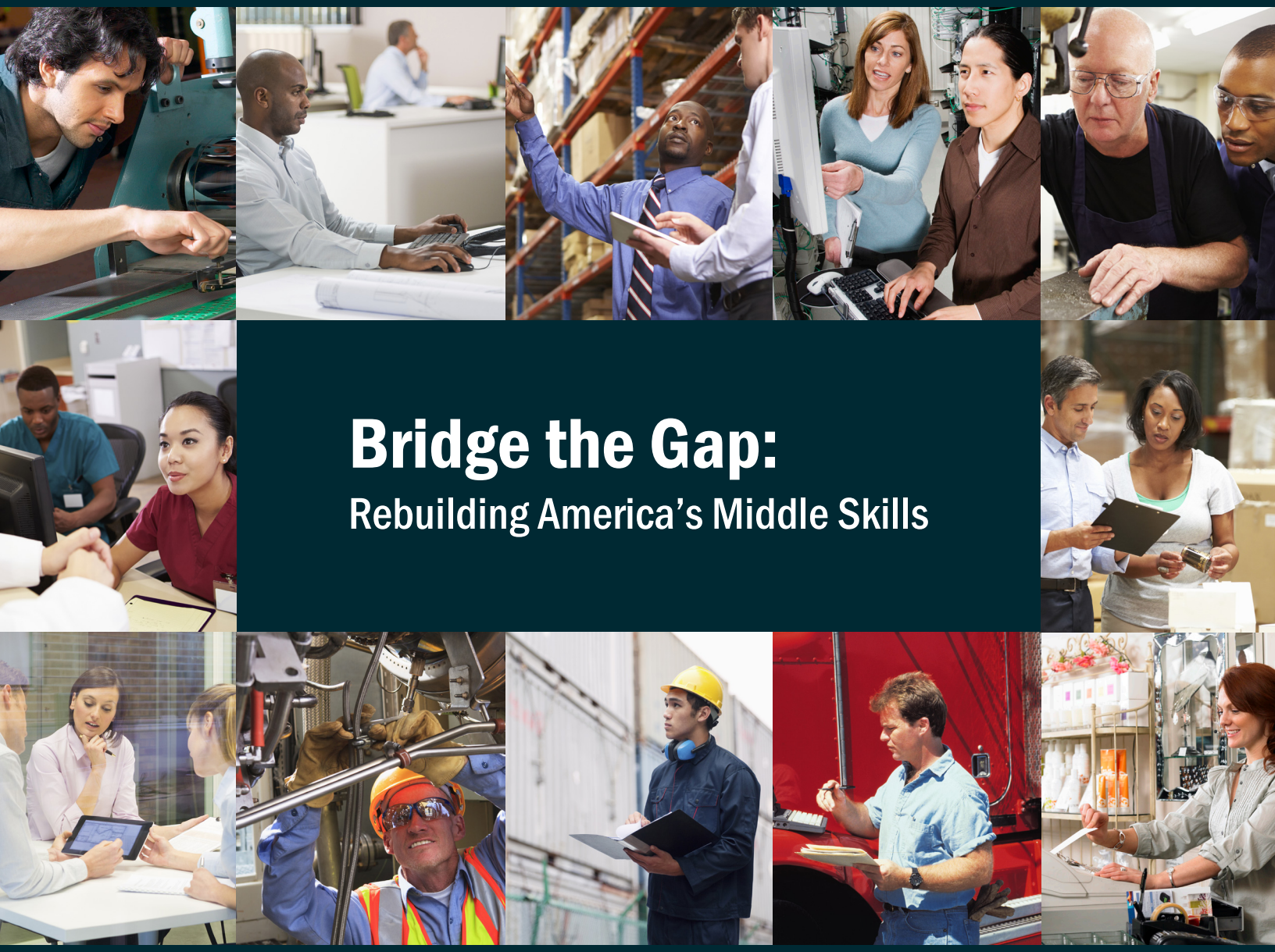

Bridge the Gap:

Rebuilding America's Middle Skills

accenture

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CAREERS IN FOCUS

HARVARD
BUSINESS SCHOOL

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Conflict of interest disclosure

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EXECUTIVE SUMMARY

Business and civic leaders, educators, and policymakers of all stripes share concerns over the relentless erosion of America's middle class and growing polarization of incomes. Most decry the loss of middle-class jobs and fear the corrosive effects such trends might wreak on the nation if left unchecked. At the heart of the issue is an oft-discussed anomaly: while millions of aspiring workers remain unemployed and an unprecedented percentage of the workforce report being underemployed, employers across industries and regions find it hard to fill open positions. The market for middle-skills jobs—those that require more education and training than a high school diploma but less than a four-year college degree—is consistently failing to clear. That failure is inflicting a grievous cost on the competitiveness of American firms and on the standard of living of American workers.

This market failure must be addressed. It is time we stopped accepting the cliché that America's job engine is stalled. Today, business leaders have a promising opportunity to work with educators, policymakers, and labor leaders to spark a revival of middle-skills jobs. To accomplish that, they must radically rethink their businesses' roles in nurturing talent. This will also require employers to accept leadership over America's system for educating aspiring workers and bringing the unemployed back into the workforce.

Historically, for innumerable Americans, middle-skills jobs served as the springboard into the middle class. Machinists and registered nurses, technical salespeople and computer technicians, financial analysts and a host of other jobs constituted the backbone of America's workforce. Their productivity drove America's competitiveness. Over the past three decades, however, the United States steadily lost its capability to create and sustain enough jobs to support the realization of the American dream for millions of workers. Between 1979 and 2000, real hourly wages for middle-skills workers stagnated; since then, wages have fallen.

The powerful forces of globalization and technological innovation account for some of that decline. As those changes buffeted the economy, they also eroded the underpinnings of America's once-effective workforce development system. In the face of that turbulence, too many businesses began relying on the "spot market" to fill their middle-skills needs instead of investing in workforce development efforts. Relationships between employers and community colleges and other talent suppliers weakened. Educators burdened by budget cuts focused on enrollment levels and graduation rates. As once-important employers stopped hiring and newer disciplines emerged, educators found it harder to train students with relevant skills.

Information deficiencies further plagued a system unused to addressing such a turbulent job market. Employers had little incentive to develop or share projections of their needs with educators, to incur the costs of defining qualifications on an industry-wide basis, or to invest in apprenticeships and cooperative education programs. Students and other aspiring workers had virtually no access to relevant information on which courses of study to pursue, how to compare between entry-level jobs for their long-term career paths and wages, or which skills local businesses were seeking.

The cumulative effects of those trends are now fully apparent in the United States. Underemployment is rampant for both middle-skills workers and recent college graduates. Too few have highly marketable skills; too many have pursued courses of study for which there is little demand. Ballooning student debt threatens the future of graduates and looms over the federal budget. Employers find it hard to fill occupations ranging from healthcare technicians to technical sales and service. Companies cite fears about the availability of skilled labor as a major deterrent to their growth plans. The current system is failing to serve the interests of employers and aspiring workers alike.

Despite the persistence of problems, no consensus has emerged on how to interdict this destructive cycle. The major stakeholders—business, educators, and policymakers—have consistently called for other players in the system to improve their performance, while attempting to improve their own results in isolation. So far, few have collaborated to take collective action and restructure the broken system.

We believe that U.S. competitiveness, broadly defined, provides alignment among different stakeholders in the skills-development system. By applying the lens of competitiveness, we endeavor to show how the use of information can improve outcomes for employers and workers. The first, essential step is to differentiate among the vast array of middle-skills jobs and concentrate on those with three important attributes:

- They create high value for U.S. businesses;
- They provide not only decent wages initially, but also a pathway to increasing lifetime career value for many workers;
- They are persistently hard to fill.

The recent emergence of much more sophisticated jobs-market data allows businesses, educators, and students to overcome the impediments posed by the information deficiencies of the past. Vehicles now exist for employers to define, communicate, and update the competencies they are seeking to wide audiences. For example, an analysis of current middle-skills job postings reveals jobs such as technical sales and sales management are both more plentiful and more rewarding than those that receive significantly more attention in the national dialogue, such as advanced manufacturing occupations. As a result, students can relate the investment of time and tuition dollars required to obtain a certification or degree to the associated earnings potential. Similarly, educators can redirect resources to developing training programs for better-paying jobs and where demand is growing.

Our analysis underscores the need for leaders from the business, education, and political spheres to act in concert to restore growth in America's middle-skills ranks.

- Business leaders must champion an employer-led skills-development system, in which they bring the type of rigor and discipline to sourcing middle-skills talent that they historically applied to their materials supply chains.
- Educators must embrace their roles as partners of employers and help their students realize their ambitions by being attentive to developments in the jobs market and the evolving needs of employers.
- Policymakers must actively foster collaboration between employers and educators, invest in improving publicly available information on the jobs market, and revise metrics used by educators and workforce development programs such that success is defined by placing students and workers in meaningful employment.

All the stakeholders must also commit to contributing to a new conversation about work in America. Too often, our society's leaders convey that a four-year college education is the only path to a respectable and rewarding career. That is not true. America's competitiveness rests on the shoulders of its middle-skills workforce. Sustaining competitiveness will require a collective effort to restart America's middle-skills engine.

CAUGHT IN THE MIDDLE

America faces a pervasive and seemingly intractable skills challenge. Well before the Great Recession, in the 1980s and 1990s, fissures began appearing between the skills demanded by American employers and the skills offered by America's labor force. The slow, jobless recovery that followed the Great Recession reinforced how wide the chasm had grown over the last few decades.[1] More than 60 months after the recession officially ended in June 2009, the American economy remains mired in a disturbing skills trap. Month after month, the U.S. labor force suffers a high unemployment rate, even as employers complain that job openings remain hard to fill. In August 2014, for example, the number of unemployed persons in America stood at 9.6 million,[2] with 4.8 million open job postings.[3]

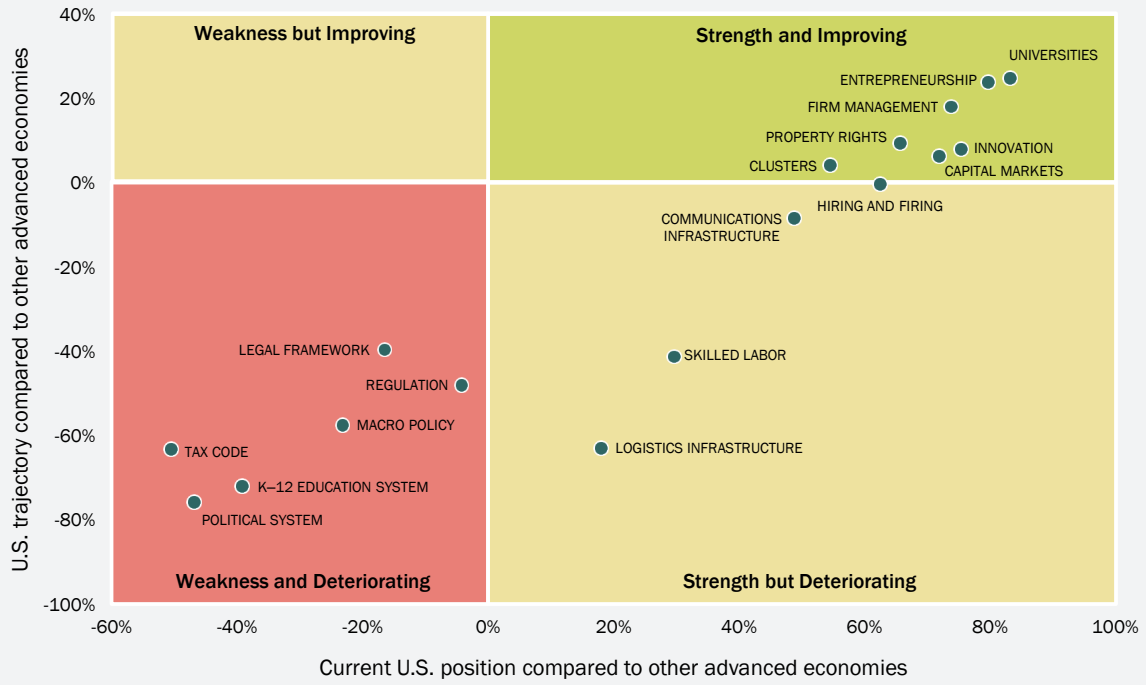
Economists, policymakers, labor unions, business leaders, and the media have all documented the mismatch in skills from their unique perspectives and offered solutions. Yet despite years of debate, America's skills gap—especially for solid, middle-skills jobs associated in the popular mind with the American dream—refuses to shrink. Why is this so? Why don't employers, educators, and potential employees take more decisive steps to end this misalignment? Who should take the lead in bridging the gap?

To probe these complex questions, the Harvard Business School launched a research initiative in 2013 in partnership with Accenture and Burning Glass Technologies. The three partners shared a common interest in trying to shed new light on the causes of the skills gap and, specifically, the role business could play in closing it.

For HBS, this research marked a natural progression in advancing our understanding of how to improve U.S. competitiveness. The School launched the U.S. Competitiveness Project in 2011 as a data-driven, non-partisan effort to diagnose the strengths and weaknesses of the U.S. economy—and to identify measures business leaders and policymakers could take to improve the nation's competitiveness. The research effort is guided by an overarching definition, developed by HBS faculty members, of what constitutes U.S. competitiveness: "The United States is a competitive location to the extent that companies operating in the U.S. are able to compete successfully in the global economy while supporting high and rising living standards for the average American."[4]

The first phase of HBS research in 2011, which covered 17 elements of competitiveness, confirmed that America's skills issue was a critical factor undermining the U.S. economy (see Figure 1). Annual surveys of HBS alumni worldwide

FIGURE 1: ASSESSMENT OF ELEMENTS OF THE U.S. BUSINESS ENVIRONMENT IN 2011



Note: Scored as percentage with positive views minus percentage with negative views.
Source: Michael E. Porter and Jan W. Rivkin, "Prosperity at Risk: Findings of Harvard Business School's Survey on U.S. Competitiveness," January 2012.

consistently suggested that the skills of the American workforce, once viewed as a source of competitiveness, were in decline relative to those of workers in other developed economies.[5] The findings also implied that the perceived skills gap was influencing corporate decision making. For example, HBS alumni involved in firm location choices reported that access to skilled labor was more often a reason to move a business activity out of the United States than it was a reason to *keep* an activity in America.[6]

For Accenture, the initiative aligned with the company's long-standing commitment to skills and employment research; talent development for clients around the world; and its *Skills to Succeed* corporate citizenship initiative. Through *Skills to Succeed*, Accenture aims to equip, globally, 700,000 people by 2015 with the skills to get a job or build a business. Accenture's experience working with global organizations, researching talent and skills issues, and equipping people with skills that enable them to contribute to the economy was vital in understanding how to close the middle-skills gap in the U.S.

The partnership was greatly enhanced by Burning Glass Technologies' agreement to join the effort. A Boston-based labor market analytics firm, Burning Glass collects U.S. job postings from over 38,000 sources. The company uses advanced proprietary text mining to read each job description posted online. It is widely regarded as the differentiated source of real-time information about the U.S. labor market. Burning Glass generously provided access to job-posting data from January 1 to December 31, 2013, allowing the entire team to analyze the middle-skills labor market in terms of trends in specific jobs, experience, qualifications, and skills sought by employers.

MAPPING THE MIDDLE-SKILLS LANDSCAPE

The authors of this report would like to start by gratefully acknowledging the deep analysis and thoughtful research undertaken by scholars and commentators on the middle-skills gap. Our effort sought to build upon that existing research. We hope to contribute a framework that allows leaders—most importantly business executives—to understand the competitive implications of the skills gap and to provide them with a set of specific and actionable recommendations for addressing it.

We began with a survey of the labor market. The basic demographics of employment are widely known. The recovery has proven a disappointment in terms of job creation when compared to previous rebounds. Broader measures of workforce demographics suggest widespread underemployment (see Figure 2 on Page 6).[7]

While the nominal unemployment rate has fallen, much of that apparent improvement has stemmed from workers taking part-time positions. Historically, during recessions it is usual for part-time employment to increase. However, this time, the persistence of high part-time employment even during the recovery is unusual. Longitudinal analysis shows that the recent recession registered a sharp spike in the number of part-time employed—peaking at 19.7% in 2010, but still short of the all-time high of 20.3% in 1983. But what is more surprising is how long high part-time employment has lingered well into the recovery.[8] By August 2014, the rate had climbed up to 23%, well over the historic highs in the past.[9]

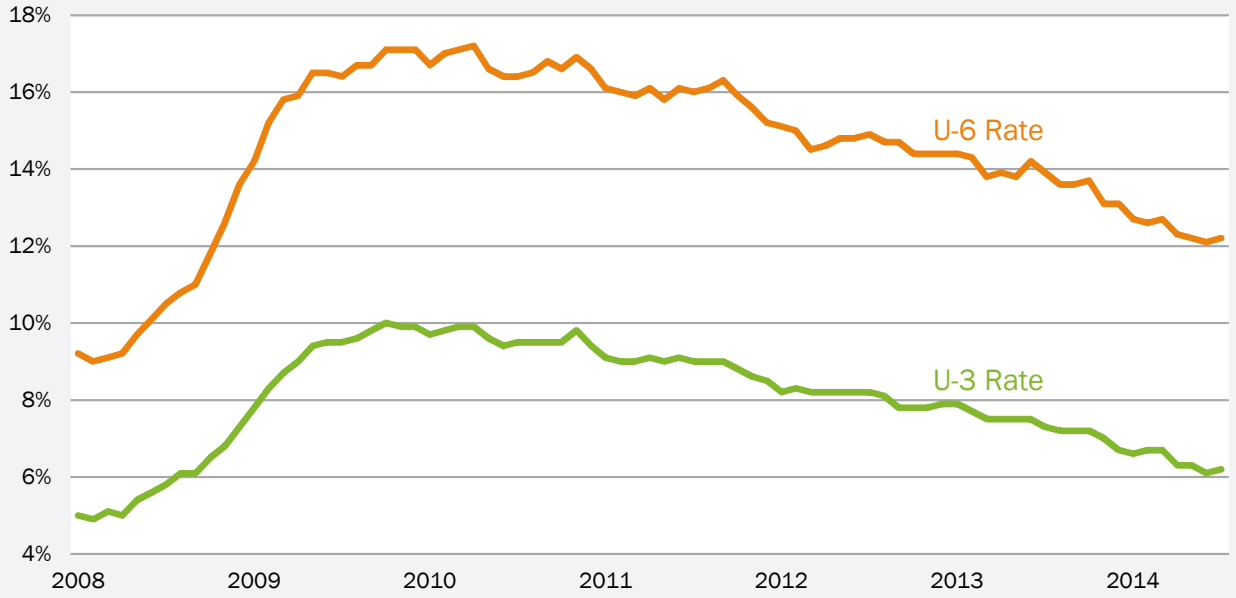
The long-term unemployed have found it particularly difficult to reenter the workforce. Thirty percent of workers who were unemployed long-term (27 weeks or more) between 2008 and 2012, in follow-up interviews after 15 months, admitted that they were still unemployed and looking for work. Another 34% had stopped looking for work altogether.[10] With each passing month away from work, worker skills and experience erode and become more irrelevant.[11]

The lethargy in the labor market applies to college graduates, too. Unemployment in recent college graduates between 20 and 29 years of age and with Bachelor's degrees was 11.5% in October 2013, compared to 9.0% in October 2007.[12] A study by the Federal Reserve Bank of New York also revealed the eroding quality of work secured by recent college graduates. More than 40% held jobs that do not traditionally require a college degree; of those underemployed graduates, almost 20% were working part-time and more than 20% were in low-wage jobs.[13]

Perhaps most alarming has been the decline in workforce participation to a level not seen since the late 1970s.[14] Although a decline in participation has been forecast for some time as the inevitable consequence of changing demographics, recent research also suggests that it is being driven by the economics of employment.[15] If potential workers cannot find employment that is more rewarding than relying on public assistance or family and social networks for support, they are less likely to continue to seek work.

The extent and persistence of high levels of unemployment and underemployment seem paradoxical in light of employers' complaints about their inability to fill open positions. We reviewed a range of studies that indicate that companies nationwide continue to find it difficult to attract talent with the requisite skills. They all tell a similar tale. For example, in a 2013 survey by Adecco, a workforce solutions provider in the United States and Canada, 92% of senior

FIGURE 2: LABOR UNDERUTILIZATION (2008-2014)



Source: Bureau of Labor Statistics, Current Population Survey.

executives expressed the opinion that troubling gaps in skills plague the workforce. Nearly 44% of the executives indicated that it was difficult to fill jobs because candidates lacked soft skills like communication and critical thinking.[16] Similarly, 49% of the respondents to Manpower Group's Talent Shortage Survey in 2013 indicated that talent shortages were undermining their ability to serve customers.[17] Employers cited the absence of technical skills (48%) and of workplace or soft skills (33%) as the most significant barriers to fulfilling their needs.[18] Companies in the U.S. can expect to feel the pinch even more severely in the future as more than 76 million baby boomers age, and their current labor participation rate falls from 80% to below 40% by 2022, typical of older age groups.[19]

To deepen our understanding of the employer perspective, two partners of our team conducted new surveys, each targeting a unique audience. In a broad survey of 10,000 HBS alumni between December 2013 and January 2014, HBS faculty unearthed very similar results to those provided by sources like Manpower. Some 38% of respondents replied that it was either very difficult or somewhat difficult to fill middle-skills positions, while only 26% indicated that it was either very easy or somewhat easy to do so. HBS alumni from middle-sized companies[20] found the task particularly challenging, with 46% reporting that sourcing appropriately skilled talent was either very difficult or somewhat difficult.

Accenture conducted a companion survey in February 2014 of more than 800 human resources (HR) executives. It discovered that 56% of respondents found middle-skills jobs hard to fill, with finance and insurance (68%) and healthcare (54%) companies experiencing the greatest challenges. Fully 69% of the overall sample and over 70% of the largest companies (those with revenues greater than $2 billion) indicated that their inability to attract and retain middle-skills talent frequently affected their performance. Over one-third of respondents believed that inadequate availability of middle-skilled workers had undermined their productivity, with manufacturing (47%) and healthcare (35%) the hardest hit.

These data imply sobering consequences not only for companies, but also for new entrants to the workforce and the unemployed hoping to reenter the labor force. America's education and workforce development systems are just not producing a sufficient number of graduates with skills relevant to today's workplace and for jobs in high demand. Employers are finding that the available talent fails to meet their standards. The data suggest that aspiring workers cannot prudently assume that academic degrees or certifications related to some desired career will necessarily lead to employment. If left unaddressed, the challenge for workers to acquire and retain attractive middle-skills jobs will only worsen over time.

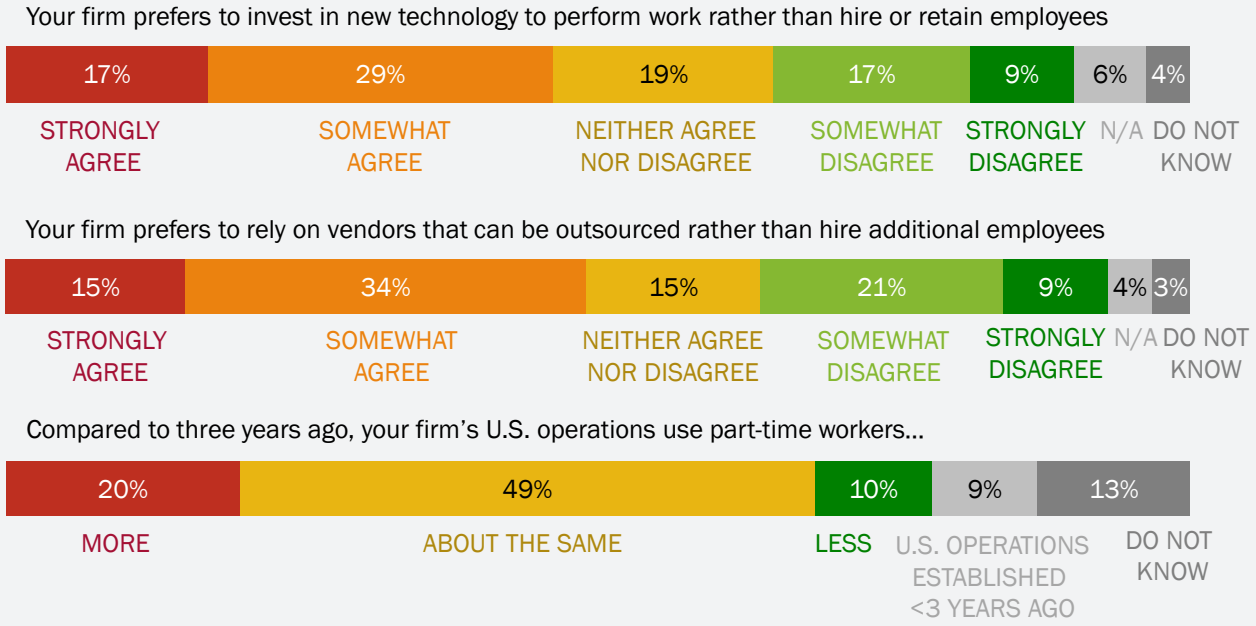
The long-term evolution of the U.S. workforce is therefore a source of concern in more than one way. Over time, America has witnessed a gradual polarization of skills in the labor market. The 1980s saw employment growth as well as wage growth for high-skill, high-wage jobs; the period from 1999 to 2007 saw an increase in low-education, low-skill jobs, while middle-skills jobs and wages declined or remained stagnant.[21]

Since 2000, "deskilling" has added further pressure on the labor market as highly-educated, high-skilled workers moved down the occupation ladder and took jobs historically held by lower-skilled workers.[22] In recent years, "mal-employment," in which workers are overeducated for their job, has been on the rise.[23]

The growth in polarization transcends business cycles, but it has been demonstrated to accelerate dramatically during recessionary periods. One study suggests that it accelerates at nearly six times the rate in recessions when compared to periods of economic expansion.[24] The polarization has become more pronounced in the recent downturn. A report from the National Employment Law Project (NELP) found that low-wage sectors, such as food services and retail trade, accounted for only 22% of jobs lost during the Great Recession but 44% of jobs gained since the beginning of the recovery. Mid-wage jobs accounted for 37% of losses but only 26% of gains; higher-wage jobs, 41% of losses but only 30% of gains.[25] While a recent NELP survey suggests an uptick in hiring in higher-wage jobs, total employment in middle- and high-paying jobs is 1.2 million jobs lower than before the recession. If this remains largely a "barbell-shaped jobs recovery"—one with employment gains recorded at the top and bottom ends of the market—it will have important implications for aspiring workers. The evolution of the composition of the workforce does not provide any assurance that workers can rely on a rising tide to enjoy higher living standards. Accenture's analysis of the U.S. labor market warns that trends such as an aging workforce and lower workforce participation rates could result in a 9% decline in U.S. standards of living (per capita GDP in real dollars) by 2030.[26] To improve their lot, workers will therefore have to rely on developing marketable skills.

But that won't be easy. The 2013–14 HBS alumni survey on U.S. competitiveness revealed another troubling insight: employers appear reluctant to hire full-time workers if an alternative presents itself. First, the survey showed, 46% of respondents agreed that their firms' U.S. operations prefer to invest in technology to perform work rather than hire or retain employees, while only 25% disagreed.[27] Second, 49% said that their firms preferred to rely on vendors to perform work that can be outsourced, while only 29% reported that their firms would rather hire additional workers and keep work in-house. Third, when choosing to hire, companies also indicated a distinct preference for relying on part-timers. Companies that increased their reliance on part-time workers over the past three years outnumbered those that had reduced their proportion of part-timers by two to one (see Figure 3). This reluctance of employers to hire puts pressure on American workers in two ways. To attract potential employers, workers must develop skills that are integral to companies' strategies, *and* they must demonstrate the capacity to master new competencies as their workplace evolves.

FIGURE 3: APPROACHES TO HIRING DECISIONS



Note: Percentages do not sum to 100% because of rounding.
Source: Harvard Business School 2013–14 Survey on U.S. Competitiveness.

Where will U.S. workers get those skills? Ironically, not from many of the employers who bemoan the lack of skilled job applicants. Only a minority of respondents to both the HBS and Accenture surveys indicated that their firms invested in skill-building for *potential* employees. For example, in the HBS survey, only 45% of the respondents said their firms offered internships or apprenticeships for middle-skills jobs. In the Accenture survey, just 22% of companies said they would always consider bringing someone on who requires additional training when they're having trouble filling a role. Even fewer small companies (14%), those with annual revenues of less than $250 million, said they were willing and able to do so.[28]

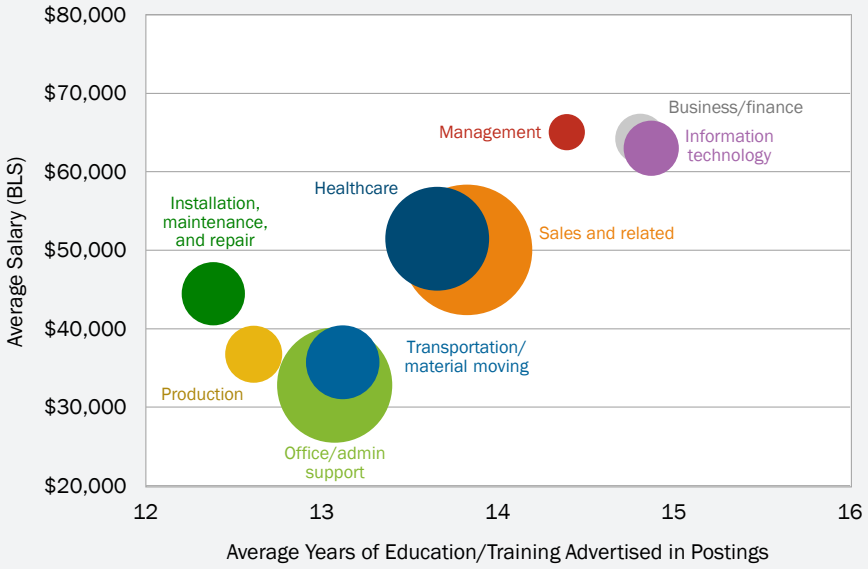
This apparently widespread unwillingness of many employers to take a more active hand in filling a skills gap that many complain threatens their competitiveness struck our team as perplexing. During the course of this research, when we asked employers about it, we found many believed that their firms could avoid the negative consequences of the skills gap, despite knowing that their industry suffered from one. They believed they would continue to attract the talent, even while predicting an enduring shortage in the general marketplace. We hope this report helps more businesses become self-aware about the need to invest in middle-skills development—not just for their own immediate needs but for building a long-term pool of skills for the region, industry, and community.

DEFINING A COMPETITIVENESS-BASED APPROACH

Despite the mass of impressive scholarly work on the middle-skills gap, the issue had not been viewed through the lens of *competitiveness*. We believe that using the expansive definition of competitiveness, employed in the broader HBS research on the U.S. economy, might reveal how business leaders, educators, and policymakers should go about addressing the skills gap—and where they ought to focus their attention.

To begin that analysis, we probed if the broad and elastic definition of "middle skills" in fact stood in the way of developing strategies to close the skills gap. The standard definition of a middle-skills job—one requiring more than a high school diploma and less than a four-year college degree—encompasses a huge array of occupations. Burning Glass reported almost 7.3 million online postings[29] for middle-skills jobs in 2013, out of a total of 19.9 million online postings.[30] In a typical month, approximately 600,000 postings come online for middle-skills jobs. Those jobs range considerably in terms of average compensation and the time required to earn the credentials. As Figure 4 illustrates, middle-skills jobs are as diverse as those who hold them,[31] differing widely in their average compensation, the education and training required beyond a high school degree, and the content of work itself.

FIGURE 4: THE SCOPE OF MIDDLE SKILLS: AVERAGE SALARY AND EXPECTED QUALIFICATIONS



Occupation Family	Online Middle-Skills Postings (2012)
Sales and related	1,910,430
Office/admin support	1,481,060
Healthcare	1,209,143
Transportation/ material moving	611,205
Installation, maintenance and repair	446,637
Production	363,544
Information technology	344,393
Business/finance	284,945
Management	148,029

Sources: Bureau of Labor Statistics, 2012 Occupational Employment Statistics dataset; Burning Glass Technologies' database of online job postings for 2012.

To understand the impact on U.S. competitiveness, we therefore needed to understand the attributes of middle-skills jobs at a more granular level. Specifically, we wanted to understand how the middle-skills gap affected the United States' ability to achieve the twin objectives of being a base from which firms can compete successfully in the global economy *while* supporting high and rising living standards for the average American. If the skills gap is a threat to America's ability to support globally competitive enterprises, it must be felt in specific jobs that are crucial to firms' performance. Which middle-skills jobs meet that standard, and are they, in fact, hard for employers to fill? If the gap is a threat to the living standards of average Americans, we wanted to understand whether middle-skills positions still offer American workers the opportunity to enjoy high and rising living standards. Or has the polarization of America progressed so far that most workers with middle skills are condemned to stagnant or declining living standards?

By analyzing those questions, we hoped to develop some insight about what leaders of all stripes, but most importantly business leaders, can do to start reducing the skills gap.

SEGMENTING MIDDLE-SKILLS JOBS

Exploring the implications of the middle-skills gap for competitiveness required us to develop a tool for describing jobs in terms of two major variables: their importance to the strategic success of American companies and their capacity to support high and improving standards of living for someone holding that job. We developed the framework below, mapping those two variables along Y- and X-axes (see Figure 5). The "Value to U.S. Business" axis displays how important an occupation is to U.S. business by measuring how much the industry contributes to the U.S. economy and how critical each occupation is to relevant industries. The "Career Lifetime Value" axis displays the value of an occupation to a worker by measuring the occupation's average salary and future earning potential. (For a detailed explanation of the methodology please turn to Appendix I on Page 29.) This matrix provides us with a tool to relate those two fundamental elements of the definition of competitiveness. Occupations that sustain U.S. competitiveness are those that offer enduring value to both businesses operating in the U.S. and American workers.

FIGURE 5: FRAMEWORK FOR OCCUPATIONAL IMPORTANCE TO U.S. COMPETITIVENESS

Which occupations are critical to U.S. competitiveness?

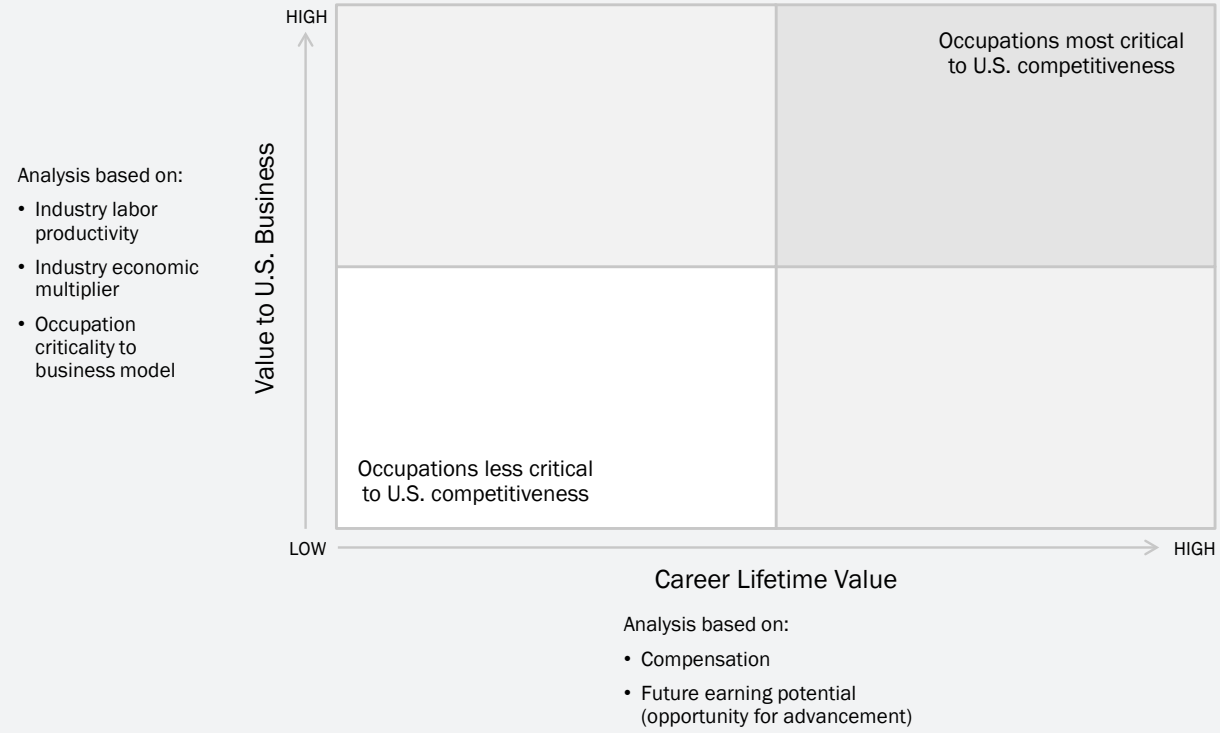
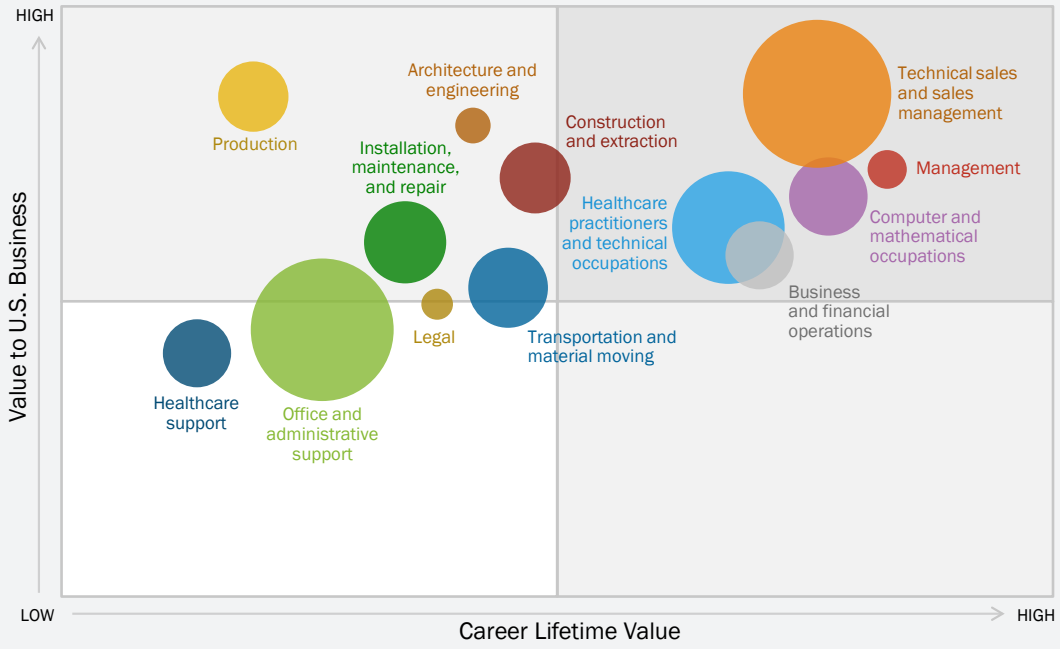


FIGURE 6: IMPORTANCE OF MIDDLE-SKILLS OCCUPATION GROUPS TO U.S. COMPETITIVENESS (NATIONAL VIEW, 2013)



Note: Bubble size reflects relative number of job postings.[34]

Sources: Bureau of Labor Statistics, 2013 Occupational Employment Statistics dataset; Bureau of Economic Analysis; Accenture Middle-Skills Survey 2014 and industry subject matter experts; Burning Glass Technologies' database of online job postings for 2013. For a detailed methodology, see Appendix I on Page 29. The number of construction and extraction jobs is an estimate.

Relying on data provided by Burning Glass, Accenture analysis, and a host of other supporting sources, the team first deployed the framework nationally, at the level of occupational groups.[32] That analysis revealed some interesting insights that belie some of the conventional wisdom pertaining to middle-skills jobs.

For example, the analysis showed the importance of certain occupational categories, such as technical sales and sales management (see Figure 6), which receive precious little attention in the national dialogue about middle skills. In addition to being the single largest occupation group in terms of job postings in 2013 (23%), these jobs fare well on both dimensions of competitiveness. Unsurprisingly, so do occupations captured in the computer and mathematical grouping.

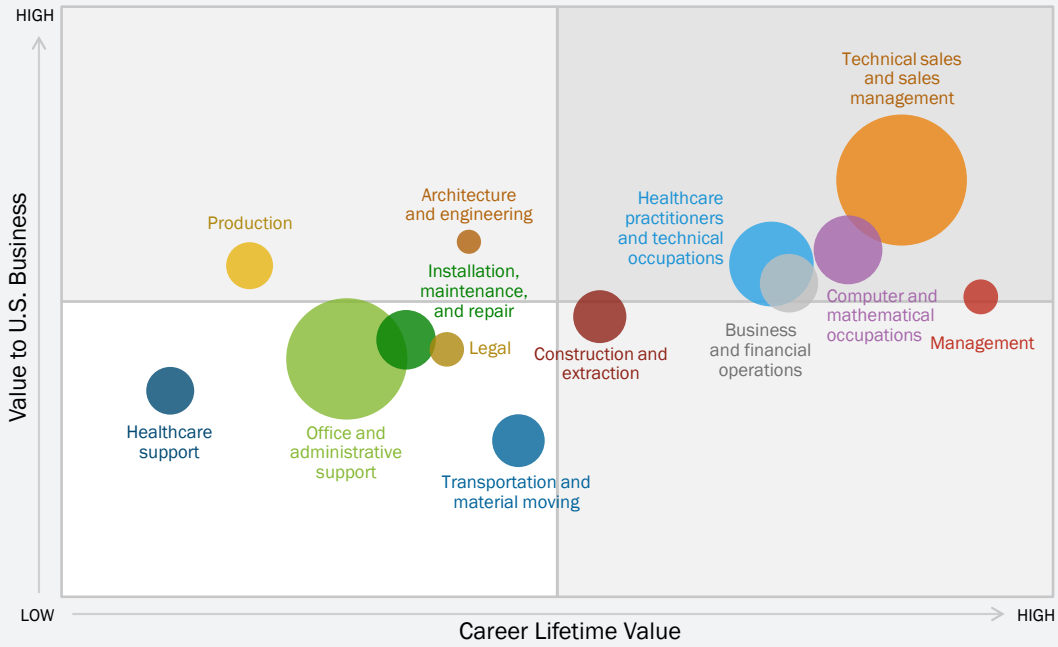
Despite much recent excitement about the potential for advanced manufacturing and the possible repatriation of manufacturing jobs, many such jobs do not offer a high career lifetime value for workers. Production jobs bifurcate into two categories with divergent career earning potential: lower-wage general production jobs and higher-wage skilled production jobs. Average wages in the general production category hover around $16 an hour, while average wages for skilled production jobs jump to $25 an hour.[33] Moreover, general production jobs are at the greatest risk of being re-offshored, depending on the vagaries of wages and trade flows worldwide. They are also at risk of being replaced by new technologies.

The analysis also revealed how unevenly occupations are spread across the U.S., reflecting clusters of economic development. The importance of various industries varies by region, based on the degree to which they are located there. For example, a comparison of the states of New York (see Figure 7) and Illinois (see Figure 8) shows the greater services orientation of the former and the greater concentration of manufacturing and engineering-related businesses in the latter.

Such considerations are particularly important for policymakers and those involved in regional economic development. State and local governments can use such data both to understand the current requirements of businesses located within their jurisdictions and to anticipate future needs.[35]

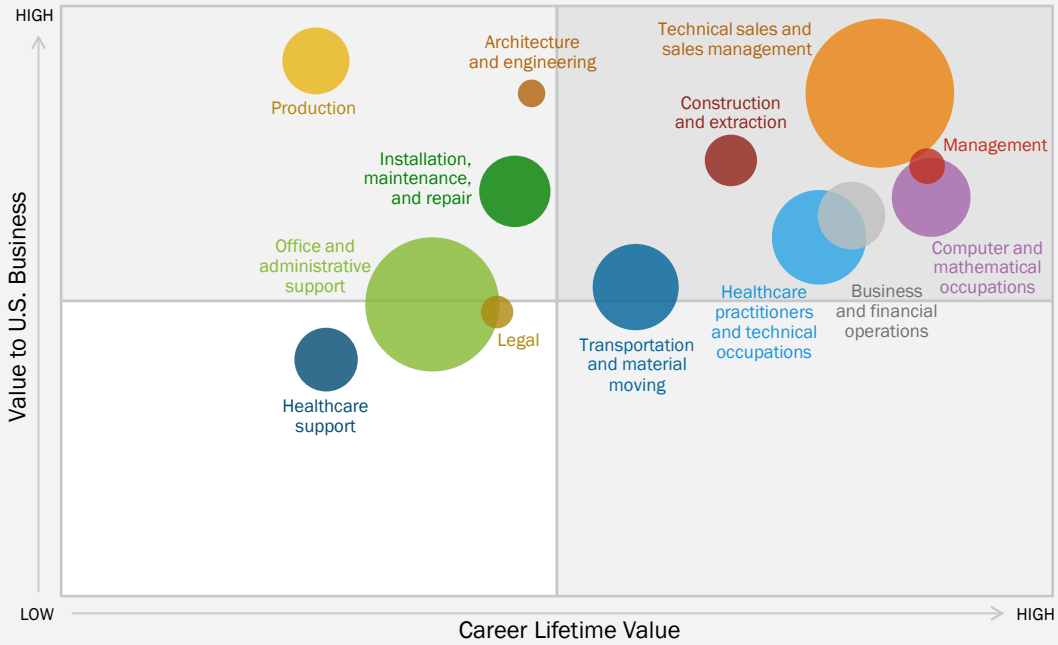
The significance of viewing middle-skills jobs through the lens of competitiveness becomes more apparent at the level of specific jobs within occupational categories. A detailed breakdown of jobs within the broad production category reveals much about the value of those positions, especially to aspiring workers. The jobs are universally evaluated as important to the competitiveness of American businesses that rely on them. Paradoxically, they are not associated

FIGURE 7: IMPORTANCE OF MIDDLE-SKILL OCCUPATION GROUPS TO U.S. COMPETITIVENESS (NEW YORK STATE VIEW, 2013)



Sources: Bureau of Labor Statistics, 2013 Occupational Employment Statistics dataset; Bureau of Economic Analysis; Accenture Middle-Skills Survey 2014 and industry subject matter experts; Burning Glass Technologies' database of online job postings for 2013. For a detailed methodology, including an explanation of differences between this state view and the national view, see Appendix I on Page 29. The number of construction and extraction jobs is an estimate.

FIGURE 8: IMPORTANCE OF MIDDLE-SKILL OCCUPATION GROUPS TO U.S. COMPETITIVENESS (ILLINOIS STATE VIEW, 2013)



Sources: Bureau of Labor Statistics, 2013 Occupational Employment Statistics dataset; Bureau of Economic Analysis; Accenture Middle-Skills Survey 2014 and industry subject matter experts; Burning Glass Technologies' database of online job postings for 2013. For a detailed methodology, including an explanation of differences between this state view and the national view, see Appendix I on Page 29. The number of construction and extraction jobs is an estimate.

with high career lifetime values for workers. That would seem illogical, since manufacturing companies regularly voice concerns about the unavailability of talent. Accenture reports that 75% of manufacturers are experiencing a moderate to severe shortage of talent;[36] other groups cite 600,000 manufacturing sector jobs remaining open consistently.[37]

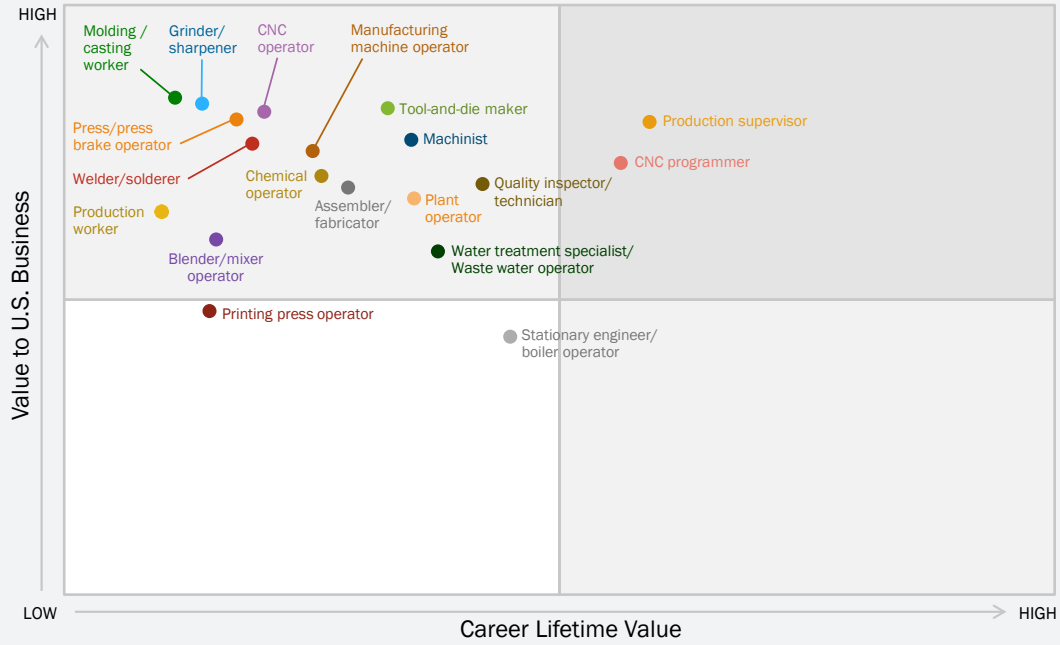
Why do production jobs fare poorly on the lifetime value variable? Many production jobs (see Figure 9)—such as a computer numerical control (CNC) machine operator, a tool-and-die maker—that require specific credentials or experience pay reasonably well by middle-skills standards. However, their career lifetime value is low as few production jobs have a clear pathway to other, higher-paying jobs. Better-paying jobs further up a manufacturing company's hierarchy are supervisory. They require extensive experience, and the ratio of supervisory personnel to core staff is such that rates of advancement are likely to be slow. In other words, machinists or tool-and-die makers are likely to remain machinists or tool-and-die makers, subject to whatever vagaries affect their specific occupations, their employer, or their employer's sector.

In contrast, other occupations provide more robust and diverse prospects for career advancement. They offer the possibility, if not the guarantee, of a higher career lifetime value. The estimated lifetime value of positions in the technical sales and sales management occupation groups is an example (see Figure 10). The category encompasses roles ranging from financial services sales agents to insurance and real estate brokers. Although unsung relative to their importance to the competitiveness of companies operating in the U.S., the jobs within this occupation group have two attractive features: they are the most frequently posted, and they enjoy among the highest average compensation level. They have the added appeal of breadth of relevance. A far larger percentage of companies require skilled sales supervisors and agents than require arc welders or turret lathe operators.

Entry-level sales jobs also have clearer pathways for advancement than many other middle-skills occupations. Using Burning Glass' data, we were able to extrapolate which positions across all middle-skills occupations offer the best platforms for advancing to other, higher-paid jobs. Sales jobs fared particularly well along this important dimension (see Figure 11).

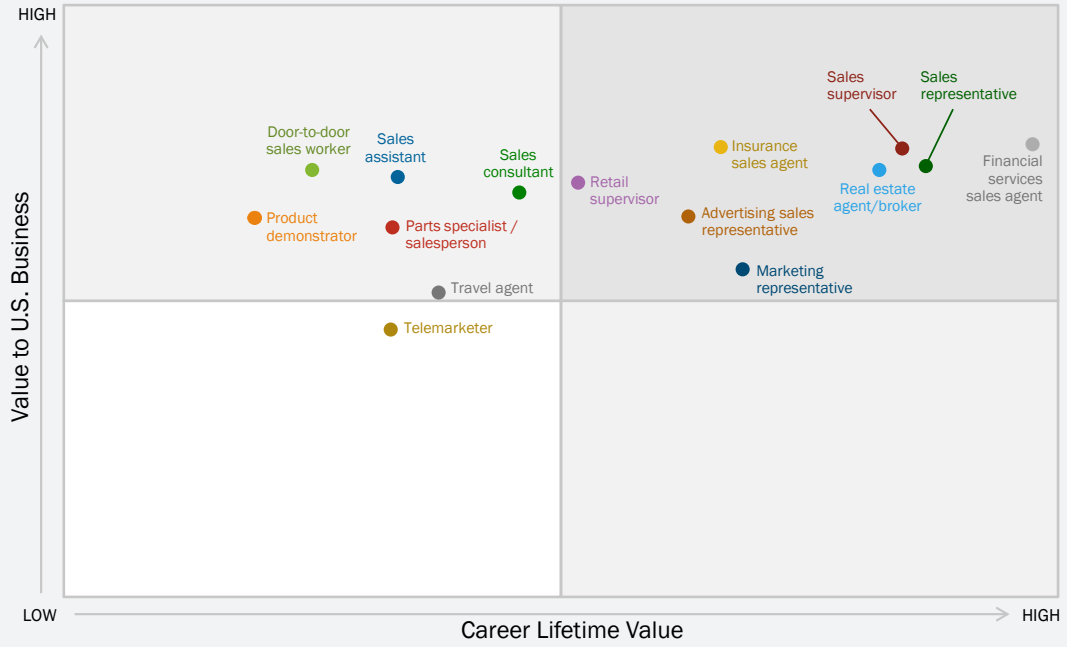
In sum, middle-skills jobs differ markedly in their capacity to offer a springboard for advancement. Some positions, like nursing assistant and sales assistant, are closely tied to ladders of progression. They provide the experience base and foundation credentials that enable an individual to advance up a professional hierarchy, enhancing the lifetime value he or she will enjoy. Such advancement is, of course, not guaranteed. But by making that initial career choice, individuals can provide themselves the prospect of moving up a career ladder should they have the capability and commitment to do so. Other jobs offer narrower and more attenuated career paths, despite requiring an equivalent initial investment in time and tuition expense.

FIGURE 9: MIDDLE-SKILLS OCCUPATIONAL IMPORTANCE TO U.S. COMPETITIVENESS: PRODUCTION (MANUFACTURING) OCCUPATIONS (NATIONAL VIEW, 2013)



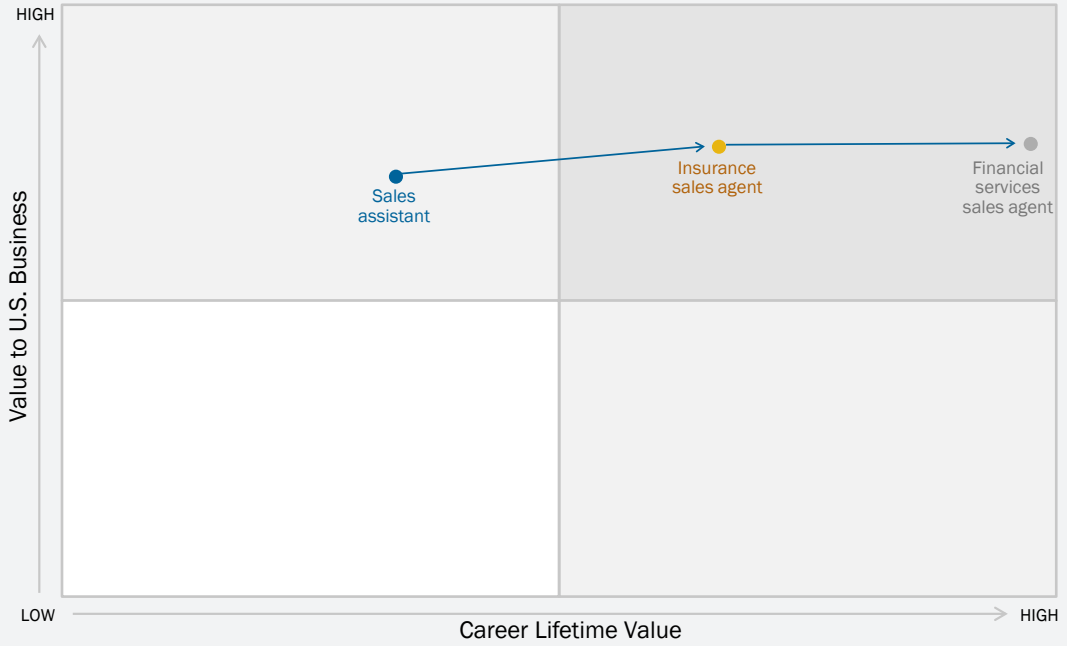
Sources: Bureau of Labor Statistics, 2013 Occupational Employment Statistics dataset; Bureau of Economic Analysis; Accenture Middle-Skills Survey 2014 and industry subject matter experts; Burning Glass Technologies' database of online job postings for 2013.

FIGURE 10: MIDDLE-SKILLS OCCUPATIONAL IMPORTANCE TO U.S. COMPETITIVENESS: TECHNICAL SALES & SALES MANAGEMENT OCCUPATIONS (NATIONAL VIEW, 2013)



Sources: Bureau of Labor Statistics, 2013 Occupational Employment Statistics dataset; Bureau of Economic Analysis; Accenture Middle-Skills Survey 2014 and industry subject matter experts; Burning Glass Technologies' database of online job postings for 2013.

FIGURE 11: MIDDLE-SKILLS OCCUPATIONAL IMPORTANCE TO U.S. COMPETITIVENESS: POTENTIAL PATHWAY FOR TECHNICAL SALES & SALES MANAGEMENT OCCUPATIONS (NATIONAL VIEW, 2013)



Sources: Bureau of Labor Statistics, 2013 Occupational Employment Statistics dataset; Bureau of Economic Analysis; Accenture Middle-Skills Survey 2014 and industry subject matter experts; Burning Glass Technologies' database of online job postings for 2013.

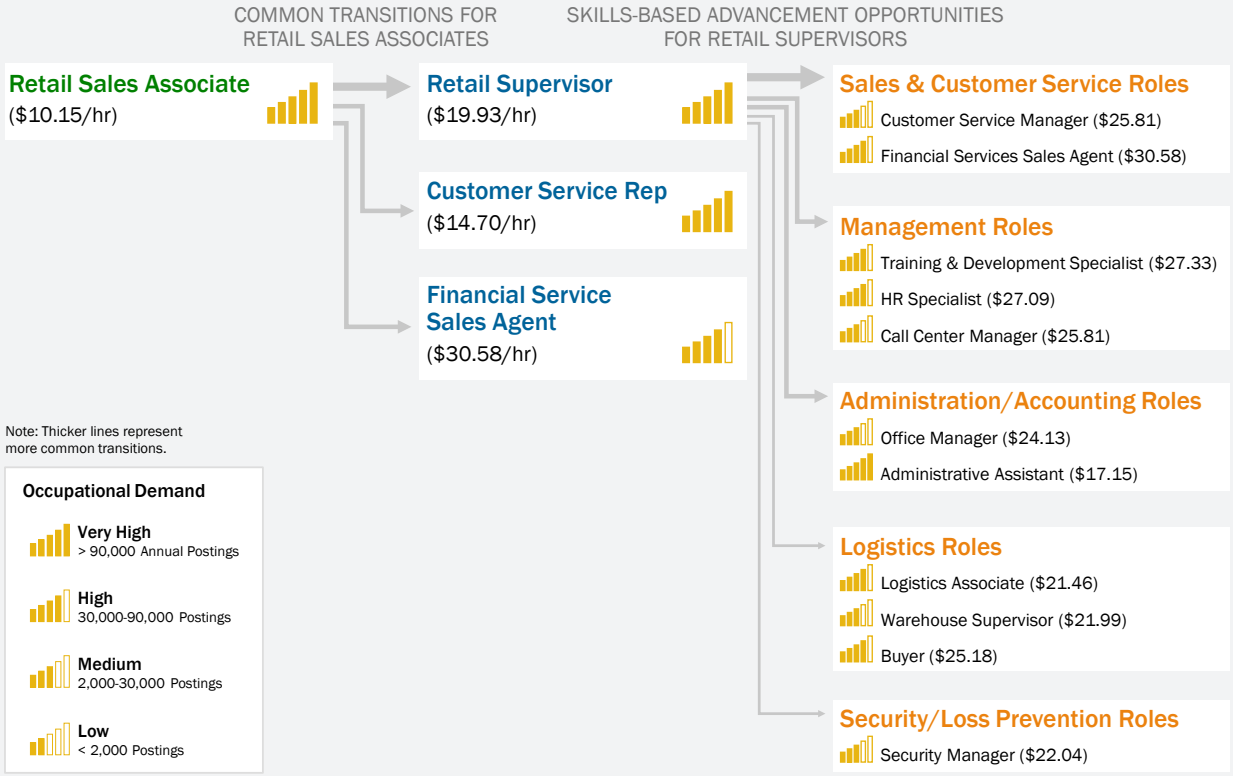
Differentiating Among Career Pathways

Some middle-skills jobs offer clear pathways to prosperity. People in those jobs have the prospect of progressing up a career ladder—at each level having the opportunity, if not the guarantee, of moving into a higher-paid role based on the experience and skills gained in their initial position. Burning Glass analytics show that help-desk/entry-level computer support jobs are excellent examples of that phenomenon. These entry-level jobs pay on average $44,000 per annum, and about 54% of the postings do not require a Bachelor's degree. More importantly, they provide a springboard for accessing higher-level positions. Experience as a computer support technician is frequently cited as preferred for applicants for higher-level positions. Workers can access those opportunities by developing additional, discrete skills acquired through certifications. A worker with aptitude and ambition has a good chance to advance to positions such as help-desk manager or network support specialist. At this stage, salaries range from $61,000 to $78,000.

Other middle-skills jobs offer little more than dead ends. People in these jobs are on a step-stool: entry-level jobs may be available, but the prospects for advancement are dim. A prominent example is a pharmacy technician. According to Burning Glass analytics, the average starting salary is around $29,000 per annum, but there is little upward mobility. Pharmacy technician is just not cited as a preferred background for applicants for other, seemingly-related, and better-paying jobs. To be sure, technicians can try to move forward with certifications, but those certifications rarely port to other clinical jobs.

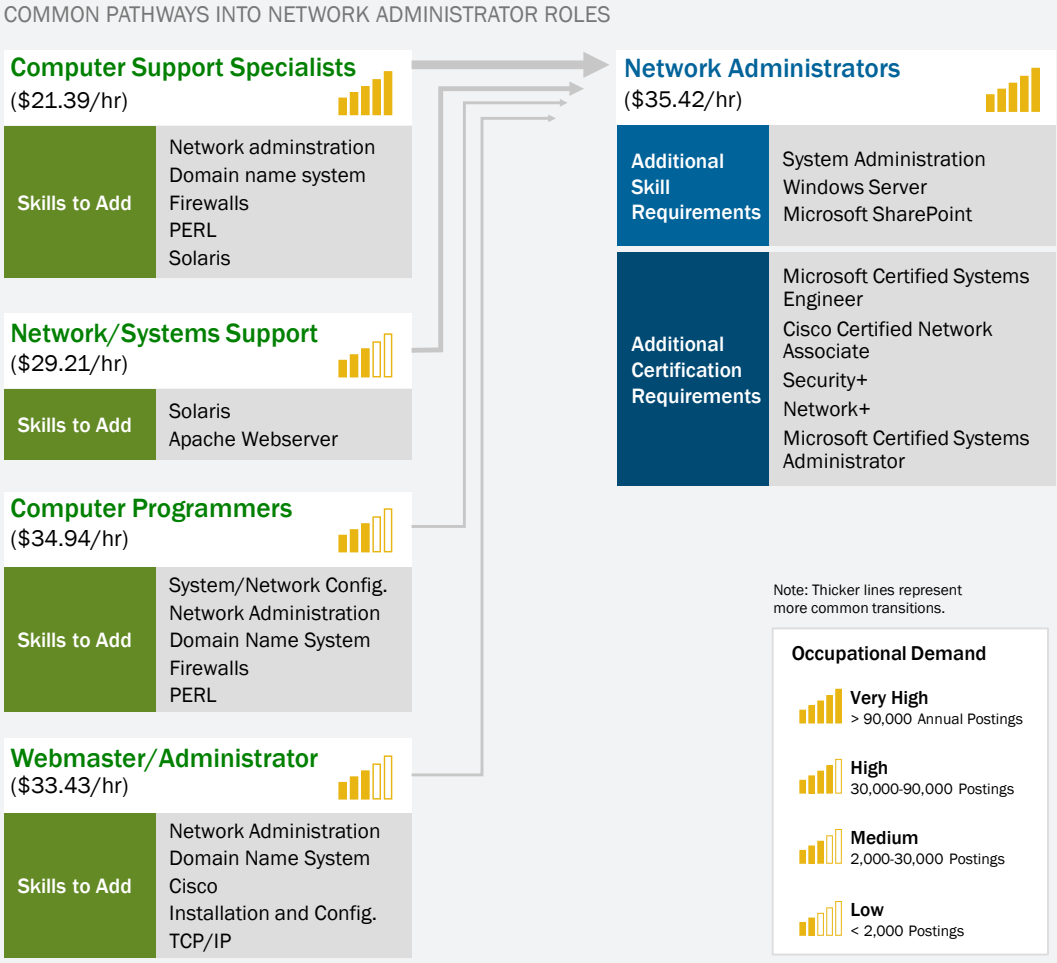
Differentiating between pathway and dead-end jobs can help policymakers and business leaders prioritize the allocation of scarce resources on skills development. For example, production jobs often get a disproportionate share of attention compared to their total impact on the U.S. economy (as shown in Figure 6). In contrast, little attention is paid to retail jobs—in fact, they are often reviled as low-paying jobs.

FIGURE 12: RETAIL CAREER PATHWAYS



Methodology: Transition pathways are based on the frequency of career transitions observed in millions of résumés and analysis of skill requirements in Burning Glass' proprietary database of more than 100 million online job postings. Wage data reflect the mean advertised hourly wage.

FIGURE 13: NETWORK ADMINISTRATOR CAREER PATHWAYS



Methodology: Transition pathways are based on the frequency of career transitions observed in millions of résumés and analysis of skill requirements in Burning Glass' proprietary database of more than 100 million online job postings. Wage data reflect the mean advertised hourly wage.

A pathways approach shows, however, that entry-level retail jobs are not necessarily dead ends and can lead to jobs with higher wages. Burning Glass analysis shows that a retail sales associate might start at an average wage of $10.15 per hour. An experienced sales associate can aspire to become a retail supervisor (average wage: $19.93 per hour) or move into adjacent roles, each with its own career pathways, such as customer service representative ($14.70) or financial services sales agent ($30.58). As Figure 12 shows, with the right kind of skills upgrading, a retail supervisor can move on to careers in sales, management, administration, or logistics. Not only are the wages higher in almost all these cases, the occupational demand is either high or very high, with tens of thousands of job postings.

A pathways-based approach can also help employers develop innovative solutions to fill vulnerable and hard-to-fill roles—and target strategic investments in training employees for those critical skills. Network administrators, a vital middle-skill role for both employers and workers, present a prime example. According to Burning Glass' hard-to-fill analytics, network administrators are the most difficult-to-fill middle-skill IT role. In each industry Accenture surveyed, at least 24% of employers named network administrators as one of their hardest positions to fill.

By investing in understanding pathways, companies will find that there are many sources for creating a healthy pipeline of network administrators. As Figure 13 shows, employers can invest in adding a basket of skills to computer programmers, network support specialists, and webmasters to take them to the next level of network administrator. Companies can even groom computer support specialists, who typically don't have a Bachelor's degree, to advance to network administrators. In each instance, not only would the company strengthen its access to skills and ability to compete—it would also be offering the average worker a chance to earn higher wages and aspire to a higher standard of living.

THE SIGNIFICANCE OF HARD-TO-FILL JOBS

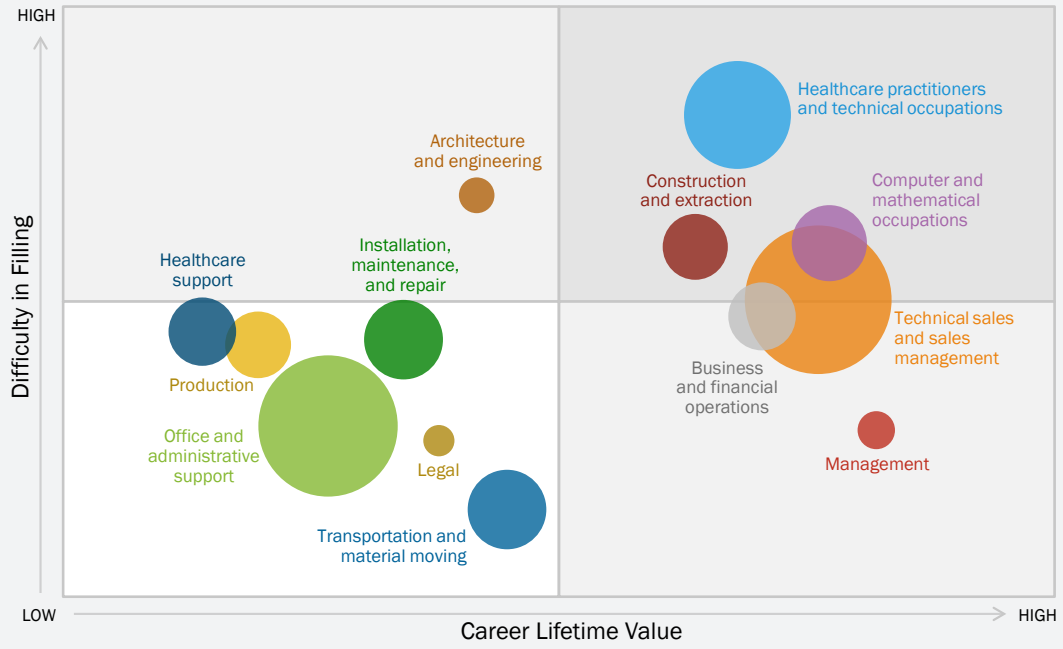
Most debate on closing the skills gap in the United States focuses either on issues around high skills (e.g., how can we increase the number of aeronautical engineers in America?) or low skills (e.g., what should be the minimum wage?). Now, increasingly, businesses are starting to feel the pinch of middle-skills gaps. When businesses come up against hard-to-fill middle-skills jobs, they face hidden costs such as lost output, increased overtime, inability to grow and compete, and higher turnover. The Accenture middle-skills survey showed that a lack of adequate middle-skills talent directly or significantly affected the productivity of 47% of manufacturing companies, 35% of healthcare and social assistance companies, and 21% of retail companies. (Percentages are of the companies surveyed.)

Using Burning Glass' data, we developed a framework to understand which jobs are consistently hard to fill and how that influences the associated career lifetime value. We augmented that analysis with primary research gathered through Accenture's survey and interviews.

For this analysis, the Y-axis displays how difficult it is to fill a specific occupation based on three attributes: posting duration, posting duplication rates, and resource intensiveness. Posting duration[38] measures how long, on average, a job posting remains active. Duplication rates[39] track how frequently employers have to duplicate job postings. Resource intensiveness[40] measures how much money employers spend on recruiting sites and agents to fill positions. We weighted each factor equally in our analysis. The X-axis, career lifetime value, is based on the same analysis performed to reveal the "importance to U.S. competitiveness." (For the full methodology, see Appendix II on Page 30.)

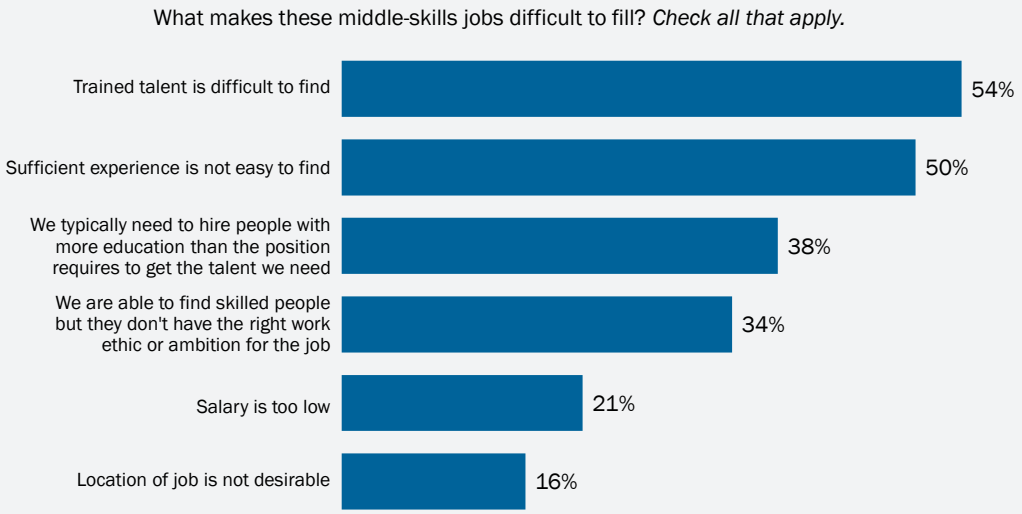
The data analysis at a national level (see Figure 14) confirmed an overlap in economic importance and job-candidate shortages in the U.S. for healthcare practitioners and technical workers, computer and mathematical positions, and technical sales and sales management callings. More easily-filled positions, such as office and administrative support and production jobs (specifically jobs requiring little experience and no significant credentials such as press operator, molding/casting worker, production worker, and blender/mixer operator), command a commensurately low lifetime value.

FIGURE 14: HARD-TO-FILL MIDDLE-SKILLS OCCUPATION GROUP ANALYSIS (NATIONAL VIEW, 2013)



Sources: Bureau of Labor Statistics, 2013 Occupational Employment Statistics dataset; Burning Glass Technologies' database of online job postings for 2013. For a detailed methodology, see Appendix II on Page 30. The number of construction and extraction jobs is an estimate.

FIGURE 15: ACCENTURE MIDDLE-SKILLS SURVEY 2014: WHAT MAKES MIDDLE-SKILLS JOBS HARD TO FILL?



Source: Accenture Middle-Skills Survey, February 2014. For a detailed methodology, see Appendix III on Page 30.

Accenture also explored why employers believe these positions are hard to fill. As expected, its survey indicated that the lack of candidates with the relevant training and experience was the major impediment to filling positions (see Figure 15). The two most critical and hardest-to-fill jobs are in the information technology field. Twenty-seven percent of companies across all industries said that the network/systems administrator post was the most difficult job for their company to fill. When asked what made it difficult, three-quarters of respondents said that network (or systems) administrators' and computer support specialists' posts were hard to fill due to a lack of applicants with technical skills. Said the operational excellence group leader at a large healthcare insurance company: "We do get people that meet many of the requirements in terms of experience or education. But they lack the technical skills, such as computer literacy, that would make them really effective." Another 21% of companies said the same of computer support specialists. Customer service representatives and sales supervisors were also called out as job postings difficult to fill across industries.

Harvard Business School Professor Willy Shih has documented the difficulties employers face trying to "reshore" manufacturing operations to the United States. He cites the challenges employers such as GE and Flextronics have experienced building and stabilizing an expanded workforce. GE experienced a 23% turnover rate amongst new, first-year employees at its legendary Appliance Park facility after expanding its payroll by over 700 workers. More startlingly, Flextronics hired 6,500 new workers at a facility in Fort Worth, Texas, in order to ensure that the firm had the 2,500 workers it ultimately required. Workers' lack of a basic understanding of what was involved in working on a factory floor was a major source of turnover.[41]

Jobs can be hard to fill for other important reasons. One of those most frequently mentioned is soft skills or foundation skills, such as work ethic, communication, teaming, and leadership.[42] Indeed, one-third of HR executives in Accenture's survey noted that while they could find skilled workers, many lacked the work ethic or ambition to be successful in the role. When asked to consider the first, second, and third most difficult middle-skills jobs to fill in their organization, respondents chose a lack of foundation skills as the second most important reason (after technical skills) for jobs that are hard to fill in all three cases.[43] This was particularly prevalent in the retail industry: 47% of retailers identified deficits in work ethic and ambition as the leading impediment to finding middle-skills talent.[44] Among businesses seeking customer service representatives, 63% of the companies surveyed said these jobs were hard to fill because of a lack of foundation skills.

For many employers, the solution to the shortage of soft skills among their middle-skills applicant pool is to "upskill" the position or to add credential requirements, such as a Bachelor's degree or more work experience. In other words, companies use credentials like advanced degrees as proxies for soft skills. In interviews, companies admitted to elevating qualification requirements to find employees with strong communication skills, leadership potential, and reliability,

especially for sales and customer-facing roles. Burning Glass' research uncovered a startling example involving computer support specialists, commonly known as help-desk staff. The job postings data showed that 43% of help-desk roles asked for a Bachelor's degree, but that the specific skills advertised for the help-desk roles were identical, whether the job posting came with or without a Bachelor's requirement.[45]

Burning Glass data show that employers have increasingly come to rely on a Bachelor's degree as an employment screen, even if it may not be related to actual job duties.[46] This "short-cut" to ensuring soft skills in employees very often comes back to haunt employers. By using overly restrictive screening procedures, employers effectively choke off viable talent from applying to their organization—and lengthen the hiring process. Burning Glass finds that help-desk jobs calling for a Bachelor's degree take 40% longer to fill on average. These job postings remain open for an average of nearly 38 days versus 27 days for help-desk positions that do not specify a Bachelor's degree (see Figure 16).

Yet many employers believe that a Bachelor's degree ensures that the workers possess the capacity to grow in their jobs. A small internet security firm that Accenture interviewed confirmed that it hires employees with a Bachelor's degree for sales roles, even though the substance of the work does not require a degree. The firm believes the college experience gives candidates a different set of valuable skills.[47] Said an HR manager: "There's something that comes with being a college student, a lot of maturity and knowing how to work with different people. They know how to communicate and to express themselves." Some companies surveyed linked their sales and revenue results directly to having polished and poised sales representatives. At Standard Motor Products, a mid-size manufacturing firm, the vice-president of HR said: "The skill set that's required to walk into a $10 billion customer and be credible (requires) someone who is well-educated and knowledgeable in the marketplace."

Other employers use higher credentials as a proxy for the capacity to advance. For example, in follow-up interviews and in open-ended questions in the Accenture middle-skills survey, HR leaders said that candidates for IT positions who possess college degrees are likely to have the technical savvy, problem-solving capabilities, and ability to adapt to new systems and technologies necessary to stay productive and be promoted. Given the recurrent difficulty in filling IT positions, they want to hire workers who can grow with the organization.

The persistence of hard-to-fill jobs across industries reveals the risks in allowing the skills gap to remain unaddressed. Many such jobs are highly important to the intrinsic competitiveness of companies. If the talent to fill those positions is chronically unavailable, employers will be obliged to rely on alternatives. They may move operations elsewhere, turn to foreign vendors, or opt to invest in labor-replacing technology, despite their initial preference to find an American worker to fill the need. For example, while nursing shortages are nothing new, a large non-profit hospital network that Accenture interviewed confirmed that it still struggled to find enough registered nurses within the United States to meet its demand. To solve the problem, it began working with nursing schools in the Philippines, Canada, and England, and now sponsors qualified candidates to work for the network in the United States.[48]

FIGURE 16: AVERAGE TIME TO FILL JOB POSTINGS

Occupational Title	Credentials Gap	Average # of Days to Fill Postings That Do Not Require a BA (Burning Glass)	Average # of Days to Fill Postings That Require a BA (Burning Glass)	% Change
Executive Secretaries and Executive Assistants	46%	24.85	27.96	13%
Transportation, Storage and Distribution Managers	42%	31.42	33.35	6%
First-Line Supervisors of Mechanics, Installers, and Repairers	34%	31.92	37.49	17%
Training and Development Specialists	25%	34.98	36.64	5%
Insurance Claims and Policy Processing Clerks	24%	24.08	27.93	16%
Human Resources Assistants (except payroll and timekeeping)	22%	21.65	24.02	11%
First-Line Supervisors of Construction Trades and Extraction Workers	21%	28.28	61.31	117%
Computer User Support Specialists (Helpdesk)	21%	27.14	37.88	40%
Production, Planning and Expediting Clerks	16%	25.83	31.08	20%

Source: Burning Glass Technologies. Burning Glass defines the credentials gap as the difference between the educational attainment of currently employed workers and the educational attainment employers are demanding for new hires.

RESTARTING AMERICA'S MIDDLE-SKILLS ENGINE

Examining the middle-skills gap by applying our expansive definition of competitiveness, we believe, offers fresh insights on how it should be overcome. By seeking to balance the interests of both businesses and workers through the use of a new diagnostic—value to U.S. business and career lifetime value—our team hopes to inspire some structural solutions for solving this seemingly intractable problem. Meaningful progress will hinge on actions that go beyond simply improving the efficiency of today's system. Rather, we must focus on developing a new middle-skills ecosystem that provides employers sufficient access to indigenous talent with the skills to fill competitively important jobs. That will help aspiring workers gain access to career ladders and hope for a decent and improving standard of living.

Balancing the two sides of the matrix will require recognizing and revisiting the roles played by all the major players in the skills ecosystem. At the center of that dialogue, however, must be the two principals in the transaction: businesses and workers. The needs of the first, to have a dependable and responsive source of talent, and the aspiration of workers, to earn a satisfactory living standard, are of paramount importance. In building this framework, we draw upon the notion of investing in the "commons," the business environment in the communities where businesses operate.[49] Improving skills is a key area where business leaders can eschew narrow, self-focused approaches to solving just their own organization's skills gap and instead invest in their local communities to enhance the local labor force's skill sets. The pay-off is a more productive workforce that helps U.S. companies compete globally.

A U.S. firm that is taking the lead in investing in the commons is The Boeing Company.[50] Boeing has enhanced its workforce planning capabilities with innovative technology and processes to look at internal as well as external factors that could cause a skills gap, both in the near and long term. It's important to remember that when Boeing identifies a looming skills gap, it usually needs thousands of employees with that skill, within a specific geographic area. Given its scale and commitment, Boeing is able to partner with educational and community partners to shape curriculum and ensure that its critical skills needs are fulfilled. The company recognizes that its size can help develop education and skills-development partnerships. Currently, Boeing partners with government agencies, a variety of learning institutions (pre-kindergarten to high school), and universities that can work together to build the talent supply pipeline across the United States—and thus improve the education and skill sets of current and future generations of American workers. Boeing is also helping *other* businesses across the country learn how to form partnerships to close skills gaps.

Investing in the commons in this fashion is not intuitive to many U.S. companies. In the past few decades, companies have become more distant from the communities in which they are located due to factors such as globalization, the relentless pressure to generate ever-increasing returns, the shift of major facilities away from head-quarter locations, and corporate mergers. They feel less obligated to those historical locales than earlier generations of management. Companies are, however, increasingly realizing that there are many significant hidden costs to ignoring their local communities' needs.[51]

Restoring some balance will require the major participants—employers, educators, workforce intermediaries, and policymakers—to address four major inefficiencies that plague the current system. These are:

- *Fragmented coordination and communication:* This inhibits the deployment of resources in a way that would maximize the outcomes for employers and workers.
- *Lack of a common language and transparency:* This is a classic supply-and-demand mismatch. Employers who demand skills and educators and workforce intermediaries who supply skills seldom share a common language or work in collaboration looking at one set of data. As a result, both sides struggle to articulate and understand what employers need and how to improve the supply of ready applicants.
- *Unclear, unstructured career paths:* Aspiring workers are not fully aware of the implications of the choices they make when they invest time and money in seeking education beyond Grade 12 or pursuing a certification in a discipline.
- *Misaligned incentives:* Individual actors in the system are encouraged to optimize their own performance without sufficient reference to the impact on the broader system.

Based on our research, we believe that the key players in the marketplace for middle skills should consider the recommendations expressed in the next few sections to overcome those inefficiencies.

RECOMMENDATIONS
Employers: Invest in Talent Supply Chains

The time has come for companies of all sizes, and in all industries, in America to assume the leadership of any effort to rejuvenate America's system for educating, training, and employing middle-skilled workers. We believe this is a business imperative for companies and not just an act of civic-mindedness or an exercise in corporate social responsibility. The skills gap has not closed, despite companies sounding the alarm about a talent shortage and its implications, for years. By stepping up to lead the change, employers would act in enlightened self-interest *as well as* benefit the communities in which their companies are located. Both in terms of firm performance and the ability of Americans to earn a decent wage, business must now assume a leadership position in addressing what represents a clear and present danger to U.S. competitiveness.

Grainger, a North American distributor of industrial supplies, has contributed more than $2 million since 2006 to support technical education in the form of scholarships, toolkits, technical education program support, and awareness. Its *Tools for Tomorrow* scholarship program offers scholarships and tools to students at over 100 community and technical colleges across the nation to support the goal of completion at these two-year institutions.

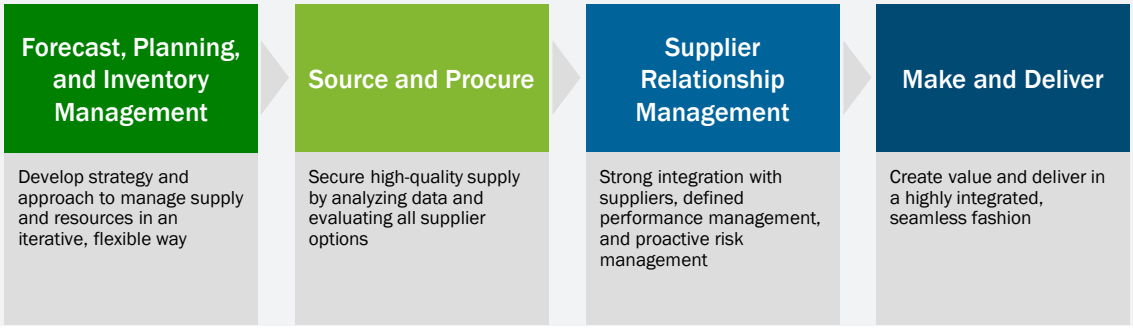
As the Grainger example shows, asserting leadership does not depend on company size. It also means far more than executives taking an interest in the subject and necessitates more than organizational champions. All the evidence in previous studies as well as our research suggests that the problems underlying America's middle-skills gap are structural. They took decades to develop and will take continuous effort to overcome. Companies hoping to avoid the competitive risks posed by the skills gap—or those seeking to build a competitive advantage by addressing it—will need to build a repeatable, documented process that is integral to their strategy and HR function.

Although some businesses are working to build their middle-skills talent pipeline, many employers do not put sufficient focus on influencing the full middle-skills talent supply chain—the overall process by which roles are sourced, developed, deployed, and retained.[52] Many companies have sophisticated talent management processes but focus them on high-skilled, white-collar personnel only. They do not apply the same design principles to middle-skills staff. And, while many companies do employ some of the strategies we describe, few have processes that meet the standards of critical processes in the organization. Executives should beware of the facile reassurance from their organizations that "we're already doing that."

Moreover, companies do not apply the same discipline in sourcing talent as they employ in sourcing other inputs. Most high-performing businesses have established supply chains essential to delivering their products and services (see Figure 17). They ensure continual optimization of the supply chain by employing planning systems, disciplined processes, and metrics. Conversely, the development of talent and skills, especially for the middle-skills workforce, lacks this strategic direction and polished execution.

FIGURE 17: LEADING-CLASS SUPPLY CHAIN COMPETENCIES

High-Performance Supply Chain Capabilities



Most employers' systems for sourcing middle-skills talent could be strengthened in the following ways:

Forecast, Planning, and Inventory Management: Many employers use a reactive approach to filling middle-skills needs.[53] Too few engage in workforce planning; too many assume that workers will be available as needed. That leaves them exposed to the vagaries of the business cycle, when all competitors are presumably adding capacity. More importantly, by failing to anticipate which workforce capabilities are critical to their strategic health, companies risk requiring workers with skills in emerging areas for which there is limited or no supply. Employers need more rigorous middle-skills workforce planning in projecting their requirements and should share those needs with their staff as well as their existing sources of talent.

Their particular focus should be those jobs that are most important to their business strategies. Just as companies design different supply chains to reflect the characteristics of various streams of inputs, firms should discriminate between jobs of genuine strategic import and easily sourced, "commodity" roles. Strategic roles are likely to have several casts—perpetually hard-to-fill jobs, jobs for which there is a dearth of younger workers,[54] positions historically associated with upward mobility in key job categories, or operational bottlenecks that can inhibit growth.

To anticipate future skills gaps and plan for its workforce needs, The Boeing Company created a Strategic Workforce Planning (SWP) group five years ago. The SWP group tracks internal indicators like workforce demographics and business trends as well as external factors such as global conflicts, political changes, and competitor action. The plan not only looks at the short-term needs of Boeing's various business units, taking a five-year view, but also the long-term needs, with up to a 15-year outlook.[55]

Why don't more companies plan for middle-skills talent? We believe that companies measure the costs of job openings too narrowly. Many rely on obvious and relevant metrics, such as the mean time to fill a position and estimates of lowered productivity. However, the all-in cost of the skills gap is seldom fully captured. Costs like increased overtime for existing workers, higher risk of voluntary turnover by overworked staff, downtime of affected capital equipment, and the cost of churn among recent hires who quit or are terminated are not usually captured. The failure to understand those systems economics contributes to the apparent belief of many businesses that the skills gap is not a pressing concern for their bottom line, at least in the short run.

Once companies do understand the hidden costs of constantly seeking middle-skills employees, they begin to find more efficient solutions to close the gap. Standard Motor Products, a manufacturing firm based in New York, found that hiring the wrong employee costs the firm two to three times the employee's annual salary. The data spurred the company to reach out to local community colleges to develop a pool of potential employees as well as provide training to current employees. Standard Motor estimates it has been able to reduce the frequency of their "misses" on hiring from around 50% to close to 10%—saving the firm a significant amount of money.[56]

Companies should also join with other employers—either in their region or from within their industry—to develop better forecasts of skills requirements. This is particularly true of industries that face a demographic transition in coming years, such as aerospace, oil exploration, and electrical utilities. Even the labor union at the Federal Aviation Administration (FAA), the organization responsible for the safety and regulation of U.S. civil aviation, is concerned about the looming skills gap. In a recent report, Edward Wytkind, president of the Transportation Trades Department at AFL-CIO, said: "One-third of the (FAA) workforce, including controllers, inspectors, (and) systems specialists, are eligible to retire (in a few years)."[57]

While any individual company may prove to be a preferred employer consistently, no firm can avoid the repercussions of an inadequate talent supply. Such collaborations can serve to provide sources of talent with more complete data about future requirements, raising the likelihood that companies will invest in response. Moreover, providing a uniform specification defining the skills and capabilities required to fill jobs reduces onboarding costs and the likelihood of early turnovers. Some industry-led partnerships, such as The Manufacturing Institute, have taken on the task of standardizing skills and credentials[58] for occupations and career pathways. However, such industry-wide efforts are far less common in the United States than elsewhere in the developed world. Fewer than 25% of the respondents to the HBS 2013-14 survey indicated that their firms participated in such collaborations.

Source and Procure: The process for procuring middle-skills talent is seldom given the same attention as the process for procuring other inputs, such as components or capital equipment. Companies do not usually cultivate a diverse supply base for middle-skills talent. For example, according to the Accenture middle-skills survey, close to half of U.S. companies *do not* partner with any community or technical colleges, and less than half partner with any community-based organizations.[59] Only 27% of respondents to the HBS alumni survey indicated that their companies have any type of partnership with local community colleges to develop a supply of qualified candidates. Instead of assisting existing suppliers of talent to improve their training and education quality, employers perpetuate a vicious cycle: they upskill positions due to the lack of acceptable middle-skills candidates in the hope that a Bachelor's degree, for example, will get them the right skills. Developing a robust network of suppliers requires sharing the company's evaluation of an aspiring supplier of talent and working with the community or technical college to fix any deficiencies.

Further, many employers do not view their existing workforce as the preferred source of talent. Upskilled positions can put jobs beyond the reach of existing staff too, who bring less formal, but nonetheless potentially important credentials as candidates for promotion. First among these is the demonstrated capacity to work successfully in the employer's operations. Inadequate soft skills often prove the undoing of new hires. Incumbent employees with a track record at a company will have demonstrated their ability to work productively. However, employers locked in a "talent on demand" approach to filling positions forfeit the opportunity to make an investment in upgrading the skills of their existing middle-skill employees, moving them up within the organization—and from left to right in our matrix of Occupational Importance shown in Figure 6.

An HR manager at a large financial services firm interviewed by Accenture recognized the virtues of internal hiring to fill middle-skills roles. The firm developed an internal mobility program that looks for ways to develop and promote from within the firm. The company claims that in 2013, it was able to fill 90 open job postings, about a third of the total open positions, through current employees internally, greatly reducing the cost of finding and hiring outside talent.[60]

Applying such supply chain management thinking to the sourcing of middle-skills talent is one way to bring new discipline to human resources functions in areas such as defining job descriptions, integrating information on the performance of both unsuccessful and successful job candidates, and working with educators to translate emerging requirements into pedagogy.

This is particularly true of those middle-skills jobs that are increasingly being upskilled. Consider office and administrative roles, which represent a large portion of middle-skills demand. According to Burning Glass estimates, such jobs account for 21% of all middle-skills job postings. The skills in many of these roles have changed over time, becoming increasingly technology-focused, for example (an understandable upgrading of skills), but employers are also using a Bachelor's degree as a screening mechanism for job readiness in many cases.

According to Burning Glass, among currently employed office and administrative workers—such as executive secretaries and insurance claims clerks—only about one in four holds a Bachelor's degree, compared with 45% of job postings requesting a Bachelor's degree for the same roles. A comparison of job postings shows no apparent difference between the skills demanded in Bachelor's degree and sub-Bachelor's degree administrative job postings. By upgrading to a Bachelor's degree requirement, employers are limiting their access to perfectly well-matched talent that is already available—and burdening themselves with the costs of keeping the position open.

Supplier Relationship Management: Employers generally do not treat community and technical colleges (the main source of middle-skills talent) as they treat other suppliers of critical inputs. Communication and collaboration are haphazard. Job requirements and staffing needs are described vaguely and conditionally. While some sectors, such as manufacturing and healthcare, demonstrate a greater willingness to form partnerships with local community colleges,[61] most companies do little to clearly communicate their needs to suppliers of talent. While businesses define clear success metrics and goals for their traditional suppliers, they seldom provide such data to educational institutions. Educators frequently complain that they can get no clear explanation as to why their graduates are not getting placed despite having credentials for jobs for which there are numerous postings. It's another vicious cycle perpetuated by lack of communication between players.

A classic example of the breakdown in communications is in the demand for medical coders. Due to changes in America's healthcare system, demand for medical coders is skyrocketing. At first sight, the data indicate the market for medical coders should be in equilibrium. Burning Glass analytics reports that there are nearly as many medical coding graduates as there are online postings for medical coding positions—in 2013 there were 33,923 medical coding graduates and 45,185 medical coding postings for new graduates. Add the substantial subset of about 125,000 current coders who may be looking for a new job and we can assume that there is a robust supply of talent, or even an oversupply of medical coders.[62]

However, medical coders consistently rank among the hardest-to-fill middle-skill jobs. In Accenture's middle-skills survey, 29% of healthcare employers named medical coders as one of their three hardest-to-fill roles, and Burning Glass analytics place medical coders in the top 20% hardest-to-fill middle-skill occupations. A closer look at the situation shows that the demand-supply mismatch is due to a shortage of *certified* coding talent. Although there were 33,923 medical coding graduates in 2013, only about 20,000 individuals took and passed the medical coding certifications necessary to secure a full-time coding position.[63] The adoption of expanded ICD-10 coding standards further exacerbates the hiring difficulties for medical coders by adding layers of complexity to these roles and forcing experienced coders to update their existing skills through additional training.

No supplier of middle-skills talent can be reasonably expected to provide consistently high-quality input under such conditions. Developing a robust supply chain of any type requires continuous investment in a relationship with partners in the system, especially in communications. The parties collaborate in establishing shared metrics, developing standards and communications protocols, and in the exchange of data about actual results. Committing to

building ongoing relationships will provide both parties insights about how to improve the efficiency of the system as a whole. Employers must commit to forging these types of relationships if they are to overcome the skills gap.

Examples of forward-thinking partnerships can be found, but they are the exception rather than the norm. Innovate+Educate, an industry-led nonprofit, for example, is working to implement "skills-based hiring" that encourages employers to look at other pathways beyond a Bachelor's degree for workforce readiness. In the City of Albuquerque, Innovate+Educate is working with the New Mexico Department of Workforce Solutions and the state's largest community college to bring together employers and potential employees on a common platform of hiring by scoring skills. The TalentABQ website helps assess potential employees' job readiness by testing for skills such as "reading for information" or "workplace observation." Based on the skill scores, TalentABQ then helps match applicants to employers who have posted jobs asking for those skills—and connects employers to candidates who might have been rejected in the traditional hiring process.[64]

Make and Deliver: Many employers are not taking responsibility or investing in employee talent development; they expect the talent they need to be developed elsewhere. Most companies express little interest in on-the-job talent development. The Accenture survey revealed that fewer than one in four companies will *always* consider bringing someone on who requires additional training when they are having trouble filling a role.[65] Another disheartening trend in the U.S. is that despite success in other countries, there is a decided lack of internships for middle-skills jobs, and apprenticeship programs are rare. Only 41% of companies offer any type of internship or apprenticeship for middle-skills jobs, and that number falls to 29% for small companies.[66] Even when internships or apprenticeships exist, many companies are not using these programs as a way to source and groom talent. Finance and insurance companies especially fail to transition interns and apprentices to full-time middle-skills roles (27% offer jobs a majority of the time).[67] In contrast, 52% of manufacturing companies offer jobs a majority of the time.[68] Perhaps this is one of the factors that leads finance and insurance companies to have the hardest time filling middle-skills jobs.[69]

If companies are to take the lead in eliminating the skills gap, they must develop integrated talent pipelines. Along with working closely with educators and workforce intermediaries, they must develop complementary internal programs, such as apprenticeships, to exert control over their sourcing of key resources. Most importantly, they must stay engaged with their suppliers of middle-skills talent. Improving the systems economics of the talent pipeline will require a long-term institutional commitment.

Companies should consider how to enlist governments at the local, state, and federal levels in their effort to reduce the middle-skills gap. Rather than lobby government leaders for temporary incentives, such as tax credits, their focus should be on steps to remove barriers that may inhibit more effective industry partnerships and deeper collaborations with educational institutions.

Summary of recommendations for employers:

- Apply supply chain management principles to sourcing of middle-skills talent and invest in a permanent process of continuous improvement.
- Engage in workforce planning to identify strategically relevant middle-skills capabilities and build roadmaps for closing potential gaps.
- Build comprehensive middle-skills job descriptions based on core capabilities, articulating competency requirements and avoiding unnecessary upskilling.
- Develop an accurate understanding of the all-in costs of job openings and employee turnover, particularly for competitively relevant positions.
- Commit to ongoing, preferred relationships with sources of middle-skills talent and invest in partnerships to develop and vet curriculum, share metrics, and hire qualified candidates.
- Provide educators and other resources with clear statements of skills profiles and anticipated staffing requirements.
- Cultivate talent pipelines to meet specific needs and spark interest in middle-skills careers through a blend of in-depth internship and apprenticeship programs, internal training programs, and community partnerships.
- Identify opportunities to work in conjunction with other regional and/or industry employers to standardize job descriptions and build the talent pool.

The Challenge for Small and Medium Enterprises

Implementing a supply chain management approach to address the middle-skills gap may seem beyond the means of small and medium enterprises. However, it is precisely because these firms lack the resources of larger companies that finding a systemic means for filling their middle-skills needs is imperative. Such companies will benefit meaningfully, albeit indirectly, if larger employers in their sectors adopt supply chain management principles. Moreover, as workforce providers become more adept at identifying and responding to the needs of employers, they will help small and medium enterprises be more effective customers for talent. Increasingly, states are launching programs that recognize the importance of smaller employers in job creation. For example, South Carolina's Apprenticeship Carolina program provides support for any company providing a single job. Groups such as local Chambers of Commerce can work independently and with local workforce development boards to help provide smaller companies with "virtual" scale.

Educators: Build Effective Partnerships with Employers

Community and technical colleges—and even high school career and technical education programs—will play an indispensable role in any broad effort to restore America's advantage in skilled labor. To do so, they will need to become comfortable forging a new type of relationship with employers. That will require some fundamentally new thinking about the ways in which community and technical colleges develop, update, and evaluate their programs.

Some colleges are making great strides in preparing students for middle-skills jobs; however, there are a multitude of challenges these educational institutions face. Although these institutions see great value in partnering with local employers, most often there is a lack of institutionalized communication and information sharing. While employers must lead the way in forming effective partnerships with community and technical colleges, educators must also take steps to encourage and complement those efforts.

Becoming an Effective Partner in the Talent Supply Chain: The notion of becoming a "supplier" may be alien or even objectionable to educators. This recommendation, however, in no way compromises the traditional mission of community and technical colleges. Rather, it provides a basis for better fulfilling one of those institutions' overarching missions: providing a basis for the students they serve to achieve success in life. When correctly applied, supply chain management creates better outcomes for all the players in the system. In middle-skills talent, it should benefit employers through faster hiring cycles, more qualified workers, and lower turnover. For educators, it should lead to faster placements for graduates, higher enrollment, and improved performance relative to metrics applied by governments or other funders. Above all, for students, it should help create pathways into the workforce such that workers enjoy a lifetime of career security and are armed with the ability to earn a decent livelihood.

Becoming such an effective partner requires educators to respond to employers' overtures about their needs and help them understand how to align their recruiting process with the institution's curriculum and resources. It also requires gaining a deep understanding of employer requirements and making them central in designing and evaluating programs. In Charlotte, N.C., in 2008, when Siemens expressed a need for workers with advanced manufacturing skills, the Central Piedmont Community College did not just send résumés to Siemens. Four faculty members traveled to Germany to get certified on Siemens' advanced manufacturing processes, and the community college began offering an Associate Degree in Applied Science in Mechatronics Technology as per Siemens' specifications. Today, many more community colleges are keen to forge such partnerships. The American Association of Community Colleges now lists, by state and industry, the college-industry partnerships that are already flourishing.[70]

Introduce Employers to Supply Chain Best Practices: Educators should advance their own "enlightened self-interest" by helping employers who have yet to adopt a supply chain management approach to hiring. Developing competence in how to help employers be better "customers" will attract more recruiters to campus and hone a school's skills in working with employers. This is a particular need of small and medium enterprises that lack the resources to develop an integrated approach to source middle-skills talent.

Focus on the Nature of Work, not Merely Technical Requirements: The dynamism bred of technological change, globalization, and evolving customer needs makes it impossible to forecast the specific skill sets required for the future. However, workers who enjoy sustained success on a job show that they understand the work—the fundamentals of basic processes as well as the attributes of various products and technologies—and they have the capacity to learn new skills as change is introduced to the workplace. There is a profound difference between understanding skills related to a specific technology versus skills related to the nature of the job as a whole. In developing and revising curricula, educators should consider how to cultivate in students the heuristics to understand the nature of their roles and their place in the broader context of their employers' industry.

Monitoring and Responding to Labor Market Trends: The market for middle-skills jobs has never been so dynamic. Aligning curricula with the needs of employers requires that educators monitor local labor markets to detect the appearance of new positions. Educators and workforce intermediaries also need to invest in understanding the likely evolution of workforce requirements in the future. A more effective dialogue with leading local employers and early identification of emerging jobs should help develop this understanding. It will also serve the needs of students. Accenture research shows that just 4% of jobseekers say that schools and universities are the best source of information on job opportunities.[71]

Programs should be regularly reviewed to ensure alignment with local employers' marketplace requirements through a consistent study of available job postings data. The demands on faculty make it difficult to keep up with changes in technology and work practices. Partnering with employers will help reduce any gap between curricula and commercial leading practices. Institutions should direct resources at occupational categories, such as sales, for which there is consistent demand for workers but that are often underrepresented in curricula. This will require reviewing whether the institution's deployment of resources reflects the current and projected composition of the regional economy, rather than legacy industries.

Take on the Soft-skills Challenge: Our survey of the literature on middle skills and our own research confirms the criticality of soft skills in securing employment. Soft-skills deficits are denying aspiring workers the opportunity to benefit from their work in earning credentials. One in four HR leaders called out soft skills, such as work ethics, communications, teamwork, and leadership, as a barrier to finding talent for the most difficult to fill jobs in their organization.[72] Although not traditionally the province of academic institutions, they could develop curricula or other resources to complement students' learning in technical areas with the skills and habits necessary to thrive in a workplace. Soft skills are an area where post-secondary educators must consider providing remedial support in order to maximize their students' prospects. Employers can be important partners in such efforts. For example, the 'Gap Inc. for Community Colleges' program provides job shadowing and workshops on Time Management, Workplace Attire, and Conflict Resolution.[73] Similarly, LaGuardia Community College partnered with Accenture to provide the 'Skills to Bookkeeping' scholarship program to low-income, non-native English speakers with experience in bookkeeping. The curriculum focused on language skills, résumé writing, interview coaching, and other professional skill building.[74]

Focus on Career Ladders, not Initial Placements: Not all entry-level middle-skills jobs are created equal. Some enjoy important advantages—links to ladders for advancement, less susceptibility to technological substitution or offshoring, higher levels of portability across industries—over others. While intrinsic interest in a career and motivation to pursue a course of study must be the primary reasons for guiding a student, educators and guidance counselors should provide students with insight about the long-term implications of career choices. That will help maximize the returns students receive from their investment of time and tuition dollars in education.

Summary of recommendations for community and technical colleges:

- Work with employers to forge supply chain partnerships.
- Spread effective best practices to other recruiters.
- Invest in information resources on the job market.
- Shift resources to reflect composition of current job market and emerging trends.
- Broaden curriculum to incorporate soft skills.
- Focus on career lifetime value and ladders of advancement.

Policymakers: Facilitate Communications and Data Sharing

Local, state, and national governments are all deeply involved in skills development. In a number of countries, comprehensive national solutions, such as an integrated virtual labor market, have significantly reduced the demand-supply gaps in skills. Although the systems in countries like Germany, Switzerland, Denmark, and Australia offer many valuable lessons, they reflect the unique economic and social development of those countries. Such systems, which rely on techniques like early tracking in the education system, are not a natural fit in the American context.

Historically, government entities at all levels have invested tremendous resources to enforce compliance with various laws and regulations. In the future, government leaders would be well served to redirect these resources to bring about better collaborations between employers and educators and workers and students. That would entail government at each level—national, state, and local—reviewing systematically the myriad of programs that support skills development. Given the tremendous changes in the economy over the last quarter-century, many established government skills programs are, unsurprisingly, no longer effective. Resources should be directed to those areas that make the market for middle-skills talent more efficient, such as:

Creating Better Real-time Data: The quality and timeliness of the information available to employers, educators, and job seekers are poor, especially when the U.S. is compared to other developed economies. The gold standard of course is Germany. Its federal employment agency launched the Virtual Labor-Market Platform (VLM) as an effort to improve the matching of employee skills with employer needs. The platform now brings together diverse players such as employers, job-seekers, training institutions, public organizations, and private recruiters on a common vision by giving them access to a consistent, centralized database. During the implementation period the VLM system accounted for 1.1 million job vacancies and 3.8 million applicant profiles. With those numbers, it is no surprise that VLM quickly won over users from both the supply and demand side. According to the European Union's database of labor market practices: "Every week, the online portal accounted for an average of 18,500 new registered jobseekers and 1,600 new registered companies."[75]

In the United States, information about job placements, job openings, compensation levels, and prospects for advancement is highly fragmented. For example, 83% of small and medium employers (companies with fewer than 1,000 employees) say that they only have some or no access at all to information on where to find candidates with the right skills.[76] Job seekers find the assistance and information available from government insufficient as well. A paltry 11% of job seekers turn to the public employment systems in search for a job. They report preferring online job boards (30%) or their personal network (15%) as means for searching for work.[77] Individual states have begun to adopt innovative practices. For example, Ohio has developed OhioMeansJobs. The online job-matching tool provides data on in-demand jobs by region and helps Ohio citizens plan better for available careers.[78] However, the absence of comprehensive data nationwide inhibits the workings of the market for middle-skills workers.

Policymakers can play a key role in facilitating the skills ecosystem by investing in systems that capture jobs data regionally, in such a way that the data ignore artificial administrative boundaries such as school districts, county, and even state lines. It goes without saying that such a system should capture data on job placements, as well as postings, in order to filter out redundant postings. Most importantly, government leaders should work with local employers to identify skills and competencies that are in chronic short supply, or in growing demand, and especially those that offer workers a higher lifetime value.

Encouraging Cooperation among Employers: The government rightfully applies restraints on competitors' communicating. However, encouraging companies to work through industry associations or other groups to create comprehensive, current job descriptions can contribute materially to closing the middle-skills gap. Developing such shared definitions is essential to providing workers with portable, stackable credentials.[79]

Focusing on Small and Medium Enterprises: Small and medium enterprises account for a substantial portion of middle-skills jobs in America. Sourcing talent represents a greater challenge for them, since they lack the discretionary resources and scale to invest in relationships with educational institutions or to develop proprietary apprenticeship or training programs. According to Accenture's survey, 66% of medium-sized businesses (with revenues of $251 million to $2 billion) found it hard to fill middle-skills positions, compared to 52% of large companies (with revenues greater than $2 billion). Providing effective support and incentives for smaller companies should be a particular focus for government.

Supporting and Replicating Successful Not-for-profit Models: Social entrepreneurs have innovated in numerous areas in which the barriers to progress seem insurmountable. Skills development is no exception. Governments at all levels should identify social entrepreneurs with proven track records and work either to attract them to their locale or to replicate the essential parts of their model. For example, Boston-based Year Up provides

young adults in urban markets with training, skills, and experiences that will prepare them for jobs with their business partners. In 2012, 84% percent of Year Up's alumni were working or had gone on to full-time education within four months of graduation. They earn an average starting wage of $30,000 a year.[80] Similarly, Skills for Chicagoland's Future (SCF) is dedicated to understanding demand as the basis for enhancing workforce development in Cook County, Illinois. In 2013, SCF engaged with 25 local employers to obtain commitments to hire 600 unemployed job seekers, a majority of whom were long-term unemployed.[81]

Removing Barriers to Employers and Educational Institutions Adopting Innovative Initiatives: Our research indicates that various government policies inhibit innovations in skills development. For example, community colleges complain that states' departments of education are slow to approve the modification of existing accredited programs or to approve new ones. Employers find the legal risks of having high-school–aged apprentices and interns in their workplace intimidating. Policymakers should identify such impediments systematically and consider policy changes to remove them. Providing tax incentives, challenge grants, and other catalysts to reward experimentation should also be considered.

Integrating Performance Metrics around the Theme of Jobs: Many bureaucracies affect the middle-skills market. Departments of Education and Labor and state and regional economic development boards—these organizations and others all oversee government policies that influence the middle-skills market. All operate with different goals, track different metrics, and deploy their resources against their own strategies. Integrating the activities of these various departments as they relate to employment by using shared, visible metrics would help reduce the drag government policies inadvertently create on job creation.

The passage of the Workforce Innovation and Opportunity Act (WIOA) in July 2014 represents an important opportunity to advance the nation's skills agenda. The legislation standardizes several aspects of workforce training. For instance, states must submit a unified workforce development strategy that cascades from the state down to the local level. Critically, it stipulates the creation of a single set of performance measures. State and local governments will play a vital role in determining the success of this legislation when implementation begins in mid-2015. For example, states will need to establish metrics that capture the effectiveness of programs in the eyes of employers. Such data, captured over time, will help guide the efforts of talent suppliers and facilitate the dissemination of best practices within and across states. Moreover, if made public, it will direct aspiring workers to programs endorsed by employers. WIOA provides policymakers of every political stripe with a singular opportunity to reshape their workforce development systems with meaningful federal support.[82]

Changing the Rhetoric about Higher Education: Government leaders have consistently emphasized the need for students to obtain advanced credentials. However, the rallying cry most frequently invoked to support that noble purpose remains "college for all." That emphasis on obtaining four-year degrees, while aspirational, ignores the demographics of our workforce. Few young Americans will complete such a degree. In 2013, only 34% of Americans aged between 25 and 29 had attained a Bachelor's degree.[83] The "college for all" rhetoric risks devaluing the legitimacy of middle-skills work. Honoring the importance of such work requires reframing our rhetoric, employing strong cultural messages like "post-secondary education for all" and "lifelong education for lifelong employability."

Summary of recommendations for policymakers:

- Support small and medium-sized employers.
- Encourage companies to collaborate in creating opportunity.
- Identify and propagate proven third-party models or social entrepreneurs.
- Incentivize innovation in the relationship between employers and educators.
- Leverage state-of-the-art information systems to provide better transparency to the jobs market.
- Remove barriers to innovation by educators, workforce intermediaries, and employers.
- Align agencies around job creation.
- Embrace middle-skills jobs publicly.

CONCLUSION

America's system of middle-skills development needs a kick-start, and the conditions could not be better. Employers, educators, workforce intermediaries, and policymakers agree that the current system yields unacceptable results. For the first time, all the key players in America's middle-skills ecosystem are primed to reach across silos and work together for reform. Everyone understands the need to reverse the steady erosion of the skills base that is undermining America's competitiveness. The hard work to equip middle-skilled Americans must begin today, if America is to be prepared to do the important work of tomorrow.

The process starts with the principal actors in America's current middle-skills system accepting that they must embrace new roles and adopt new practices. For employers, this means recognizing a simple truth: they have to take ownership for fixing the skills gap in their firm, industry, community, and region. Skilled workers will not appear on demand and ready to be productive *deus ex machina*. Instead, businesses have to be willing to make the investments necessary to close the skills gap: establishing rigorous processes for working with talent suppliers, measuring the true costs of the shortage of skilled labor, investing in improving the skills of incumbent workers, and collaborating with other employers in their industry or region to define skills requirements.

Educators and other providers must embrace unfamiliar—and perhaps initially uncomfortable—relationships with employers. For example, the metrics that educational administrators and the policymakers who fund them use to evaluate the skills development system must be derived from those valued by employers, not independent of them. Educators may also redirect resources to programs that relate to the middle-skills jobs of today, in areas like technical sales, healthcare, and a variety of engineering disciplines. They should certainly make soft skills more integral to the general curriculum and embed them in specific courses that employers identify as critical to hiring decisions. Most importantly, educators must help students develop a sense of ownership over their own careers, earlier in life. Steering students on a pathway to success will include: providing better exposure to workplaces, developing means for probing students' interests, and inculcating an understanding of the varying prospects for advancement in different entry-level jobs.

Policymakers must set aside the notion that they are a third leg of the middle-skills stool. Rather they should embrace the role of enablers of a new system that focuses on aligning the resources of the educational and training systems with the needs of local employers. Removing regulatory and legal impediments to collaboration, providing funding for experimentation and for the scaling of successful models, and vetting new legislation and regulations relative to their broad impact on job creation—these are the kind of interventions that will help catalyze the change American employers and workers want.

While business can and should invest in leading the transformation, it is clear that success will depend on adopting an approach that engages all the stakeholders, especially educators. In recent times, the rise of collective impact[84] organizations—independent "backbone" organizations that facilitate coordination among multiple stakeholders committed to a common shared vision on solving complex issues—offers hope. A collective action approach, in which partners such as educators, employers, and policymakers agree upon a shared agenda and governance model and hold themselves and each other accountable for achieving their objectives, is particularly well-suited to addressing the middle-skills gap. It allows different partners to play to their strengths, relying on a core, professionally managed organization to facilitate progress. Such efforts have already been formed across the country to solve issues ranging from economic development to education reform and healthcare access. Those ready to embrace the middle-skills challenge could adopt and adapt this model.

We hope this report encourages business leaders, educators, and policymakers to bring new energy and determination in addressing America's middle-skills gap. Many collective impact efforts relied on the vision of early champions, who seized the opportunity and engaged a set of like-minded but diverse leaders, intent on bringing about change. It's time now for a new cohort of leaders to step forward in order to put America back to work.

APPENDIX I: METHODOLOGY

A FRAMEWORK FOR UNDERSTANDING OCCUPATION IMPORTANCE TO U.S. COMPETITIVENESS

We developed a framework to map occupations according to their importance to the two fundamental elements of U.S. competitiveness: firms' success in the global economy *and* high and rising living standards for the average American.

Y-Axis: Value to U.S. Business

The "Value to U.S. Business" axis displays how important an occupation is to U.S. business by measuring how much the industry contributes to U.S. competitiveness and how critical each occupation is to the industries in which it is found.

Industry Contribution to U.S. Competitiveness (50%)

- Labor Productivity (25%):[85] How much does the industry produce relative to the compensation its workers receive? Productivity is calculated as a ratio of industry GDP to employee compensation. Bureau of Economic Analysis (BEA) sources for these two metrics, listed respectively:
  - –Annual Industry Accounts: Gross Domestic Product (GDP) by Industry
  - –Regional Economic Accounts (Regional Data): Compensation of Employees by BEA Region. The interactive table showing "Compensation of Employees (millions of current dollars)" is available on http://www.bea.gov/iTable/index_regional.cfm (from the "Compensation of Employees" link within the "Gross Domestic Product by State" group of tables).
- Economic Multiplier (25%): How much of an effect does the industry have on a local/regional economy? Source: BEA RIMS (Regional Industrial Multiplier System) II input-output multipliers (Type I), purchased from the BEA and used for each geography covered in our analysis. https://www.bea.gov/regional/rims/rimsii/

Occupation Criticality to Industry (50%): How important is the occupation to companies' business models? Sources: Accenture Middle-Skills Survey (details in Appendix III on Page 30) and Accenture industry subject-matter experts.[86] Respondents gave each occupation a score from 1 to 10 for each industry on the following scale:

- 1: not critical to business model
- 2-5: moderately critical to business model (e.g., back office, administrative support and corporate functions, facilities/office repair)
- 6-9: critical to business model (occupation focuses on maintaining company's day-to-day operations)
- 10: Extremely critical to business model (occupation and quality of worker drives company's ability to create revenue and margin)

Final scores for each occupation were calculated as weighted averages using Burning Glass data regarding the distribution of each occupation across industries. Occupations were not scored for industries where their distribution was less than 2%, as those scores may have been anomalous.

X-Axis: Career Lifetime Value

The "Career Lifetime Value" axis displays the value of an occupation to a worker by measuring the occupation's average salary and future earning potential.

- Average Salary (50%): How much does the occupation pay on average? Source: Bureau of Labor Statistics, National Occupational Employment and Wage Estimates.
- Future Earning Potential (50%): How much can workers in an occupation make in their most likely next jobs? Sources: Bureau of Labor Statistics, National Occupational Employment and Wage Estimates; Burning Glass résumé database (see below).

Burning Glass mined its database of seven million anonymized résumés collected from recruiting agencies, job boards, corporations, state workforce agencies, and other workforce intermediaries to identify likely career transitions among middle-skill roles. The résumé data were first parsed to identify subsequent occupations held by workers who started in a middle-skill role. Common next-step career transitions for each middle-skill role were identified, counted, and assigned a likelihood of occurrence based upon the percentage of actual workers who made each transition. Next, average OES salaries for the best-fit SOC occupation[87] assigned to each next-step role were used to calculate an average future salary for each transition. The average future salary for each middle-skills role was then calculated by weighting the average salary for transitions originating from that role by each transition's likelihood of occurrence. The average future salary scores were then normalized on a scale of one to ten to arrive at a final Future Earning Potential score.

Note: Data were obtained for the latest available time periods: RIMS economic multipliers, 2010; labor productivity, 2012; average salary, May 2013; occupation criticality, 2014. All Burning Glass data were for 2013.

APPENDIX II: METHODOLOGY

A FRAMEWORK FOR UNDERSTANDING HARD-TO-FILL JOBS

We used a framework similar to our "Importance to U.S. Competitiveness" framework to understand which jobs are hard for businesses to fill and also provide high career lifetime value to workers.

Y-Axis: Hard to Fill

The Hard-to-Fill axis shows how hard it is to fill an occupation based on three attributes of employers' posting behavior: posting duration, posting duplication rates, and resource intensiveness.

- Posting Duration (33%): How long are job postings for the occupation active?
- Duplication Rates (33%): How frequently do employers duplicate postings?
- Resource Intensiveness (33%): How much money do employers spend to fill openings? For example, are they more likely to pay for recruiters or post on expensive job boards?

Source for all three attributes: Burning Glass' database of over 100 million historical online job postings collected from job boards, government agencies, educational institutions, and employer websites.

X-Axis: Career Lifetime Value

This axis uses the same analysis described in Appendix I on Page 29.

APPENDIX III: METHODOLOGY FOR ACCENTURE'S MIDDLE-SKILLS SURVEY

The Accenture Middle-Skills Survey was conducted between January and February 2014 among 809 Human Resources (HR) executives in the U.S. across 18 industries and a range of company sizes and revenues. The online survey was designed by Accenture survey experts and fielded by a third-party firm. The survey aimed to identify and understand issues that HR leaders face in hiring workers, developing skills, and ensuring a sufficient supply of talent to meet the middle-skills jobs required in their organizations. Two-thirds of respondents were HR directors; the remaining third were senior vice presidents of HR and senior managers. Half of the participating companies had revenue over $1 billion, and one-quarter had over 10,000 employees. The margin of error for the survey was 3.4%.

APPENDIX IV: METHODOLOGY FOR HBS' 2013–14 ALUMNI SURVEY

The 2013–14 HBS survey on U.S. competitiveness was designed and conducted by HBS faculty and researchers in conjunction with Abt SRBI, a leading survey research firm. A copy of the survey and a full report on methodology are available at: http://www.hbs.edu/competitiveness/survey.

The field period for the survey was December 12, 2013, to January 17, 2014. Alumni respondents included participants in Harvard Business School's MBA, doctoral, and longer executive education programs. This survey solicited a representative sample of all alumni—15,099 individuals. Of these, 1,947 (12.9%) completed the survey.

Respondents weighed in from 46 U.S. states (66.7% of respondents with known locations) and 72 other countries (33.3%). They ranged in age from 26 to 98 years, and the 75.6% who currently work came from every sector of the economy, with heavy representation in the finance and insurance, manufacturing, professional, scientific, technical, and information sectors. Among the respondents who are currently working, just over 40% reported a title of chief executive, chair, president, founder, owner, managing director, managing partner, or a similar title at the very top of an organization.

APPENDIX V: INITIATIVES FOCUSED ON CLOSING THE MIDDLE-SKILLS GAP IN AMERICA*

Type of Initiative	Name of Initiative	Website/Link
Community/Technical College Initiatives	Air Washington	http://www.airwashington.org/
Community/Technical College Initiatives	Alpena Community College - Sustainable Solutions for NE Michigan: Green Jobs and Clean Energy	http://discover.alpenacc.edu/new_taaccct_grant.php
Community/Technical College Initiatives	American Association of Community Colleges - Virtual Career Network - Health Care	http://www.aacc.nche.edu/Resources/aaccprograms/health/cap/Pages/vcn_healthcare.aspx
Community/Technical College Initiatives	Arizona Sun Corridor - Get Into Energy Consortium	http://az.getintoenergy.com/
Community/Technical College Initiatives	Bismarck State College - Training for Regional Energy in North Dakota (TREND)	http://www.bismarckstate.edu/ceti/news/?NID=222
Community/Technical College Initiatives	Borough of Manhattan Community College (BMCC) - Health Information Pathways	http://www.bmcc.cuny.edu/news/news.jsp?id=10912
Community/Technical College Initiatives	Central California Community Colleges Committed to Change (C6) Consortium	http://c6.whccd.edu/Pages/index.aspx
Community/Technical College Initiatives	Central Community College - Innovations Moving People to Achieve Certified Training	http://www.cccneb.edu/component/content/article/37-201213collegepresidentsannualreport/1069-projectimpact
Community/Technical College Initiatives	Central Piedmont Community College (CPCC) - The Center for Energy Training	http://www.cpcc.edu/energy?searchterm=center+for+energy
Community/Technical College Initiatives	Chattanooga State Community College - Institute of Material Joining and Testing (IMJAT)	http://www.chattanoogastate.edu/engineering-technology/partnerships/imjat
Community/Technical College Initiatives	Chippewa Valley Technical College - Bridges2Healthcare	http://advancewisconsin.org/advance-wisconsin/national/bridges2healthcare/
Community/Technical College Initiatives	City Colleges of Chicago - Reinvention	http://www.ccc.edu/menu/Pages/Reinvention.aspx
Community/Technical College Initiatives	City University of New York (CUNY) - CareerPATH	http://www.cuny.edu/academics/conted/PATH/healthcare/HostosCCPBrochure.pdf
Community/Technical College Initiatives	Cleveland Community College - Mission Critical Operations	http://clevelandcc.wordpress.com/2013/09/18/ccc-receives-23-million-grant-from-the-u-s-department-of-labor-trade-adjustments-assistance-community-college-and-career-training/
Community/Technical College Initiatives	College of Central Florida - Information Technology Careers for Rural Areas	http://www.cf.edu/news/taaccctgrant091913.html
Community/Technical College Initiatives	Colorado Online Energy Training Consortium (COETC)	http://occrl.illinois.edu/projects/transformative_change/tci-consortia-members/coetc/
Community/Technical College Initiatives	Community College Consortium for Bioscience Credentials	http://occrl.illinois.edu/projects/transformative_change/tci-consortia-members/community-college-consortium-for-bioscience-credentials/
Community/Technical College Initiatives	Community College of Rhode Island - Pathways to Advance Career Education Program (PACE)	http://www.ccri.edu/president/archive/2011/federal_grant.html
Community/Technical College Initiatives	Community College System Of New Hampshire (CCSNH) - Regional Advanced Manufacturing Partnership	http://www.ccsnh.edu/news/manufacturing-industry-nh-get-199-million-shot-arm
Community/Technical College Initiatives	Connecticut State Colleges & Universities - Health & Life Sciences Career Initiative	http://www.ct.edu/initiatives/hlsci
Community/Technical College Initiatives	Consortium for Healthcare Education Online (CHEO)	https://cheo.pbworks.com/w/page/59450915/Consortium%20for%20Healthcare%20Education%20Online%20%28CHEO%29
Community/Technical College Initiatives	Contra Costa Community College District - Design It - Build It - Ship It	http://designitbuilditshipit.com/about/

*This is not an exhaustive list, nor has the success of these initiatives been measured or vetted by our team.

Type of Initiative	Name of Initiative	Website/Link
Community/Technical College Initiatives	Delaware Technical & Community College (DTCC) - Maximizing Student Achievement for Employment Success	https://etagrantees.wfgps.cms.uat2.keymind.com/resources/2014/06/09/19/29/de-delaware-technical-and-community-college-maximizing-student-achievement-for-employment-success
Community/Technical College Initiatives	East Los Angeles College - Technology & Logistics Program	http://www.elaclogistics.com/downloads/Working_World_Ad.pdf
Community/Technical College Initiatives	Edmonds Community College - Progressive, Accelerated Certifications for Employment in Information Technology (PACE-IT)	http://www.edcc.edu/pace-it/
Community/Technical College Initiatives	Flathead Valley Community College - Amplifying Montana's Advanced Manufacturing and Innovation Industry	http://www.fvcc.edu/wp-content/uploads/2013/08/June-2013-AMAMII-Newsletter.pdf?61d1e1
Community/Technical College Initiatives	Florence-Darlington Technical College - Accessible Support Services and Instruction for Sustainable Transition to Work (ASSIST) Program	http://assist.fdtc.edu/Default.aspx
Community/Technical College Initiatives	Florida TRADE Consortium	http://www.fltrade.org/
Community/Technical College Initiatives	Fox Valley Technical College - Advanced Manufacturing Pathways PLUS Project (AMP+)	http://advancewisconsin.org/advance-wisconsin/amp/
Community/Technical College Initiatives	Front Range Community College - Colorado Helps Advanced Manufacturers Program (CHAMP)	http://web1.frontrange.edu/catalog/4086.htm
Community/Technical College Initiatives	Greenville Technical College - SC Adult College Completion through E-Learning Resources and Academic Tracks to Employment Consortium (ACCELERATE)	http://www.clemson.edu/centers-institutes/cucwd/news/sc-accelerate-accelerating-adult-education/
Community/Technical College Initiatives	Illinois Green Economy Network (IGEN) Career Pathways	https://igencareerpathways.org/
Community/Technical College Initiatives	Indiana Commission for Higher Education - Indiana Return on Investment Report	http://iwis.in.gov/documents/FullROIRpt.pdf
Community/Technical College Initiatives	Iowa Advanced Manufacturing Consortium (A-IM)	https://go.dmacc.edu/news/Pages/20130425-1.aspx
Community/Technical College Initiatives	Kansas City Kansas Community College - Technical Education Center	http://www.kckcc.edu/academics/academic-divisions/technical-education-center
Community/Technical College Initiatives	LaGuardia Community College (LAGCC) - Skills to Bookkeeping Scholarship Program	http://www.qgazette.com/news/2014-01-29/Features/LaGuardia_CC_Hosts_Bookkeeping_Scholarship_Program.html
Community/Technical College Initiatives	Lake Region State College - Precision Agriculture	http://www.lrsc.edu/programs-3/precision-agriculture
Community/Technical College Initiatives	Lone Star Community College - Energy & Manufacturing Institute	http://www.lonestar.edu/corporatecollege/energy-manufacturing-institute.htm
Community/Technical College Initiatives	Los Angeles Healthcare Competency to Career Consortium (LA H3C)	http://college.lattc.edu/lah3c/
Community/Technical College Initiatives	Macomb Community College - Coalition of Advanced Manufacturing (M-CAM)	http://www.macomb.edu/news/2013/09/news-article2.html
Community/Technical College Initiatives	Maine Community College System - Future for ME	http://www.mccs.me.edu/about/futureforme.html
Community/Technical College Initiatives	Maine Community College System - Maine is IT!	http://www.mccs.me.edu/student/maineisit.html
Community/Technical College Initiatives	Massachusetts Community Colleges and Workforce Development Transformation Agenda (MCCWDTA)	http://www.masscc.org/partnerships-initiatives/redesigning-community-college-education-and-training
Community/Technical College Initiatives	Midlands Technical College - Better Occupational Outcomes with Simulation Training (BOOST) - New Pathways to Healthcare Careers	http://www.midlandstech.edu/boost/
Community/Technical College Initiatives	Missouri Community College Association - MoHealthWINs	http://mccatoday.org/mohealthwins/

Type of Initiative	Name of Initiative	Website/Link
Community/Technical College Initiatives	Missouri Community College Association - MoManufacturingWINs	http://mccatoday.org/momanufacturingwins/
Community/Technical College Initiatives	Motlow College - Workforce Development Pilot Program (WDPP)	http://www.mscc.edu/news/092911LaborGrant.aspx
Community/Technical College Initiatives	Mount Wachusett Community College - Advanced Manufacturing, Mechatronics, and Quality Consortium	http://mwcc.edu/news/2013/09/26/mount-wachusett-selected-to-oversee-15-9-million-multi-state-taaccct-grant/
Community/Technical College Initiatives	Mountwest Community and Technical College - Beacon Project	http://www.mctc.edu/student-services/beacon-project/
Community/Technical College Initiatives	Multi-State Advanced Manufacturing Consortium (M-SAMC)	http://www.msamc.org/
Community/Technical College Initiatives	National STEM Consortium (NSC)	http://www.nationalstem.org/
Community/Technical College Initiatives	North Carolina Community Colleges - SuccessNC	http://www.successnc.org/
Community/Technical College Initiatives	Northeast Wisconsin Technical College - Making the Future: The Wisconsin Strategy	http://newmfgalliance.org/media/35549/dept.%20of%20labor%20grant%203-29-2013.pdf
Community/Technical College Initiatives	Northern Nevada Consortium for Manufacturing and Mining	http://elkodaily.com/news/gbc-to-receive-million-training-grant/article_41101ad0-20be-11e3-9f6b-001a4bcf887a.html
Community/Technical College Initiatives	Northern Virginia Community College - NOVA Credentials to Careers Consortium	http://www.nvcc.edu/c2c/
Community/Technical College Initiatives	Partnership for Accelerated Learning through Visualization, Engagement, and Simulation (PAVES)	http://pavesal.com/
Community/Technical College Initiatives	Passaic County Community College - Northeast Resiliency Consortium	http://www.northjersey.com/news/passaic-county-community-college-receives-9m-federal-grant-to-lead-multi-state-job-training-program-1.694780
Community/Technical College Initiatives	Pine Technical College - Rural Information Technology Alliance (RITA)	http://pinetechnicalcollege.blogspot.com/2013/09/ptc-named-leader-in-18-million.html
Community/Technical College Initiatives	Purdue University - Gallop-Purdue Index	http://www.purdue.edu/newsroom/releases/2013/Q4/gallup-and-purdue-university-partner-to-measure-college-outcomes-with-landmark-study.html
Community/Technical College Initiatives	Raritan Valley Community College - Greater Raritan Workforce Delivery Project (WDP)	http://www.raritanval.edu/admin/research/wdp/index.html?terms=Workforce%20Delivery%20Project
Community/Technical College Initiatives	Retraining the Gulf Coast Workforce through IT Pathways Consortium	http://www.collegetransition.org/about.currentprojects.gulfcoast.html
Community/Technical College Initiatives	Roane State Community College - A Prescription of Healthcare Training in Tennessee	http://www.roanestate.edu/?8303-Rx-Tennessee
Community/Technical College Initiatives	Rochester Institute of Technology - Co-op Program	http://www.rit.edu/co-op.html
Community/Technical College Initiatives	Rogue Community College - Pathways to Allied Health Professions	https://www.roguecc.edu/PSA/2012/N12-105%20grant%20will%20benefit%20RCC%20students%20and%20local%20health%20care%20providers.pdf
Community/Technical College Initiatives	SC Technical College System - readySC	http://www.readysc.org/
Community/Technical College Initiatives	ShaleNET	http://www.shalenet.org/
Community/Technical College Initiatives	Sinclair Community College - Accelerate IT	http://www.sinclair.edu/online/accelerate/?searchTerm=Instruction to accelerate learning
Community/Technical College Initiatives	South Dakota Allied Health Training Consortium	http://www.sintegleska.edu/allied-health.html
Community/Technical College Initiatives	Southeastern Economic and Education Leadership Consortium	http://www.pstcc.edu/grants/seelc.php
Community/Technical College Initiatives	Southwest Missouri Public Safety and Emergency Medical Initiative	http://www.themaneater.com/stories/2012/9/21/missouri-community-colleges-receive-career-trainin/
Community/Technical College Initiatives	St. Louis Community College - Mississippi River Transportation, Distribution, & Logistics Consortium (MRTDL)	http://www.stlcc.edu/Workforce-Solutions/MRTDL/

Type of Initiative	Name of Initiative	Website/Link
Community/Technical College Initiatives	State University of New York (SUNY) Statewide Community College Collaborative - Training and Educational in Advanced Manufacturing (TEAM) Project	http://www.hezel.com/what-s-up/current-projects/117-suny-taaccct
Community/Technical College Initiatives	Strengthening Workforce Alignment in Montana's Manufacturing and Energy Industries (SWAMMEI)	http://mus.edu/2yr/TAACCCT/SWAMMEI%20Abstract.pdf
Community/Technical College Initiatives	Technical Retraining to Achieve Credentials (TRAC-7)	http://www.trac7.org/
Community/Technical College Initiatives	Texarkana College - Health Professions Pathways	https://www.texarkanacollege.edu/academics/health-science-division/healthcare-professions-pathways/
Community/Technical College Initiatives	The National Information, Security, and Geospatial Technologies Consortium	http://nisgtc.org/index.html
Community/Technical College Initiatives	The North Carolina Advanced Manufacturing Alliance	http://advancedmanufacturingalliance.org/
Community/Technical College Initiatives	Tidewater Community College - Virginia RETHINKS Health Sciences Education	http://www.tcc.edu/news/press/jobtraining2011.htm
Community/Technical College Initiatives	Tyler Junior College - ACT-On Retail Management Careers Project	http://www.tjc.edu/info/2004134/professional_and_amp_technical_programs/748/act-on_retail_management_careers_project
Community/Technical College Initiatives	United Tribes Technical College - Tribal College Consortium for Developing Montana and North Dakota Workforce (TCC DeMaND)	http://www.uttc.edu/news/story/102711_01.asp
Community/Technical College Initiatives	Vermont Tech - Institute for Applied Agriculture and Food Systems	http://www.vtc.edu/meet-vtc/centers-institutes/ag-institute
Community/Technical College Initiatives	Vincennes University - Logistics Training and Education Center (LTEC)	http://www.vinu.edu/logistics-training-education-center-ltec
Community/Technical College Initiatives	Virginia's Community Colleges - Virginia Education Wizard	https://www.vawizard.org/vccs/Main.action
Community/Technical College Initiatives	Washtenaw Community College - Intentionally Growing New Information Technology Employees (IGNITE) Program	http://www.wccnet.edu/ignite/
Community/Technical College Initiatives	Waubonsee Community College - Strengthening Transitions, Building Pathways and Improving Achievement for Disadvantaged Workers	http://www.waubonsee.edu/news/archive/2012/20120925durbinGrant.php
Community/Technical College Initiatives	Western Governors University	http://www.wgu.edu/about_WGU/overview
Community/Technical College Initiatives	Wichita Area Technical College (WATC) - National Aviation Consortium (NAC)	http://watc.edu/nac/
Community/Technical College Initiatives	Wisconsin Technical College System - Intentional Networks Transforming Effective and Rigorous Facilitation of Assessment, Collaboration, and Education (INTERFACE)	http://matcitsupport.org/overview/interface-grant/
Corporate Initiatives	Apprenticeship 2000	http://apprenticeship2000.com/
Corporate Initiatives	Business Roundtable	http://businessroundtable.org/
Corporate Initiatives	Greater Omaha Chamber - Intern Omaha	https://www.omahachamber.org/talent-and-workforce/intern-omaha.cfm?
Corporate Initiatives	Accenture / Education For Employment - Programming For The Future	http://www.efe.org/news/item/438-accenture-managing-director-jill-huntley-and-efe-ceo-jamie-mcauliffe-speak-on-partnerships-for-youth-employment-at-davos/438-accenture-managing-director-jill-huntley-and-efe-ceo-jamie-mcauliffe-speak-on-partnerships-for-yo
Corporate Initiatives	Alcoa Foundation - Global Internship Program for Unemployed Youth	http://www.iie.org/en/Programs/Alcoa-Foundation-Global-Internship-Program/About
Corporate Initiatives	Amazon.com, Inc. - Mechanical Turk	https://www.mturk.com/mturk/welcome
Corporate Initiatives	Best Buy - Geek Squad AcademyTM	https://academy.geeksquad.com/
Corporate Initiatives	BMW Manufacturing Co., LLC - BMW Scholars	https://www.bmwusfactory.com/careers/bmw-scholars/

Type of Initiative	Name of Initiative	Website/Link
Corporate Initiatives	Cisco Systems Inc. - Cisco Networking Academy	http://www.cisco.com/web/learning/netacad/index.html
Corporate Initiatives	Discovery Communications, LLC - Discover Your Skills	http://discoveryourskills.com/
Corporate Initiatives	Disney - Disney Institute	http://disneyinstitute.com/
Corporate Initiatives	DuPont / Parkersburg West Virginia University - Learn and Earn Program	http://www.wvup.edu/workforce-community/learn-and-earn/
Corporate Initiatives	Florida Power & Light Company (FPL) - Apprenticeship Degree and Qualification Program	http://www.aspeninstitute.org/policy-work/economic-opportunities/skills-americas-future/models-success/next-era-energy
Corporate Initiatives	Gap Inc. - Gap Inc. for Community Colleges	http://www.aspeninstitute.org/policy-work/economic-opportunities/skills-americas-future/models-success/case-study-gap-community-colleges
Corporate Initiatives	Gap Inc. - This Way Ahead	http://www.gapinc.com/content/csr/html/community/youth.html
Corporate Initiatives	Grainger Inc. - Tools for Tomorrow®	http://www.graingercsr.com/serving-our-communities/skilledtrades/
Corporate Initiatives	IBM - Pathways in Technology Early College High Schools (P-TECH)	https://www-03.ibm.com/press/us/en/presskit/42300.wss
Corporate Initiatives	John Deere - John Deere TECH Program	http://www.deere.com/wps/dcom/en_US/corporate/our_company/careers/students/high_school/high_school.page
Corporate Initiatives	JPMorgan Chase & Co. - New Skills at Work	http://www.jpmorganchase.com/corporate/Corporate-Responsibility/new-skills-at-work
Corporate Initiatives	Luminant - Luminant Power Track	http://www.luminantpowertrack.com/
Corporate Initiatives	McDonald's - English Under the Arches™	http://www.aspeninstitute.org/policy-work/economic-opportunities/skills-americas-future/models-success/mcdonalds-english-under-arches
Corporate Initiatives	McDonald's - Hamburger University	http://www.aboutmcdonalds.com/mcd/corporate_careers/training_and_development/hamburger_university.html
Corporate Initiatives	Microsoft - Elevate America	http://www.microsoft.com/about/corporatecitizenship/en-us/community-tools/job-skills/elevate-america/
Corporate Initiatives	Motorola Solutions - Motorola Moments	http://www.aspeninstitute.org/policy-work/economic-opportunities/skills-americas-future/models-success/motorola-moments
Corporate Initiatives	Pacific Gas & Electric Company (PG&E) - PowerPathway™	http://www.pge.com/about/careers/powerpathway/
Corporate Initiatives	Snap-on, Inc. - Student Excellence Program	http://www1.snapon.com/SEP
Corporate Initiatives	Southwire Company - 12 For Life	http://www.12forlife.com/
Corporate Initiatives	Starbucks Corporation - Starbucks College Achievement Plan	http://www.starbucks.com/careers/college-plan
Corporate Initiatives	Toyota Motor Corporation - Advanced Manufacturing Technician Work/Study Program	http://www.mclean.k12.ky.us/userfiles/1135/Toyota%20Technician%20Program.pdf
Corporate Initiatives	United Parcel Service of America, Inc. (UPS) - Metropolitan College / UPS	http://metro-college.com/ups/
Corporate Initiatives	Volkswagen of America, Inc. / Chattanooga State Community College - Volkswagen Academy	http://www.chattanoogastate.edu/engineering-technology/partnerships/vw-academy/
Corporate Initiatives	Xerox Corporation Ltd. - Workforce Predictive Analytics	http://go.evolvondemand.com/rs/evolvondemand/images/case%20study_Xerox%20Finds%20Precision%20and%20Profit_R2.pdf?mkt_tok=3RkMMJWWfF9wsRonvqjLZKXonjHpfsX56uktUa%2B2lMI%2F0ER3fOvrPUfGjI4ASMdjI%2BSLDwEYGJlv6SgFSLfDMbdn0rgJUxU%3D
For-Profit Entrepreneur	App Academy	http://www.appacademy.io/#p-home
For-Profit Entrepreneur	Code Fellows, LLC.	http://www.codefellows.org/
For-Profit Entrepreneur	Codecademy	http://www.codecademy.com/
For-Profit Entrepreneur	Coder Camps	https://www.codercamps.com/

Type of Initiative	Name of Initiative	Website/Link
For-Profit Entrepreneur	Coding Dojo™	http://codingdojo.com/
For-Profit Entrepreneur	Craftsmanship Academy	http://craftsmanshipacademy.com/
For-Profit Entrepreneur	Dev Bootcamp	http://devbootcamp.com/
For-Profit Entrepreneur	Fullstack Academy of Code	http://www.fullstackacademy.com/
For-Profit Entrepreneur	Galvanize	http://www.galvanize.it/school/
For-Profit Entrepreneur	General Assembly	https://generalassemb.ly/
For-Profit Entrepreneur	Hack Reactor	http://www.hackreactor.com/
For-Profit Entrepreneur	Hackbright Academy	http://www.hackbrightacademy.com/
For-Profit Entrepreneur	Hacker School	https://www.hackerschool.com/
For-Profit Entrepreneur	Kaplan Inc., Metis	http://www.thisismetis.com/
For-Profit Entrepreneur	Launch Academy	http://www.launchacademy.com/
For-Profit Entrepreneur	TeaLeaf Academy	http://www.gotealeaf.com/
For-Profit Entrepreneur	The Flatiron School	http://flatironschool.com/
For-Profit Entrepreneur	The Tech Academy	http://techacademyportland.com/
For-Profit Entrepreneur	Thinkful, Inc.	http://www.thinkful.com/about
For-Profit Entrepreneur	Treehouse Island Inc.	https://teamtreehouse.com/
For-Profit Entrepreneur	Udacity, Inc. - Nanodegrees	https://www.udacity.com/nanodegrees
For-Profit Entrepreneur	Viridis	https://viridislearning.com/
Public Workforce Initiatives	Common Core State Standards Initiative	http://www.corestandards.org/
Public Workforce Initiatives	Employment Advancement Right Now (EARN) Maryland Program	https://www.dllr.state.md.us/earn/
Public Workforce Initiatives	Minnesota Jobs Skill Partnership (MJSP) Program	http://grantsoffice.com/GrantDetails.aspx?gid=4063
Public Workforce Initiatives	Ohio Means Jobs	http://workforce.ohio.gov/JobsForecasting.aspx
Public Workforce Initiatives	U.S. Registered Apprenticeship College Consortium (RACC)	http://www.doleta.gov/OA/racc.cfm
Industry Sector Initiatives	Automotive Manufacturing Technical Education Collaborative	http://autoworkforce.org/About_Us
Industry Sector Initiatives	Manufacturing Institute - Dream It. Do It.	http://www.themanufacturinginstitute.org/Image/Dream-It-Do-It/Dream-It-Do-It.aspx
Industry Sector Initiatives	Manufacturing Institute - Get Skills to Work	http://www.themanufacturinginstitute.org/Skills-Certification/Webinar-Series/2013-04-Get-Skills-to-Work/April-2013-Get-Skills-to-Work.aspx
Industry Sector Initiatives	Manufacturing Institute - M-Badges	http://www.themanufacturinginstitute.org/News-Articles/2013/04/01-NYSCI-STEM-Badges-Meeting.aspx
Industry Sector Initiatives	Maryland Center for Construction Education and Innovation	http://www.mccei.org/mccei/
Industry Sector Initiatives	National Institute for Metalworking Skills, Inc. (NIMS)	https://www.nims-skills.org/web/nims/home
Industry Sector Initiatives	North Coast Marine Manufacturing Alliance	http://www.northcoastmma.org/
Industry Sector Initiatives	Ohio Regional Information Technology Engagement (RITE) Board - Get I.T. Here	http://www.getithere.net/
Industry Sector Initiatives	Pacific Northwest Center of Excellence for Clean Energy	http://cleanenergyexcellence.org/about/
Industry Sector Initiatives	Right Skills Now	http://rightskillsnow.org/
Industry Sector Initiatives	Skill Works - Emergency Medical Careers Partnership (EMCP)	http://www.skill-works.org/workforce-partnerships-phase-2.php
Industry Sector Initiatives	Skill Works - Green Construction Program	http://www.skill-works.org/workforce-partnerships-phase-2.php#partnership5
Industry Sector Initiatives	Skill Works - Healthcare Training Institute (HTI)	http://www.skill-works.org/workforce-partnerships-phase-2.php#partnership2

Type of Initiative	Name of Initiative	Website/Link
Industry Sector Initiatives	Wisconsin Industry Partnerships Project	http://www.cows.org/_data/documents/1489.pdf
Industry Sector Initiatives	Wisconsin Regional Training Partnership (WRTP)/BIG STEP	http://www.wrtp.org/index.php
Industry Sector Initiatives	Lancaster County Workforce Investment Board - Industrial Maintenance Training Center of Pennsylvania	http://www.lancastercountywib.com/partnership-information/industrial-maintenance
Intermediary / Non-Profit Initiatives	A Billion + Change	http://www.abillionpluschange.org/
Intermediary / Non-Profit Initiatives	ACT - Work Ready Communities	http://workreadycommunities.org/
Intermediary / Non-Profit Initiatives	American National Standards Institute (ANSI) - Energy Efficiency Standardization Coordination Collaborative (EESCC)	http://www.ansi.org/standards_activities/standards_boards_panels/eescc/overview.aspx?menuid=3
Intermediary / Non-Profit Initiatives	American Society for Training & Development - Association for Talent Development	http://www.astd.org/
Intermediary / Non-Profit Initiatives	American Welding Society	http://www.aws.org/w/a/
Intermediary / Non-Profit Initiatives	Apprenticeship Carolina	http://www.apprenticeshipcarolina.com/
Intermediary / Non-Profit Initiatives	Aspen Institute - Skills for America's Future	http://www.aspeninstitute.org/policy-work/economic-opportunities/skills-for-americas-future
Intermediary / Non-Profit Initiatives	Association for Career & Technical Education	http://www.acteonline.org/
Intermediary / Non-Profit Initiatives	Center for Energy Workforce Development (CEWD) - Get Into Energy	http://www.cewd.org/state-consortia/
Intermediary / Non-Profit Initiatives	Corporation for a Skilled Workforce	http://skilledwork.org/
Intermediary / Non-Profit Initiatives	JOBipedia	http://jobipedia.org/#sthash.XlZKMaP9.CsxXgTZh.dpbs
Intermediary / Non-Profit Initiatives	Jobs For The Future	http://www.jff.org/
Intermediary / Non-Profit Initiatives	Khan Academy	https://www.khanacademy.org/computing/cs
Intermediary / Non-Profit Initiatives	Manufacturing Works - Chicago Workforce Center	http://www.chicagomfgworks.org/index.html
Intermediary / Non-Profit Initiatives	National Skill Development Corporation	http://nsdcindia.org/
Intermediary / Non-Profit Initiatives	National Skills Coalition	http://www.nationalskillscoalition.org/
Intermediary / Non-Profit Initiatives	National Youth Employment Coalition	http://www.nyec.org/
Intermediary / Non-Profit Initiatives	Opportunity Nation	http://opportunitynation.org/
Intermediary / Non-Profit Initiatives	Science + Technology Education Innovation Center	http://www.sciencecenterofpinellas.org/eic/industry-partnerships.html
Intermediary / Non-Profit Initiatives	Skills for Chicagoland's Future	http://www.skillsforchicagolandsfuture.com
Intermediary / Non-Profit Initiatives	Technical College System of Georgia - Quick Start	http://www.georgiaquickstart.org/
Intermediary / Non-Profit Initiatives	The San Francisco Foundation - Bay Area Workforce Funding Collaborative	http://sff.org/programs/core-program-areas/community-development/bay-area-workforce-funding-collaborative/
Intermediary / Non-Profit Initiatives	Workforce Intelligence Network (WIN)	http://win-semich.org/
Intermediary / Non-Profit Initiatives	Year Up	http://www.yearup.org/

Notes

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[27] Michael E. Porter and Jan W. Rivkin et. al., "*An Economy Doing Half Its Job*," September, 2014. The survey authors were concerned that the phrasing of the survey questions would unduly influence responses. To guard against that possibility, they randomly split the respondents into two groups for the top two questions in Figure 3. So for example, half were presented the statement, "My firm's U.S. operations prefer to invest in technology to perform work when possible rather than hire or retain employees," and the other half read, "My firm's U.S. operations prefer to hire or retain workers when possible rather than invest in technology to perform work." For the former statement, 53% agreed and 19% disagreed. For the latter, 39% disagreed and 32% agreed. The 46% reported in the text is the average of those who agreed with the former statement and those who disagreed with the latter. The second question on relying on vendors was handled in the same manner.

[28] Accenture Research, Accenture Middle-Skills Survey, February 2014.

[29] Authors' note: The 7.3 million online postings for middle-skill jobs in 2013 do not necessarily correspond to 7.3 million open positions. Some postings for a specific position may be posted multiple times, for example, if an employer was initially unsuccessful in filling the role. In other instances, an employer may post only one job description to fill multiple positions. For both these reasons, there is no one-to-one correspondence between online postings and open positions.

[30] To quantify online postings for middle-skills jobs, Burning Glass first used its analytics to determine whether an occupation is commonly open to job seekers without Bachelor's degrees. After eliminating jobs that are not commonly open to such workers, Burning Glass deemed as "middle-skill" all remaining jobs from the following occupation families: Architecture and Engineering; Business and Financial Operations; Community and Social Services; Computer and Mathematical; Construction and Extraction; Education, Training, and Library; Healthcare Practitioners and Technical; Healthcare Support; Installation, Maintenance, and Repair; Legal; Life, Physical, and Social Science; Management; Office and Administrative Support; Production; Protective Service; Sales and Related; Transportation and Material Moving. For all other occupation families, an occupation was identified as "middle-skill" if at least 20% of its postings required postsecondary education below the Bachelor's degree level (such as an Associate's degree).

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[32] Occupation groups are defined by the Bureau of Labor Statistics' Standard Occupation Classification system.

[33] Burning Glass Technologies' real-time labor market data, 2013.

[34] Occupation groups with very low numbers of middle-skills jobs in the private sector have been removed (Protective Service; Community & Social Services; Life, Physical & Social Science; Arts, Design, Entertainment, Sports & Media).

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[38] Burning Glass Technologies' real-time labor market data, 2013.

[39] Ibid.

[40] Ibid.

[41] Willy C. Shih, "What It Takes to Reshore Manufacturing Successfully," *Sloan Management Review*, Fall 2014.

[42] See for example Richard J. Murnane and Frank Levy, "Teaching the New Basic Skills: Principles for Educating Children to Thrive in a Changing Economy." The Free Press, 1996.

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[49] See Gary P. Pisano and Willy C. Shih, "Restoring American Competitiveness," *Harvard Business Review*, July 2009. Also see Rosabeth Moss Kanter, "Enriching the Ecosystem," *Harvard Business Review*, March 2012.

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[55] Phone interviews conducted by Accenture with Human Resources Leaders, June–August, 2014.

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[87] "OES" refers to the Bureau of Labor Statistics' Occupational Employment Statistics program, which produces the National Occupational Employment and Wage Estimates. "SOC" refers to the federal government's Standard Occupational Classification system.

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