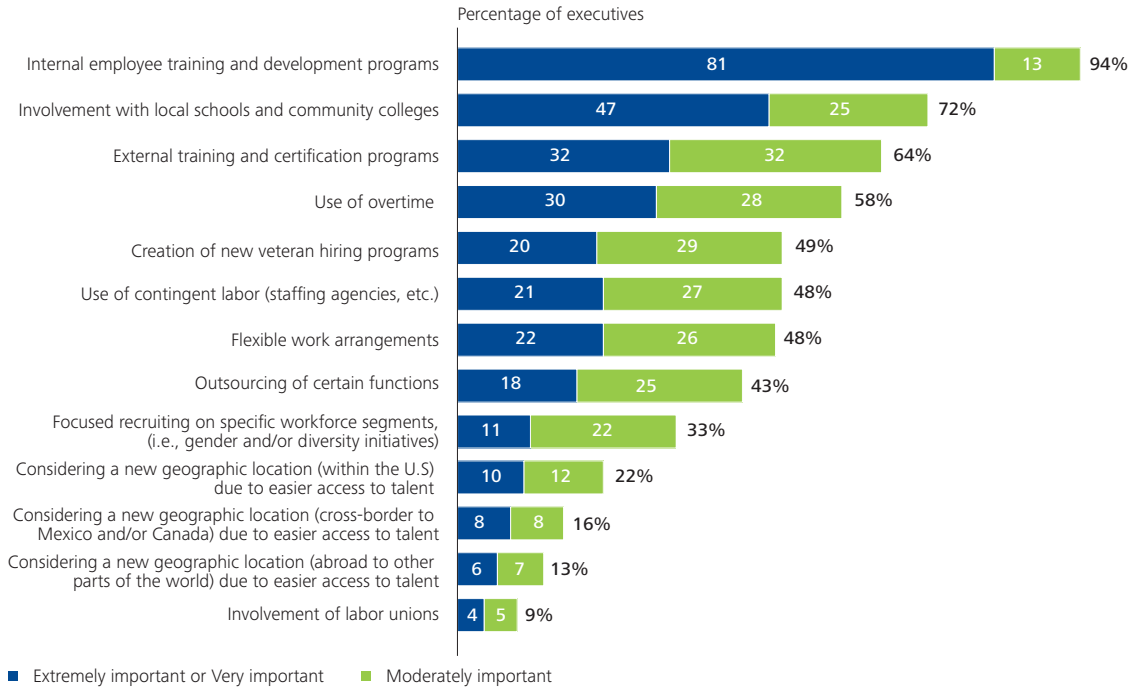
Pilot an analytics initiative

Few executives reported using analytics effectively to help screen candidates. Analytics efforts do not have to be time consuming, expensive, or require advanced tools. Information readily available can help leadership better understand prospective candidates and make decisions they were not able to before. For example, data elements stored within human resource information systems like previous experience, educational background, and performance ratings can be analyzed to understand which individuals are high performing and strong prospective candidates. In addition, using data-driven decision-making powered by analytics can reveal profiles that were not readily apparent to leaders and further expand the successful applicant pool.

Invest in internal training and development programs

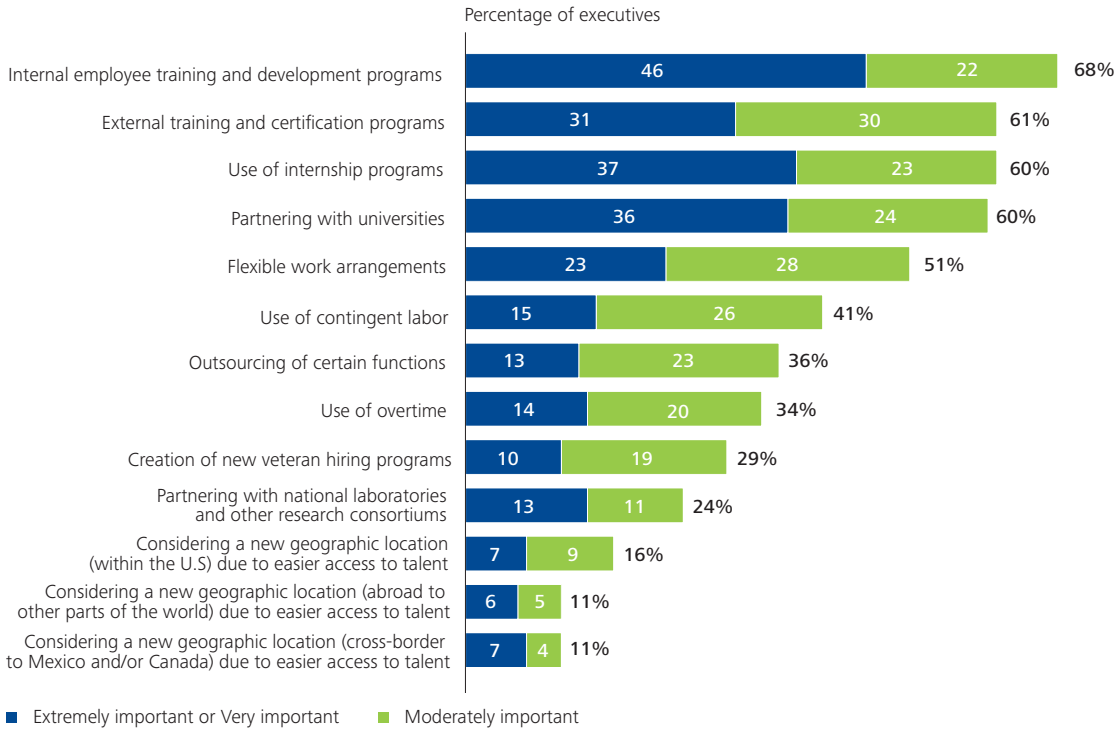
The most recent data from the Bureau of Labor Statistics shows the average worker stays at a job for 4.6 years.[32] Because of this turnover threat, manufacturers may be reluctant to increase investment in training. However, companies should consider the consequences of not investing. Executives seem to agree, as they indicate focusing on internal training and development programs hold the highest promise to mitigate talent shortage among both the skilled production workforce and engineers, researchers, and scientists figure (16 and 17).

Figure 16: How important are the following techniques to mitigate the effects of existing skills shortages for a skilled production workforce?



Note: "Extremely important" and "Very important" responses have been summed together.

Figure 17: How important are the following techniques to mitigate the effects of existing skills shortages for engineers, researchers, and scientists?



Note: "Extremely important" and "Very important" responses have been summed together.

In order to be successful, employee training and development programs must be based on a holistic training strategy that includes both internal and external experiences, aligned to both the skills the company currently needs and the skills they will need in the future. There are a number of considerations when cultivating a learning and development strategy at a company:

- **Build an integrated training strategy:** Manufacturers cannot simply "throw training at the problem"; providing periodic classroom trainings do not do enough to build employees' capabilities. Companies can build integrated development strategies that not only include formal training, but also informal training, knowledge sharing, apprenticeship, and ongoing performance support and coaching.[33] New learning technology can help companies reinvent their learning and development strategies. For example, employees can now choose to improve their knowledge through a variety of online sources, and new knowledge tools allow them to search for the right answers on their own. Giving employees the power to educate themselves creates a much more engaged and productive workforce.[34] Experiential training can also be just as important as training inside a classroom. Employees can learn just as much, if not more, from deployments across various departments, with different teams, and different management. Manufacturing companies must take a close look at the variety of career paths within their company, and the experiences that individuals need to be successful.

- **Build high-performing managers to create high-performing teams:** Manufacturing companies often put too little focus on preparing their employees for promotion to management roles. Clearly identifying individuals that are strong management candidates, and training them, will directly benefit the company. Strong managers can support staff training, ensuring staff have current skills and driving a culture of continuous learning. This translates to more productive teams and greater value for the company. Effective managers also support a more engaged workforce, reducing attrition and related costs.

Readily available tools

Respondents cite training and development – both internal and external – among the most effective skilled production workforce development strategies. Although training alone is not enough to remedy the skills gap, it does have an important role to play. However, without competency models or targets in place, it's hard for manufacturers to target investments where they will have the most impact or to measure the impact of training efforts. There are readily available tools created specifically for this purpose, such as The Manufacturing Institute's NAM-endorsed Manufacturing Skills Certification System, which can help manufacturers provide their workers with the required range of skills to compete. No matter which approach is used, the bottom line is that manufacturers need to more effectively understand what skills they really need, and then use targeted training approaches to make sure their workforce is prepared to deliver.

Conclusion

The impact of the skills gap is real, and it is substantial. Executives noted the greatest impacts their businesses face as a result of the skills shortage include their ability to meet customer demand, their ability to maintain or increase production levels, and their ability to implement new technologies while achieving productivity targets. The resulting consequences are material. The inability to meet production levels hurts a company's growth and its earnings.

With the manufacturing industry likely facing the need for 3.4 million workers and an expected shortage of 2 million workers in the U.S. over the next decade, there is no choice but to examine the impact of the skills gap and take a new approach to talent management. The contributing factors – a shortage of workers with adequate STEM skills, the impending onslaught of baby boomer retirements and the expected industry expansion – cannot be ignored. A general lack of interest in the industry must be addressed, too. It's time for manufacturers to renew a fierce focus on talent management, coupled with positioning the industry as a viable career option, in order to mitigate the impact of the skills gap, both today and in the future.

There isn't one specific solution to overcome the skills gap issue. Instead, a combination of strategies must be employed in concert to address current and future issues. Multiple stakeholders have to collaborate to address the skills gap. Manufacturing companies have to rethink their talent sourcing and recruiting strategies to attract new employees, improve candidate screening practices, define clear competency models and role-based skills requirements, invest in internal training and development, and engage with local schools and community colleges. Additionally, manufacturers and communities must stand together to poise the industry as a viable career option by improving the overall image of manufacturing. The U.S. federal and state governments must also continue and increase their focus on improving the education system and businesses must do their part to support the effort. None of these solutions on their own will close the gap, but together, manufacturers, academia, communities, and government can provide a foundation to mitigate the skills gap over time.

Methodology

The 2014 Manufacturing Skills Gap survey was conducted by The Manufacturing Institute and Deloitte, in which over 450 manufacturing executives participated.

Figure 18: Participating company primary industry classification

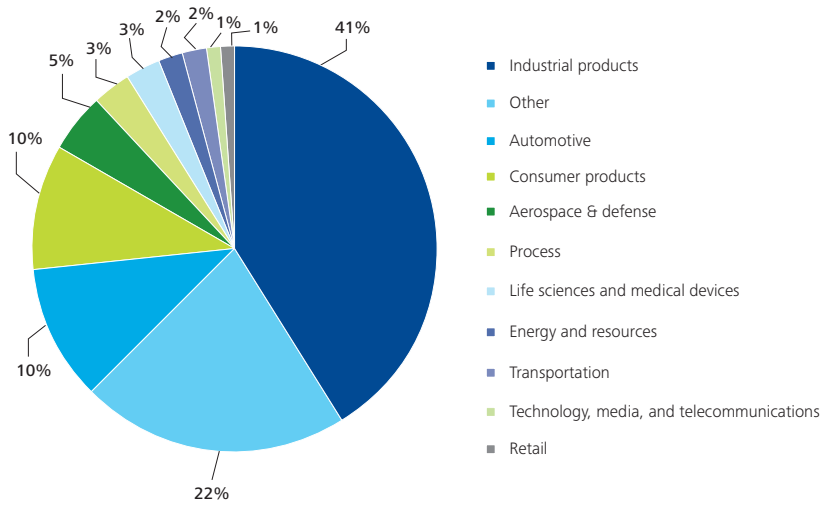
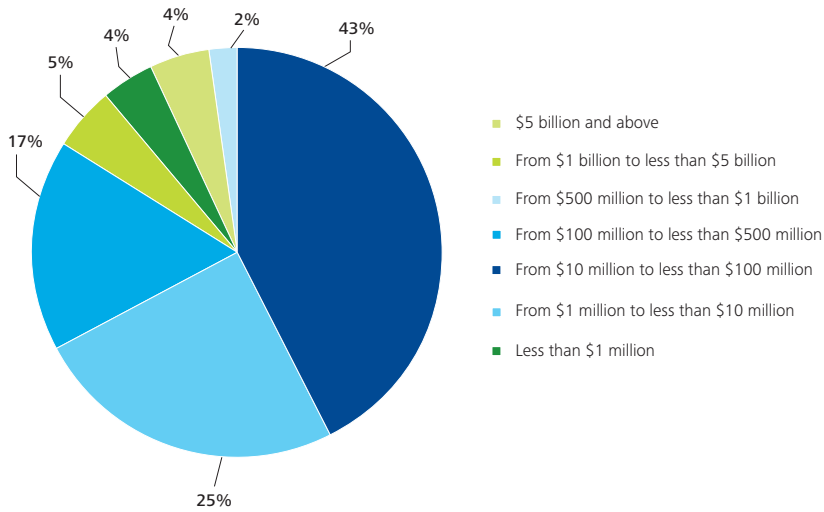


Figure 19: Participating company size, based on annual revenue



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About The Manufacturing Institute
The Manufacturing Institute is the 501(c)(3) affiliate of the National Association of Manufacturers. As a non-partisan organization, the Institute is committed to delivering leading-edge information and services to the nation's manufacturers. The Institute is the authority on the attraction, qualification and development of world-class manufacturing talent. For more information, please visit www.themanufacturinginstitute.org.

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