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THE EQUIPMENT INDUSTRY TECHNICIAN SHORTAGE: CAUSES, IMPACTS, AND POLICY RECOMMENDATIONS

By Danny Berg, Josh Klein, and Will Nisbet

Assessing the skills gap, its causes, and possible solutions

There is a skills gap that has profound impacts on businesses, with a variety of factors contributing to its existence. Combating the skills gap involves improving visibility in high schools, developing partnerships amongst stakeholders, and improving workforce development programs.

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[1] This report was prepared by Danny Berg, Josh Klein, and Will Nisbet for Associated Equipment Distributors and the Associated Equipment Distributors Foundation with the help of research assistant Jake Hoioos and faculty advisor John Parman, PhD. This report was compiled as part of the Policy Research Seminar capstone course for a Master's in Public Policy through the William & Mary Public Policy program. The views expressed in this report are those of the authors and do not necessarily reflect the views of AED or the AED Foundation.

1 | EXECUTIVE SUMMARY

A skills gap refers to a mismatch between the skills that businesses are looking for in employees and the skills present in the workforce, which makes it difficult for businesses to hire and expand. This report focuses on a shortage of technically skilled workers in the heavy equipment distribution industry. Businesses in this industry distribute, rent, and support heavy equipment that is used in construction, mining, power generation, and a variety of other sectors.

Analyses of economic trends and of a survey of AED distributor members conducted in the summer of 2015 indicate the anecdotal evidence of a technical skills gap is also borne out in the data. AED members report significant difficulty in recruiting technicians, with the primary cause of this difficulty being a lack of technical skills among job applicants. A similar trend appears in the broader economy.[2] Respondents to the AED survey also report a job opening rate (the percent of jobs going unfilled) more than three times the national average. These factors indicate a significant mismatch in skills that is hampering businesses' ability to hire, grow, and serve customers.

The skills gap has significant negative effects on companies' bottom lines and on their ability to grow. Studies of the manufacturing industry indicate that businesses may be foregoing 11% of earnings and 9% of revenue due to the skills gap and the inability to hire qualified workers. Among AED members, more than 50% report that the inability to find qualified technicians hinders business growth and increases costs and inefficiencies. More than 60% say that the skills gap makes it difficult to meet customer demand.

A variety of causes are likely to blame for the technical skills gap. Chief among them are failures in the technical education system, retiring Baby Boomers, and poor visibility and perception of vocational careers among youth. Programs in workforce development at the federal level are often focused on re-skilling workers or targeting at-risk demographics but not on helping youth who want to pursue a technical career, as evidence by the eligibility requirements for the centerpiece of workforce development legislation, WIOA.[3] The lack of new technical workers is exacerbated by retirement of Baby Boomers. Among manufacturing executives, 93% say that Baby Boomers retiring are an issue contributing to the skills gap. Finally, data from both the equipment industry and the broader economy indicates that there is a poor perception of technical careers. Respondents to the AED survey report that youth are being pushed away from vocational education tracks and towards 4-year degrees. Other studies find only 37% of parents would encourage their child to pursue a technical career.[4]

Addressing the skills gap requires the input of all stakeholders to further coordinate and develop effective policy initiatives. Analysis of workforce policy in South Carolina highlights the potential benefits of cooperation between businesses and schools to create formalized apprenticeships programs. In Washington, detailed tracking of workforce programs has provided lawmakers and stakeholders with concrete insights into the effectiveness of a variety of policies. Outside of government, cooperation between technical schools and businesses has proven effective to share curricula that best prepare students for vocational careers. Finally, addressing the skills gap requires engagement with students and parents at the high school level to increase their awareness of viable technical careers and to give interested students the resources they need to pursue these professions.

[2] Deloitte "The skills gap in U.S. manufacturing 2015 and beyond," 2015, *Manufacturing Institute*
[3] "Workforce Innovation and Opportunity Act (WIOA): Interim Program Guidance for Adult, Dislocated Worker, and Youth Programs", accessed December 20, 2015,https://dwd.wisconsin.gov/wioa/pdf/py15_wioa_ib_program_guidelines.pdf
[4] Deloitte "Overwhelming Support U.S. public opinions on the manufacturing industry," 2014, *Manufacturing Institute*

The Equipment Industry Technician Shortage: Causes, Impacts, and Policy Recommendations

ASSESSING THE SKILLS GAP, ITS CAUSES, AND POSSIBLE SOLUTIONS

2 | INTRODUCTION

A skills gap refers to a mismatch between the skills that businesses are looking for in new employees and the skills present in the workforce. This in turn makes it difficult for businesses to hire and expand. Of specific concern is a skills gap in jobs that require vocational skills, namely a shortage of technically skilled workers in the heavy equipment distribution industry, which is represented by Associated Equipment Distributors (AED). The businesses in this industry require skilled technicians to repair and maintain equipment, which member businesses rent or sell to consumers.

Research and analysis of skills gaps have garnered significant attention in recent years and for good reason. A lack of skilled workers hampers business growth and can produce a drag on the economy. Previous anecdotal reports from members of AED suggested that they were facing their own skills gap that made it difficult to recruit technicians. This report will delve into these concerns through an analysis of economic trends, workforce development policies, and of a survey of AED equipment distributor members.

In the summer of 2015, AED developed and disseminated a survey to its equipment dealership members. The survey collected data on each respondent's company profile, their recruiting habits, and their perceptions of the skills gap. This data provides a link between the experiences of AED members and broader national trends.

Connecting what is observed among AED dealership members to larger industries is key to illustrating that addressing the skills gap is not just an issue for AED but for the whole economy. Manufacturing was chosen as an analogous technical industry in the broader economy. An important portion of this analysis is to compare and connect trends found in AED members with the experiences of wider sections of the economy. Manufacturing is an industry that is facing a shortage of technical workers and which makes up a large portion of the American and Canadian economies. This analogue provides an opportunity to identify trends, causes, and effects of the skills gap that might not appear in the AED survey alone.

2.1 | Survey Methodology

Anecdotal evidence from AED dealership members had suggested the possibility of a shortage of qualified technicians. In order to gain concrete insights into the recruiting difficulties of dealerships, AED and the AED Foundation created and released a survey to its 430 dealerships in the United States and Canada. Surveys were both mailed to the dealership and made available online. The surveys were then collected online and by mail, email, and fax. Cross-referencing data, including IP addresses for online submissions,

ensured that no member submitted duplicate surveys. In total 105 members responded, representing roughly 24% of members.

The surveys collected represented a sample that was skewed in terms of revenue. Using data from the number of members in various dues categories, it is evident that the sample has significantly fewer of the smallest members, less than $5,000,000 in revenue, than expected and more medium size businesses than expected. Unless noted, the metrics taken from the data do not appear significantly correlated with revenue so it is likely the data does speak to the experiences of the rest of the AED membership extrapolated to the rest of the AED membership and the heavy equipment industry.

2.2 | The Client

Established in 1919, AED is an international trade association based in Oak Brook, Illinois representing more than 800 construction equipment distributors, manufacturers and industry-service firms nationwide. AED members sell, rent, and service equipment and engines for heavy and light construction, mining, agriculture, forestry, quarrying, and industrial applications. The AED Foundation (AEDF) addresses professional education and workforce development for the equipment industry. AEDF's activities include industry and accrediting diesel-equipment technology college programs.

3 | THE SKILLS GAP

There is a skills gap in jobs that require technical skills, with a specific shortage of technically skilled workers in the heavy equipment distribution industry, which is represented by AED. The businesses in this industry require skilled technicians to repair and maintain equipment, which they in turn rent or sell to consumers. Manufacturing provides the best analogue for AED's membership in a larger sector for the economy. The broad manufacturing sector represents around 12% of the United States' yearly Gross Domestic Product, with yearly revenues of upwards of $2 trillion. This makes the manufacturing industry at large around 80 times larger than AED's membership.[5] Both the equipment distribution industry and the manufacturing industry are experiencing a lack of technically skilled workers available to fill positions requiring technical training, as borne out in surveys of businesses in both sectors. The AED member survey and broad economic studies provide an opportunity to identify the skills gap and its effects in concrete rather than anecdotal terms.

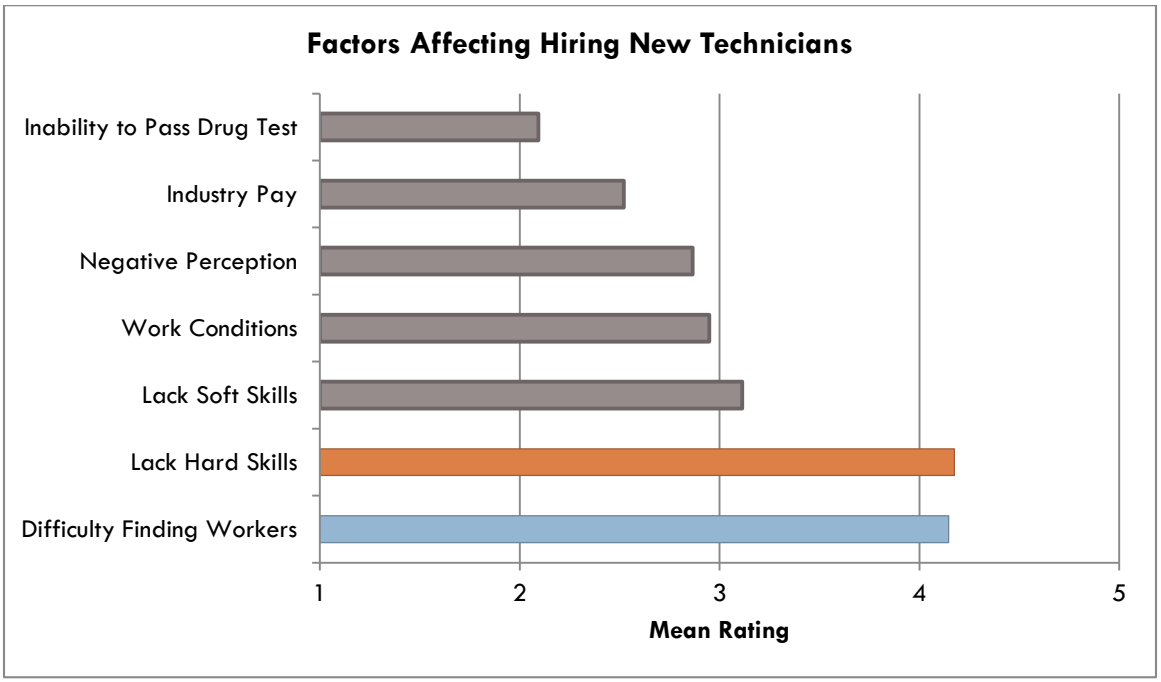
While there are certainly differences between the heavy equipment and manufacturing industries, there are similarities between the natures of the skills gap affecting their workforces. These connections between the experiences provide a broader context for the challenges facing businesses due to the shortage of technical workers. The link between the issues faced by manufacturers and AED members, both in terms of the existence of the skills gap and looking at the issues created by the lack of technically skilled workers, is critical when looking at the role of the skills gap in the economy today. The shortage of technically skilled workers could be costing the US economy upwards of $180 billion in revenue in affected sectors alone.[6] An important consideration is also the industries impacted in the fallout of the skills gap for heavy equipment and manufacturing.

[5] "Facts About Manufacturing." National Association of Manufacturers. Accessed December 4, 2015. http://www.nam.org/Newsroom/Facts-About-Manufacturing/.
[6] Accenture "2014 Manufacturing Skills and Training Study Out of Inventory Skills Shortage Threatens Growth for US Manufacturing," 2014, *Manufacturing Institute*.

3.1 | Perceptions of the Skills Gap

FIGURE 1: RATINGS (1-5) OF FACTORS AED MEMBERS LISTED AS AFFECTING HIRING

FROM THE SURVEY OF AED MEMBERS WITH THE SCALE 1-5: 1 INDICATING "NO DIFFICULTY" AND 5 REPRESENTING "GREAT DIFFICULTY"



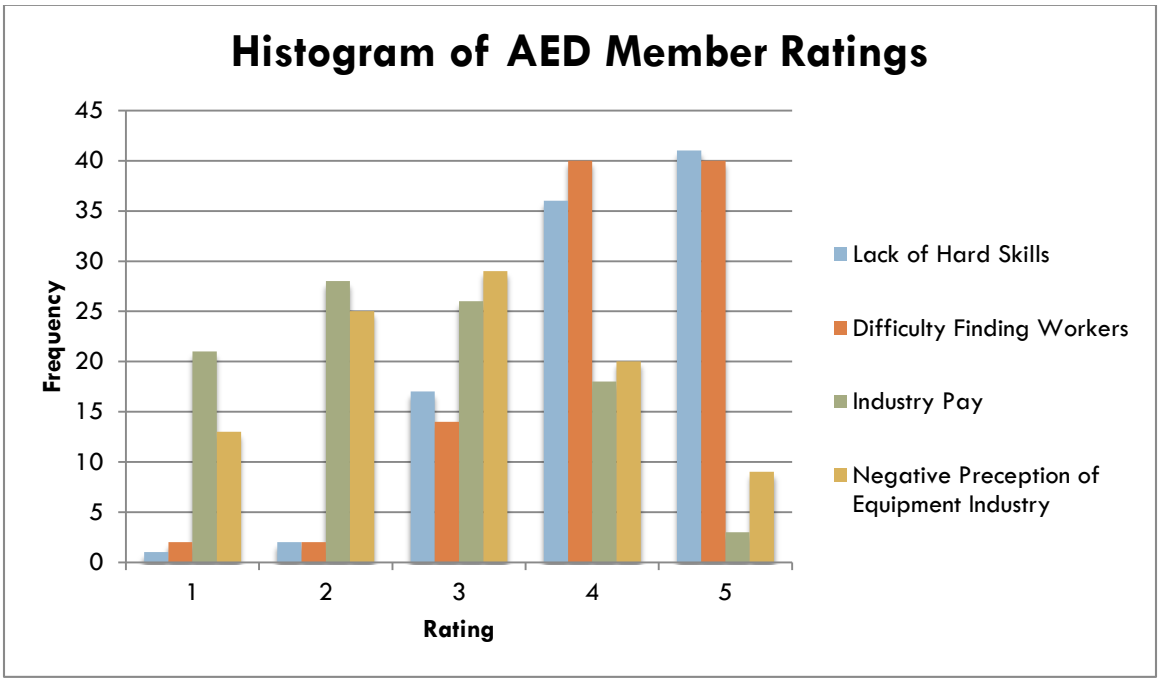
A survey of executives in the manufacturing industry found that 84% said that there was a skills gap.[7] Manufacturing executives further said that they expect the skills gap to only get worse by 2020.[8] When further asked what factors are issues with the skills gap, 67% of executives answered that employees lack the hard skills that they need in the industry.

These results are both very much in line with the results of the survey of AED members. In the survey, respondents were asked to rate on a 1-5 scale, with 1 indicating no difficulty and 5 indicating great difficulty, how much difficulty they had in finding technicians. Then they were asked to rate on a 1-5 scale, with 1 indicating not significant and 5 being very significant, how a variety of factors (lacking hard skills, inability to pass drug test, etc.) contributed to that recruiting difficulty. *Figure 1* shows the mean response to these questions. Immediately evident is that AED dealerships indicate a high level of difficulty in recruiting technicians, with the primary reason for this difficulty being a lack of hard (technical) skills among applicants. Also notable is that factors which had been reported anecdotally to be important, namely low pay and a negative perception of the industry, appear at the bottom of the list.

[7] *Supra*, note 2
[8] *Ibid*

FIGURE 2: HISTOGRAM OF AED MEMBER RATINGS OF VARIOUS ISSUES

FROM THE SURVEY OF AED MEMBERS WITH THE SCALE 1-5: 1 INDICATING "NO ISSUE" AND 5 REPRESENTING A "MAJOR ISSUE"



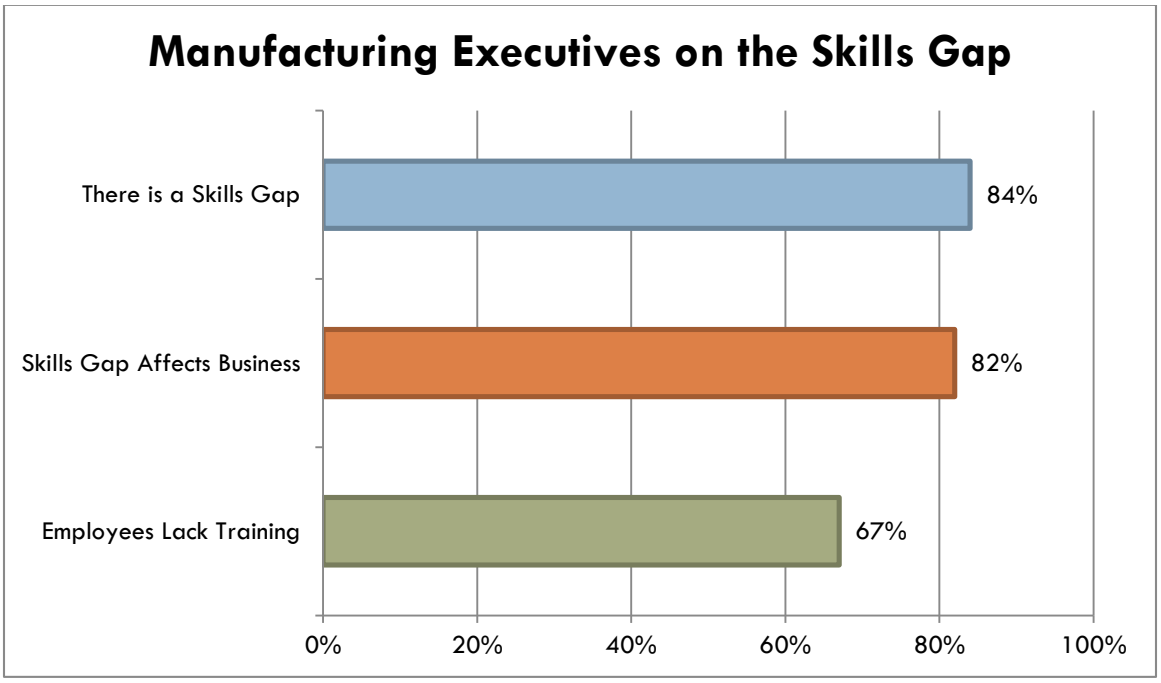
The histogram in *Figure 2* provides a further breakdown of how respondents rated a selection of factors. The height of each bar represents the number of respondents who indicated the given rating for the respective factor. Again, the primary takeaway is that a majority of respondents rated the Difficulty Finding Technicians as a 4 or 5. A similar trend appears in the histogram for Lack of Hard Skills, where only a handful rated it to be an insignificant factor in recruiting difficulty. Conversely, the distributions for the less important factors, Industry Pay and Negative Perception of Industry, are roughly bell shaped over the rating levels. This shows that the high average ratings for Difficulty Finding Technicians and Lack of Hard Skills are representative of a real world difficulty in recruiting, or at the very least, a perception thereof.

As seen in *Figure 3*, surveys of manufacturing executives align with the results of the AED member survey that there is a skills gap in manufacturing, and that the lack of employees with hard skills is a significant factor. When asked about the existence of a skills gap, 84% of manufacturing executives said that one existed.[9] This result is very much in line with the 75% of AED members that said there was a skills gap.[10] Similarly, comparable percentages of manufacturing executives reported that the skills gap is affecting business (82%) when compared to AED members saying that the skills gap either hinders ability to meet demand (74%) or increases costs and inefficiencies (57%).[11]

[9] *Ibid*
[10] From the AED survey data
[11] *Ibid*
Supra, note 2

FIGURE 3: THE SKILLS GAP FOR MANUFACTURERS[12]

FROM A SURVEY OF MANUFACTURERS CONDUCTED BY DELOITTE FOR THE MANUFACTURING INSTITUTE



While one may levy the criticism that this data only measures perception, the perceptions reported are backed by employment data in the AED survey.[13] Two metrics can be used to look for a shortage of qualified technicians in the workforce. The first metric is job opening rate (JOR), which is calculated by taking the number of unfilled positions and dividing it by the total number of positions, filled and unfilled, in the job market. The second metric that can be used is the amount of time that an advertised position remains open before being filled.

[12] *Supra, note 2*
[13] *Ibid*

FIGURE 4: JOB OPENING RATES FOR AED MEMBERS

FROM THE SURVEY OF AED MEMBERS

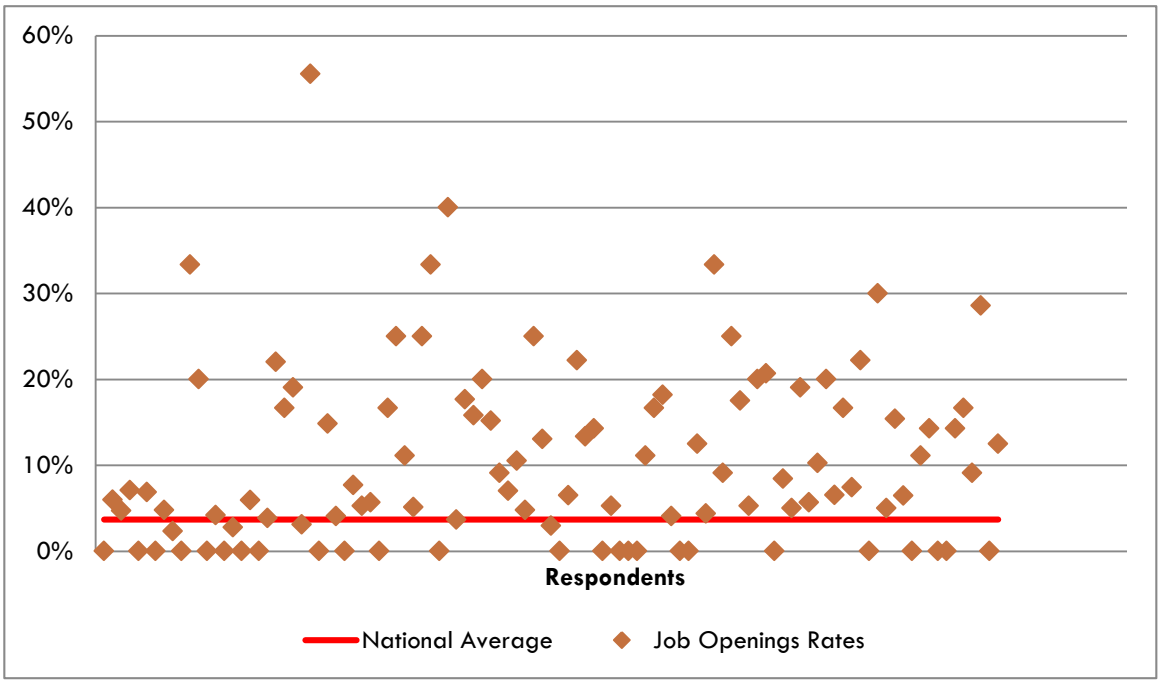


Figure 4 shows a scatter plot of the job opening rate for survey respondents. The red line indicates the BLS determined nationwide job opening rate of 3.7%. [14]As is clearly evident, a majority of AED dealerships have a JOR which exceeds the national average, often to a very significant degree. In fact the mean job opening rate for respondents was roughly 11.34%, more than three times the national average. Even the median value, which is not sensitive to outliers, is 8.43%, more than double what the rest of the nation faces. This rate also varies greatly on a regional basis among AED members, from 1.7% in Canada to almost 18% in Western and South Eastern regions of the United States[15]. Given the reported difficulty in finding qualified technicians, this job opening rate is likely not a sign of an industry ready to boom, but of a mature industry that cannot hire the skilled workers that it needs. This talent shortage leads to low industry growth as businesses are unable to meet customer demand or take advantage of new opportunities. It should also be noted the analysis shows that larger businesses, by revenue, may have lower job opening rates[16]. This could mean that the under representation of the smallest businesses in AED's membership in the survey also causes an underestimation of AED's membership's job opening rate.

[14] Accessed December 4, 2015, "Job Openings and Labor Turnover Summary", Economic News Release, Bureau of Labor Statistics, http://www.bls.gov/news.release/jolts.nr0.htm

[15] From the AED survey data. Regions based on AED distributor regions. Appendix 7.2

[16] From AED survey, full analysis in Appendix 7.3

FIGURE 5: AVERAGE LENGTH OF JOB OPENINGS (PLOTTED ON A LOGARITHMIC SCALE)

FROM THE SURVEY OF AED MEMBERS

Further evidence of the skills gap in the equipment distribution industry is presented in the scatter plot, *Figure 5*. The plot shows the average number of days that a job remains open. The national average for how long a position remains open is 28.1 business days.[17] Accounting for weekends, over this roughly 4-week period we can estimate the total number of days to be 36.1. Similarly to JOR, a majority of AED members fall above this national average, in fact the mean and median values for the number of days a position remains open for respondents to the dealership member survey are 76.4 and 45, respectively. It should be noted that the y-axis is on a log scale, those highest points represent respondents who indicated that a position may remain open for a year or more before being filled. As with JOR the AED survey presents significant variation in the average amount of time a job remains open, from an average of 36 days in Canada to an average of over 150 days in the Western United States.[18] It is not a coincidence that these regions appear opposite from one another in both the job opening rate and the average amount of time a job remains open. Across all respondents in the survey, we observe significant positive correlation between these two factors. This relationship makes sense in that, all else being equal, the more time it takes to fill positions, the higher the percentage of positions open at a given time will be.

3.2 | Effects of the Skills Gap

Another connection between the experiences of AED members and the experiences of the wider manufacturing industry that can be seen in *Figure 6* is the effects of the skills gap on businesses. Similar to AED members, the skills gap hurts manufacturers by hindering their ability to grow, increasing production costs through additional overtime and inefficiencies, and making it harder to meet customer demands. Some estimates put the impact of the skills gap on businesses at around 9% of foregone yearly earnings.[19] In the

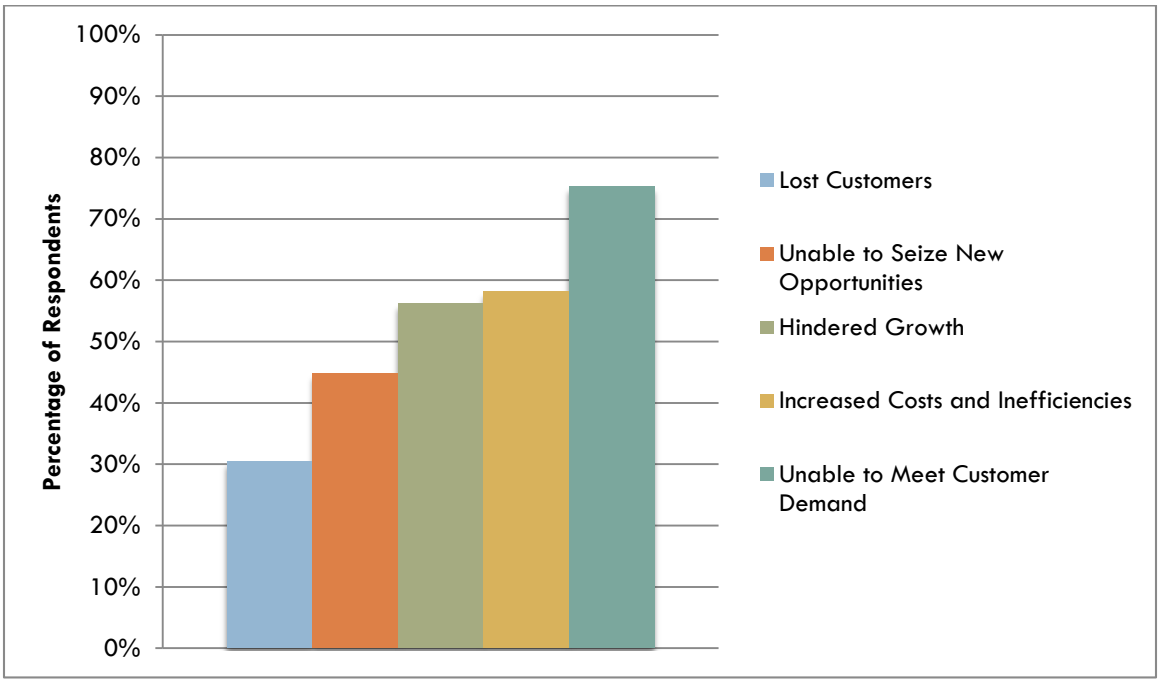
[17] http://dhihiringindicators.com/, "DHI-DFH Mean Vacancy Duration Measure", DHI Hiring, Accessed December 4th, 2015
[18] *Supra,* note 15
[19] *Supra*, note 6

manufacturing sector as a whole, that could translate to over $180 billion in lost earnings each year.[20] If the same estimate were to hold true for AED members, the skills gap could be costing the full AED membership in the United States approximately $2.4 billion each year, at the average estimate of total dealer revenues in the United States. That translates to costs for individual member businesses of around $6.1 million each.[21] If current AED member employment trends held true, eliminating the current skills gap could lead to an additional 4,000 jobs nationwide.[22]

In the equipment distribution industry, the skills gap is real and it adversely affects businesses. These effects appear in the form of decreased expansion potential, lost revenue and lost wages, among other detriments.

FIGURE 6: EFFECTS OF THE SKILLS GAP

FROM THE SURVEY OF AED MEMBERS



In the survey, AED dealership members were asked: "*If your company has had difficulty finding technicians, how has this affected your company? (Select all that apply).*" *Figure 6* illustrates the percentage of respondents who indicated that skills gap resulted in the given effect for their business. While only a third reported losing customers due to recruitment issues, a majority said the skills gap hindered business growth and made it difficult to meet customer demand.

[20] *Supra*, note *5*

[21] This calculation is based off of the estimate for the average total revenue for all AED dealers in the United States of $26,952,500,000 combined with the estimate from the Accenture study of a 9% loss of revenue from the skills gap. That equates to a total yearly loss for AED members of around $2.4 billion. This estimate hinges on the estimate for lost revenue from the manufacturing study holding for AED members – which we believe that it should, given the established similarities in lack of technically skilled workers in manufacturing and for AED members.

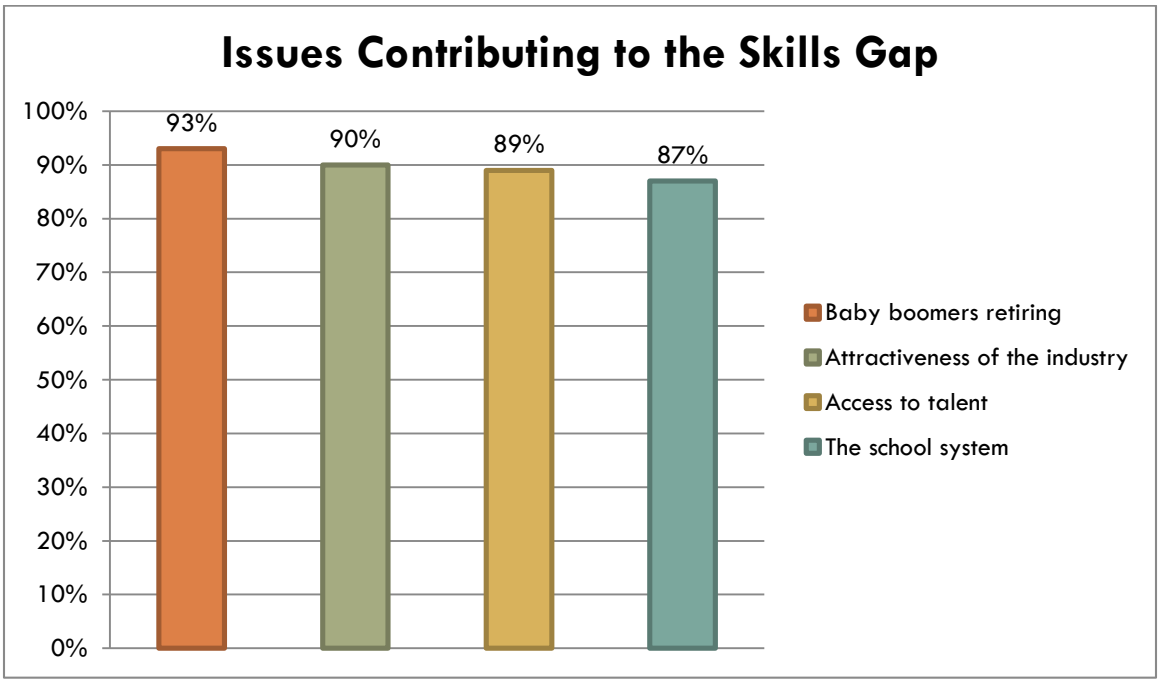
[22] AED member survey about revenue per employee ($600,000 per employee)

4 | EXPLAINING THE SKILLS GAP

The existence of the skills gap is supported both by the evidence from the manufacturing industry and from the AED membership, and it is abundantly clear that the skills gap is hurting businesses in need of technically skilled workers. To look further at the skills gap, it is important to take a closer look at some of the factors that may be contributing to the existence of the skills gap. *Figure 7* demonstrates some of the major external reasons why manufacturing executives believe that the skills gap exists today.

FIGURE 7: MANUFACTURING EXECUTIVES ON ISSUES THAT CONTRIBUTE TO THE SKILLS GAP[23]

FROM A SURVEY OF MANUFACTURERS CONDUCTED BY DELOITTE FOR THE MANUFACTURING INSTITUTE



In *Figure 7*, it is evident that there are several strong explanations for the lack of technical workers from the responses of manufacturing executives when asked about issues contributing to the skills gap. Specifically, the retirement of baby boomers, the current educational landscape, and the perception of the industry are key factors in the existence of the skills gap. Analyzing the possible explanations for the skills gap will give some valuable insight about the potential root causes of this issue that has such profound impacts on American businesses.

4.1 | Baby Boomers Retiring

While 2.7 million baby boomers are expected to retire from the manufacturing industry over the next ten years, an additional 700,000 jobs are likely to be created in manufacturing over that time; as a result, the skills gap is likely to only continue to grow. Today, six out of every ten job openings in manufacturing go unfilled. Of the 3.4 million manufacturing jobs expected to open over the next decade, 2 million are projected to go unfilled. That means that the skills gap in manufacturing is anticipated to have more than

[23] *Supra*, note 2
These results reflect the number of respondents that rated each category as having either a "significant" or "moderate" impact on the existence of the skills gap.

tripled between 2011 and 2025.[24] Given the analogies between the manufacturing and heavy equipment skills gaps, it is easy to see that the retirement of baby boomers also plays a large role in the lack of workers to fill open positions in both sectors. The present effects of this can even be seen in the survey of AED members who responded that they expect 10% of their current workforce to retire in the next five years, with 21% of businesses reporting that they expect 20% or more of their workforce to retire over the next five years. Some businesses reported expected retirement rates of 40% over the next 5 years.[25] This will likely put even greater strain on an already over stretched technical workforce.

For AED members, this level of retirement may have dire consequences. Of the 89 businesses that answered the question asking what the main reason for technicians leaving was, 60 indicated that the employee was continuing work in a technical field, either for a customer, for a competitor or in another industry that requires technically skilled labor. Only 15 indicated that the main reason for a technician leaving was retirement. However, as Baby Boomers continue to reach retirement age, which they do at a rate of 10,000 per day, AED members, and the economy as a whole, more and more businesses will have to contend with dearth of technical talent and an increasing number of open positions to fill.[26] Even as baby boomers are leaving the technical workforce, the pipeline of new workers in technical training schools, typically two-year degree programs, has not grown to the same levels that have occurred in four-year institutes.

4.2 | Social Momentum Toward Four-Year Degrees

Since 2000, college entry has risen by 25%; 5 million more students will start college in 2015 than did in 2000.[27] This is while the college-age population has grown around 15% over that time.[28] In the survey of manufacturing executives, 89% said that access to talent contributed to the skills gap and 87% said that the school system played a part in the lack of technical workers.[29] These two issues combine when looking at the landscape of high school students entering college. Four-year colleges have seen a noticeable jump in the number of students that enrolled as opposed to two-year schools. From 2000 to 2012, those enrolled in four-year colleges have increased by 46.6% while two-year colleges, many of which offer technical degrees needed by AED and the manufacturing sector, have only seen an increase of 20.6%. Compare this with the trends from 1990 to 2000, when four-year colleges saw only 7.2% growth over that time while two-year degrees grew by 13.5%. Comparing these pre-2000 and post-2000 trends indicates that four-year colleges have seen a staggering 547% change in the rate of enrollment growth between the period 1990-2000 versus 2000-2012. Meanwhile, two-year degrees have seen only a 50% increase in rate of enrollment between the two time periods.[30] As seen in *Figure 8,* growth in four-year colleges has increased much more rapidly than enrollment at two-year colleges.

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[24] *Supra*, note 2
[25] From the AED survey data
[26] D'Vera Cohn and Paul Taylor, "Baby Boomers Approach 65 – Glumly," Pew Research Center. Accessed December 9, 2015. http://www.pewsocialtrends.org/2010/12/20/baby-boomers-approach-65-glumly/
[27] "Table 105.20. Enrollment in elementary, secondary, and degree-granting postsecondary institutions, by level and control of institution, enrollment level, and attendance status and sex of student: Selected years, fall 1990 through fall 2024," National Center for Education Statistics. Accessed December 4, 2015. http://nces.ed.gov/programs/digest/d14/tables/dt14_105.20.asp?current=yes
[28] "Table 101.20. Estimates of resident population, by race/ethnicity and age group: Selected years, 1980 through 2013," National Center for Education Statistics. Accessed December 4, 2015. http://nces.ed.gov/programs/digest/d14/tables/dt14_101.20.asp?current=yes
[29] Supra, note 2
[30] "Table 105.20. Enrollment in elementary, secondary, and degree-granting postsecondary institutions, by level and control of institution, enrollment level, and attendance status and sex of student: Selected years, fall 1990 through fall 2024," National Center for Education Statistics. Accessed December 4, 2015. http://nces.ed.gov/programs/digest/d14/tables/dt14_105.20.asp?current=yes

FIGURE 8: TRENDS IN TWO-YEAR VERSUS FOUR-YEAR DEGREES BETWEEN THE PERIODS 1990-2000 AND 2000-2012[31]

FROM STATISTICS PUBLISHED BY THE DEPARTMENT OF EDUCATION STATISTICS

	Enrollment growth between 1990 and 2000	Enrollment growth between 2000 and 2012
4-year colleges	7.2%	46.6%
2-year colleges	13.5%	20.6%

Despite higher entry rates, colleges have not seen an increase in retention rates, and the four-year college retention rate has stayed relatively constant at around 71%.[32] There will be almost 4.5 million students that begin four-year colleges in 2015 that will not return in 2016.[33] The number of young people looking to start technical jobs and who view them as a potentially fruitful career are dwindling.[34] Dealerships indicate a belief that "Vocations have been abandoned in the US" and that students are pushed, by their parents, into college and "…steered away from blue collar jobs." This trend may be caused in part by poor perceptions of technical jobs.

4.3 | Low Social Perceptions and Visibility of Technical Jobs

Only one out of every three parents would encourage their child to pursue a degree in manufacturing.[35] This result is surprising given that 90% of Americans believe that manufacturing is important to the country's economic prosperity, and 82% say they would support further investment in the manufacturing industry.[36] In fact, if given the option to create one thousand new jobs in their local community, Americans ranked manufacturing as the number one industry that they would choose for those jobs.[37] On a slightly larger scale, 37% of parents would encourage their child to work in a technically skilled job.[38] Given the seemingly broad support for manufacturing in the United States, one would expect more support for people entering the industry. One major factor causing this friction between perception of the industry and support of working in the industry is the visibility of technical work in society, and specifically, in school.

If a parent is familiar with the manufacturing industry, that parent is twice as likely to encourage a child to pursue a career in manufacturing. This reality also appears in the AED survey data in which respondents say that if they can get parents on their side, they have a good chance of recruiting young technicians. If this can't be done, students are pushed into 4-year schools, and likely won't view technical work as a viable option. This speaks to the importance of visibility of technical careers.

There are a number of potential explanations to why this lack of visibility exists. One is the lack of exposure in the school system. 87% of manufacturing executives said that the school system contributes to the

[31] *Ibid*
[32] "Table 326.30. Retention of first-time degree-seeking undergraduates at degree-granting postsecondary institutions, by attendance status, level and control of institution, and percentage of applications accepted: 2006 to 2013," National Center for Education Statistics. Accessed December 4, 2015. https://nces.ed.gov/programs/digest/d14/tables/dt14_326.30.asp
[33] *Supra*, note 4
[34] From AED survey data
[35] Supra, note 4
[36] *Ibid*
[37] *Ibid*
[38] *Supra*, note 2

skills gap, and only 30% of American parents believe that school systems encourage children to pursue manufacturing careers. 78% of Americans went so far as to say that the education system needs to be reformed, and 72% said that some form of internship or apprenticeship program would help increase interest in manufacturing work.[39] This is against the backdrop of a 40% decline in apprenticeships in the United States since 2000.[40] This social perception problem, combined with the issues presented by the lack of growth in technical training programs is only exacerbated by a mismatch present between local schools and the needs of highly technical industries.

4.4 | Misalignment of Labor Market Needs and School System

At the root of the technical workforce crisis is an education system that provides limited opportunities to explore technical careers and which produces graduates without the requisite skills to fill labor openings. Across all geographic regions and company sizes, AED members report a general dissatisfaction with local education institutions. When asked the question, *"Do you believe that local educational institutions in your area (high schools, community colleges, other technical schools) understand your company's workforce needs and align their curricula and train students to meet those needs?"* only 15% of respondents said yes.

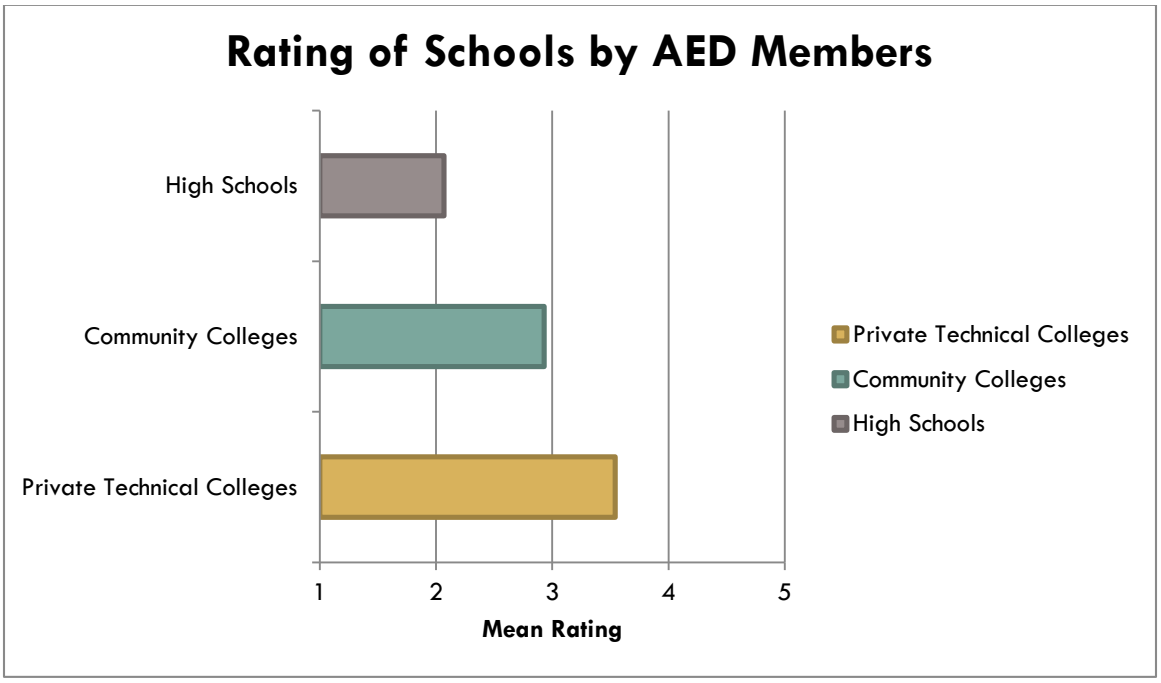
This problem is not unique to AED. 87% of manufacturing executives rated issues with the school system as contributing to the skills gap, and only 30% of American parents believe that schools encourage pursuing manufacturing careers.

Figure 9 further illustrates this point. The graph presents average ratings of local high schools, community colleges, and private technical schools by AED members, on a 1-5 scale. While the ratings for the technical schools are slightly above the midpoint of the rating scale (3), high schools and community colleges are significantly behind. The poor ratings, especially for high schools, are indicative of a technical education system that has largely neglected secondary school students and other young adults. This lack of focus pushes students away from technical careers at an early age.

[39] *Supra*, note 4
[40] *Supra*, note 2

FIGURE 9: RATINGS (0-5) FOR AED MEMBER SATISFACTION WITH LOCAL SCHOOLS

FROM THE SURVEY OF AED MEMBERS WITH THE SCALE 1-5: 1 INDICATING "NOT SATISFIED" AND 5 REPRESENTING "VERY SATISFIED"



4.5 | Lack of Wage Growth

A common suggestion may be that the skills gap is caused by low wages or wage growth in the equipment industry. The argument is that if businesses are unable to attract qualified technicians they should raise wages to attract more applicants. The evidence from the AED survey data, however, does not support this hypothesis. Once we control for regional and revenue differences, having higher starting or average wages does not appear to correlate with lower job opening rates, or with jobs remaining open for fewer days.[41] This suggests that higher wages alone will not solve the skills gap in the heavy equipment distribution industry.

5 | POLICY ANALYSIS

5.1 | AED Foundation Recruitment Strategy

Any consideration of the extent to which public policies can help AED address the skills gap in its technical workforce must be done in the context of the AED Foundation's community-based recruitment strategy.[42] The community-based recruitment strategy is intended to facilitate dialogue and partnerships between individual AED members and key stakeholders in their local area including other AED members, high schools, and technical colleges. This approach is designed to increase the visibility of the technician profession and its benefits among high school students, while providing guidance on the pathways to pursuing these careers and opportunities to financially support their transition to a technical college. The AED Foundation has worked with its members to establish educational and professional development standards for technical

[41] From AED survey data, full analysis in Appendix 7.3

[42] Steven A. Johnson, "Recruitment Guidebook for AED Member Dealers: Recruiting Young People for Careers in the Construction Equipment Industry" (2nd Ed., May 2012), The AED Foundation.

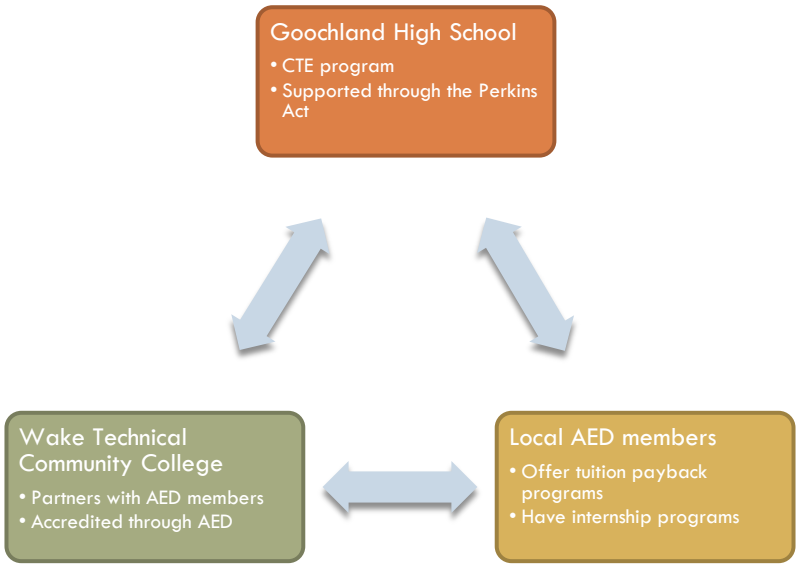
colleges to incorporate within the curriculum of their technician-oriented degree programs, and awards an industry-recognized accreditation to schools that adopt these standards. The success of this strategy relies on stakeholders' recognition of the mutually beneficial incentives it provides.

5.1.1 | The AED Foundation's workforce model in Virginia

A demonstration of how the AED community-based recruitment strategy works in practice in southern Virginia is the collaboration between the career & technical education (CTE) program at Goochland High School, Richmond-area AED members, and the regional college that holds AED accreditation, Wake Technical Community College. Goochland High School hosts AED members for on-campus marketing and career events, and AED members donate equipment to the school's CTE program as well as provide access to their facilities for site visits. Goochland students interested in pursuing a technical degree at Wake Tech are provided with internship and post-graduation employment opportunities with AED members as well as participation in a tuition reimbursement program upon starting their technician career. The AED Foundation works with Wake Tech to ensure that its curriculum for AED technician-oriented degree programs aligns with the skills and competencies students need to transition into careers as AED technicians.

Graphic A: AED Foundation model in Virginia

From AED Foundation Materials



The AED Foundation's community-based recruitment strategy shares many similarities with the approach of organizations representing industries with comparable workforces experiencing challenges with skills gaps. For example, the Center for Energy Workforce Development (CEWD),[43] an association of electric, natural gas, and nuclear utilities in the United States, was founded in response to an anticipated shortage in

[43] Center for Energy Workforce Development, "About," http://www.cewd.org/about/, accessed December 4, 2015.

that industry's skilled workforce. Over the last 10 years CEWD has established a multilayered consortia[44] of key stakeholders[45] across the nation, soliciting the participation of employers, educators, and worker groups to develop targeted strategies[46] that build sustainable pipelines developing skilled workers to meet the industry's future needs. These consortia represent networks at the national, regional, and state levels that regularly meet to collaborate on initiatives to raise awareness about the utility technician profession, provide technical training and education opportunities for secondary and post-secondary students, develop technical curricula tailored to local employer needs, and coordinate marketing and recruitment efforts.

The strength of CEWD's consortia strategy is that it reflects an inclusive approach by opening participation to all education stakeholders, regardless of whether or not their school offers academic programs or coursework specifically geared toward utility technician career preparation. Expanding the range of participants from the education sector allows CEWD to maintain a robust network to develop innovative solutions to local utility workforce needs as well as disseminate information, share resources, and exchange best practices. The fundamental idea behind this approach is that while some high school or community colleges in CEWD's consortia may not currently offer utility technician-oriented curricula, their inclusion in these networks makes them stakeholders in the technical skills gap issue and ensures they know about the resources and opportunities available to students interested in these career fields and can send them in the right direction through their active engagement with other consortia participants.

The AED Foundation's community-based recruitment strategy empowers AED members to become proactive participants in the effort to close the skills gap by engaging with local stakeholders to strengthen the pipeline that supplies the next generation of the technician workforce. While there certainly are differences between the heavy equipment and utility industries, the similarities between the nature of the skills gap affecting their workforce and their strategic responses to it demonstrate that each provides examples for ways in which the other might consider opportunities to support its approach. For example, CEWD's online presence uses a minimalist yet professional style in its website design that displays content in a quickly digestible summary format, provides links within a layout that's simple to navigate, and embeds its products and resources in parts of its web domain that are easy to identify and access. The AED Foundation's website has an engaging and creative design as well as innovative features that set it apart from other workforce development organizations in a way that effectively communicates and distinguishes its brand. However, opportunities exist to fine tune the site layout to facilitate new visitor navigation so that users who are not already familiar with the arrangement of specific resources can efficiently locate important content.

The AED Foundation's current emphasis on its accreditation program for technical colleges that develop and deliver curricula aligning with the essential competencies of AED's technician workforce has many advantages, and with colleges across the country in the process of becoming accredited, students increasingly have greater access to post-secondary educational opportunities that can prepare them for technician careers. While this emphasis is critical to the success of the community-based recruitment strategy's goals, it's also important to focus on efforts to strengthen the workforce pipeline at the secondary and pre-secondary levels to enhance opportunities for students to engage with the industry and develop an awareness of the technician profession as a viable career path at earlier stages in their education experience. For example, CEWD's Get Into Energy[47] program is a comprehensive initiative aimed at teen and preteen students[48] that

[44] Center for Energy Workforce Development, "State Consortia," http://www.cewd.org/state-consortia/, accessed December 4, 2015.
[45] Center for Energy Workforce Development, "Partnerships," http://www.cewd.org/about/partners.php, accessed December 4, 2015.
[46] Center for Energy Workforce Development, "Strategies," http://www.cewd.org/about/strategies.php, accessed December 4, 2015.
[47] Center for Energy Workforce Development, "Get Into Energy," http://getintoenergy.com, accessed December 4, 2015.

uses targeted marketing strategies that include videos, games, an interactive website, contests, live demonstrations, local training sessions, and events to increase exposure to the utility industry and its technician workforce as early as possible so these careers resonate with students when they consider their options after high school graduation. Get Into Energy also targets information and resources to parents,[49] educators, and guidance counselors[50] that connect utility technician skills to STEM education with lesson plans and career exploration tools, recognizing the influential role these stakeholders play in advising students on their career choices.

The AED Foundation resources available to the public through its website are effective at helping young adults already motivated to pursue a technician career locate accredited programs and connect with local dealers, but opportunities exist to increase its outreach and engagement efforts among the secondary, and potentially the pre-secondary, student population.

Aside from the best practices that can be learned from peer workforce development organizations, AED stands to benefit from government action directed at addressing the skills gap. The extent to which public policies can support AED specifically is explored in the following case studies that identify relevant federal and state initiatives that both provide a context for further advocacy and examples of the types of public-sector opportunities with the greatest potential use for AED. The nature of the cases and their discussion are oriented toward workforce development policies best situated for strengthening the AED Foundation's community-based recruitment strategy.

5.2 | U.S. Federal Case Study[51]

In 2014, President Obama signed the bipartisan Workforce Innovation and Opportunity Act (WIOA), which reformed and reoriented state and federal labor market programs to facilitate job seeker access to education, training, employment, and support services, and connect employers with skilled and qualified workers. WIOA established a strategic partnership between the Department of Labor's Employment & Training Administration (DOL/ETA) and state workforce agencies to provide federal resources and guidance in supporting states with the administration and delivery of program services through a network of local American Job Centers.

To foster coordination and cooperation among all stakeholders, states are placed into regional sectors to align economic development strategies, and state-level workforce development boards consisting of public and private sector representatives implement targeted interventions adapted to local market conditions. Core programs encompassed within WIOA are held accountable to data-driven common performance indicators that must be regularly reported to DOL/ETA and made available to the public. Fundamentally, WIOA reflects the national model for workforce development policy in the United States, and represents the macro-level context within which AED's technical workforce shortage issue is situated.

Implementation of the WIOA reforms among the states began in the summer of 2015, and DOL/ETA has been working closely with state workforce agencies to establish a framework of federal expectations to guide their efforts. As DOL/ETA continues to issue directives to state workforce agencies, industry groups like

[48] Center for Energy Workforce Development, "Get Into Energy: Youth," http://getintoenergy.com/youth/, accessed December 4, 2015.
[49] Center for Energy Workforce Development, "Parents," http://www.cewd.org/parents_index.php, accessed December 4, 2015.
[50] Center for Energy Workforce Development, "Teachers and Guidance Counselors," http://www.cewd.org/educators_index.php, accessed December 4, 2015.
[51] "The Workforce Innovation and Opportunity Act," United States Department of Labor, Employment and Training Administration (ETA), http://www.doleta.gov/wioa/, accessed December 4, 2015.

AED should regularly monitor the issuance of federal policy documents published on DOL/ETA's website to remain informed about the guidance states receive, which can reveal the implications for industry stakeholders and uncover potential opportunities for private sector employer groups to become involved in the emerging processes and programs. For example, as regional and state-level workforce development boards assemble, AED should notify its members of opportunities to participate as it will ensure their interests as individual employers and as representatives of the heavy equipment industry are given voice when decisions are made about the allocation of public resources for workforce initiatives. Additionally, AED can advise its members on opportunities to become involved with the American Job Center network. These local offices supply career coaching, training, and funding resources to job seekers as well as maintain a virtual presence on a centralized website that enables employers to post job openings and provide job seekers with information regarding the required skills and credentials to pursue a particular career path.

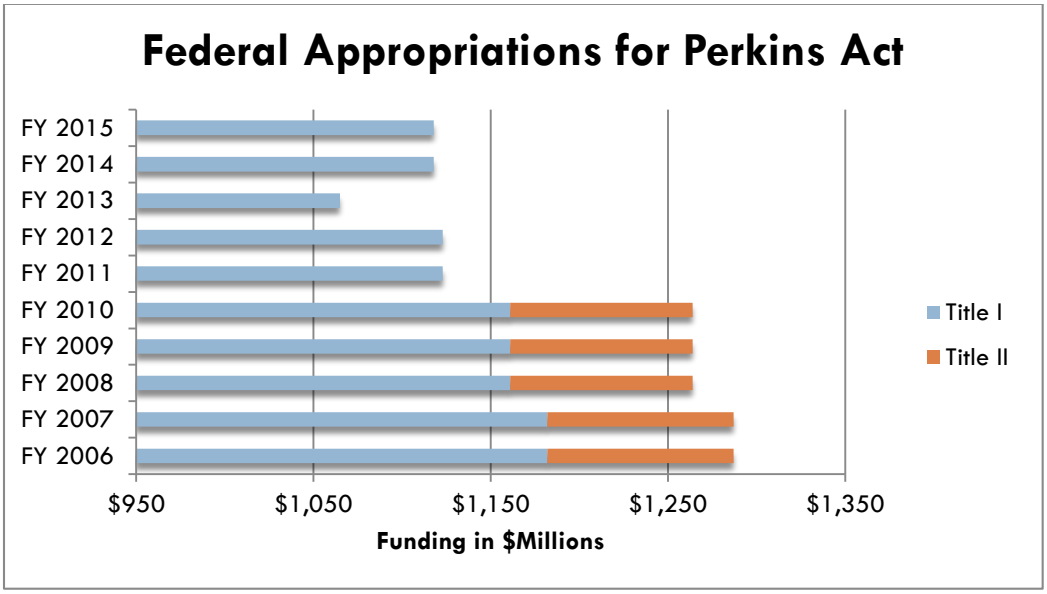
AED involvement with the emerging WIOA programs can help raise the visibility of technician careers, connect interested job seekers with the resources they need to become eligible and apply for job openings, and give a voice to the unique concerns of the heavy equipment distribution industry in local decision-making through the participation of AED members in state workforce development boards.

5.2.1 | Perkins Act Funding for CTE Programs

The Carl D. Perkins Career and Technical Education ("Perkins") Act[52] provides federal funding for secondary and postsecondary career & technical education (CTE) programs in schools throughout the United States. This investment provides opportunities for high schools and colleges to develop programs that prepare students for careers in the technical workforce through hands-on training aligned with industry-specific skillsets integrated within the traditional academic curricula. The Perkins Act is the primary source of financial support for CTE programs and was designed to provide Title I block grants to the states for general funding distributed to high schools as well as Title II[53] grants to promote innovation in program development and career guidance and support services for both students and educators. However, congressional funding for Title I grants has been inconsistent in recent years, while Title II grants have gone unfunded since 2010. Reauthorization of the Perkins Act was included in the Budget Act of 2015, but sustaining the investment in CTE will depend upon stakeholders ensuring Congress continues to appropriate the necessary funding.

Graphic B: Federal Appropriations for the Perkins Act

From the *National Association of State Directors of Career and Technical Education Consortium*[54]



[52] National Association of State Directors of Career and Technical Education Consortium, "Carl D. Perkins Career and Technical Education Act of 2006," http://www.careertech.org/perkins, accessed December 4, 2015.
[53] U.S. Department of Education, "Perkins IV: Title II – Tech Prep Education," https://www2.ed.gov/about/offices/list/ovae/pi/cte/factsh/title2-factsheet-32510.pdf, accessed December 4, 2015.
[54] National Association of State Directors of Career and Technical Education Consortium, "Federal Appropriations for Career Technical Education (CTE): Fiscal Years 2000-2015," http://careertech.org/sites/default/files/Carl%20D.%20Perkins%20Act%20Funding%202000-15%20NASDCTEc.pdf, accessed December 4, 2015.

5.3 | South Carolina Case Study[55]

Apprenticeship Carolina is a South Carolina initiative launched in 2006 that established a statewide apprenticeship program in collaboration with the state technical college system and the South Carolina Chamber of Commerce. This program represents a successful public-private partnership that proactively solicits the expertise of local employers on the competencies required of their technical workforce so that state colleges can more effectively design their programs to ensure that students demonstrate mastery of essential skills upon graduation. To facilitate the transition of students from high school to post-graduation work, businesses and technical colleges are encouraged to work together to find opportunities to incorporate on-the-job training into existing curricula through apprenticeships. This combination of class-based and work-based learning is uniquely balanced for each professional program as a result of the informed diagnosis of businesses in the affiliated industries of their human resource needs as well as the curricular expertise of technical college administrators. Synthesizing this information into content standards, Apprenticeship Carolina then formally establishes specific technical apprenticeships as registered programs with the Department of Labor that qualify for federal funding.

Apprenticeship Carolina represents a model state-level workforce policy that can support the AED Foundation's community-based recruitment strategy. By facilitating dialogue and collaboration between employers and educators, local governments can play an important role in sustaining mutually beneficial partnerships that ultimately promote job creation and improve local economic development. AED already encourages its members to connect with local high schools and technical colleges to raise awareness about technician careers and the pathways available to students interested in pursuing this profession, but including the public sector as stakeholders in these initiatives can strengthen their effectiveness, particularly with regard to efforts supporting students' transition from high school graduation to post-secondary technical education and employment opportunities. South Carolina leveraged its expertise of the public resources and funding available through existing workforce programs, in this case on-the-job training apprenticeships, to help educators and employers take advantage of federal and state grants by working together to develop curricula that met requirements to qualify these programs for funding. More importantly, the state was able to assume this role without incurring much additional financial commitment on its part.

State policymakers have an economic incentive to engage with educators and employers and provide access to existing public resources if doing so ultimately promotes local job creation, and South Carolina can be an example AED references in advocating for similar state-level policies that support its existing community-based recruitment strategy.

[55] Jennifer Gonzalez, "Apprenticeship Programs Expand With Help of Community Colleges," *The Chronicle of Higher Education*, September 19, 2010, www.newcarolina.org/userfiles/ncar/documents/chronicle.pdf, accessed December 4, 2015.

5.3.1 | Canadian Case Study

The skills gap in the technical workforce is not a problem unique to the United States. A recent survey of Canadian executives found that 59% of respondents expressed concern about their ability to find qualified candidates with the skills needed to fill the job openings anticipated over the next two years.[56] Much like their counterparts in the U.S., Canadian policymakers who have traditionally identified skills with academic attainment now recognize that the nature of the skills employers need cannot be taught to students through traditional classroom strategies alone.[57] The Interprovincial Red Seal Program is responsible for promulgating federal standards for integrating vocational and apprenticeship training into existing academic curricula, and certifying programs developed by the individual provinces. The Canadian provincial governments exercise a significant degree of autonomy in designing, administering, and funding their own separate workforce development programs, but the federal government does provide targeted employer tax credits and educator grant funding to encourage collaboration between employers and provincial governments in developing apprenticeship programs. As in the U.S., the programs comprising the Canadian workforce development system are primarily oriented toward re-skilling adult workers, but there is a growing emphasis among policymakers on strengthening apprenticeship and vocational training programs that will more effectively transition high school graduates into high-demand technical careers.[58]

The survey responses of Canadian AED members[59] demonstrate the importance of maintaining a strategic focus on younger workers transitioning out of school and into technical workforce. Canadian respondents report the highest percentage of workers aged 18-25 (18.5%) as well as the lowest job opening rate (0.017) and the shortest number of days a job remains open (36 days). Furthermore, the relative perception of local schools is more favorable on average among Canadian AED members than their counterparts in the U.S., particularly at the high school level (2.75 out of 5). While this suggests that the technician shortage in Canada may be somewhat less pronounced than in the United States, the small number of Canadian respondents to the survey makes it impossible to draw valid conclusions.

[56] Robert I. Lerman, "Expanding Apprenticeship Training in Canada: Perspectives from International Experience," Canadian Council of Chief Executives, April 21, 2014, accessed December 4, 2015, http://www.ceocouncil.ca/publication/expanding-apprenticeship-training-canada-perspectives-international-experience-2.
[57] *Ibid*
[58] *Ibid*
[59] See Section 7.2.

5.4 | Washington Case Study[60]

Washington State is often highlighted as a leader in state-level workforce policy program administration. The state's exemplary status is recognized as primarily the consequence of the Washington State Workforce Training and Education Coordinating Board (WTECB), which promulgates, tracks, and reports accountability, performance monitoring, and management standards to evaluate the programs constituting the state workforce development system. One of the evaluated outcomes is return on investment, and in 2006 researchers from the Upjohn Institute conducted an analysis of the return on investment of 11 state programs comparing their net benefits to costs. Of particular note, this analysis demonstrates the positive short- and long-term net impacts associated with community & technical college job preparation, secondary career technical education, and apprenticeship programs. On average, participants in these workforce programs increased their initial employment earnings 6.7 – 9.2 percentage points within 9 months of completion, and 4.6 – 6.8 percentage 2 years after the initial period. This data demonstrates the effectiveness of education-oriented (i.e. CTE) workforce development programs relative to other initiatives based on the return on investment exhibited in the increased employment earnings of individuals who participate in these programs.

The Washington case demonstrates both the importance of data collection to evaluate policy performance outcomes and the relative effectiveness of workforce development programs targeting job-oriented technical education and training when measured against other public labor market policy interventions. The strategic alignment of education and workforce initiatives among stakeholders in the public and private sectors relies on access to data so that the resources invested in these programs produce positives returns. The National Skills Coalition cites Washington as a model for other states to follow, and much of WTECB's work anticipates the program performance monitoring, evaluation, and reporting requirements of the federal WIOA reforms.

AED has a stake in the development and implementation of state-level data collection initiatives that will ultimately supply the information supporting the efficacy of public programs targeting the technical skills gap in its industry as well as aid its efforts to advocate for the adoption of such policies with proven success. The Washington case also lends further support for the efficacy of workforce development policies that promote career & technical education through skills-based job preparation and apprenticeship programs.

[60] Kevin Hollenbeck and Wei-Jang Huang, "Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State." Upjohn Institute Technical Report No. 13-029. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. http://dx.doi.org/10.17848/tr13-029

6 | RECOMMENDATIONS

6.1 | Strengthening the Community-Based Recruitment Strategy

- Consider a consortia model to expand the scope of engagement with secondary and post-secondary educators outside the existing network of AED Foundation accredited technical colleges, and solicit their participation in the development and implementation of future strategic initiatives.
- Increase targeted outreach efforts to secondary and pre-secondary students to raise awareness and understanding of the heavy equipment industry and the career opportunities associated with the technician profession.
- Identify opportunities to incorporate technician-oriented skill sets into secondary-level curricula (Ex. career and technical education & STEM programs), enabling students to develop and master key competencies early.
- Redesign the layout of the AED Foundation's website to streamline navigation and ensure that critical content and resources are easily identifiable and accessible.

6.2 | Addressing the Skills Gap through Public Policy

- Encourage AED member participation in WIOA workforce development and engagement with their American Job Center locations.
- To the extent possible, work with DOL/ETA to have information and resources about AED technician careers included on the American Job Center website.
- Monitor the publication of newly promulgated guidelines from DOL/ETA directing state implementation of WIOA reforms to identify potential implications for AED.
- Promote state-level workforce development initiatives that facilitate coordination among educators and employers to develop partnerships that take advantage of public funding resources for specific programs, like apprenticeships.
- Continue to incentivize career technical education programs at the high school and post-secondary school levels aimed at addressing labor market and local employment needs, especially in terms of easing the process for accessing workforce development funds for technically focused programs.
- Advocate for the adjustment of national workforce policies to incorporate an emphasis on individuals entering the labor market broadly and those seeking technical careers specifically to support their pursuit of education and training programs designed to prepare them to enter these industries, particularly those experiencing workforce shortages.

6.3 | Further Study and Next Steps

- Develop and administer a new survey targeting AED members with questions that solicit more detailed responses regarding the nature of the skills gap and its effect on their businesses as well as their experience and perception of the resources and practices promoted by the AED Foundation through its community-based recruitment strategy.
- Consider incentivizing survey participation among AED members to ensure that a more representative sample is captured that accurately reflects the distribution of members based on revenue characteristics.
- Conduct a more comprehensive analysis of the causes of the skills gap with a focus on perceptions of the technician profession among students, educators, parents, and current AED technicians, as well as trying to understand the factors motivating student career and post-secondary education decisions.
- Evaluate the performance of AED accredited technical programs to assess the relative rates of participation and attempt to determine career opportunities pursued by graduates upon degree completion.

7 | APPENDIX

7.1 | Skills Gap One Pager

THE SKILLS GAP

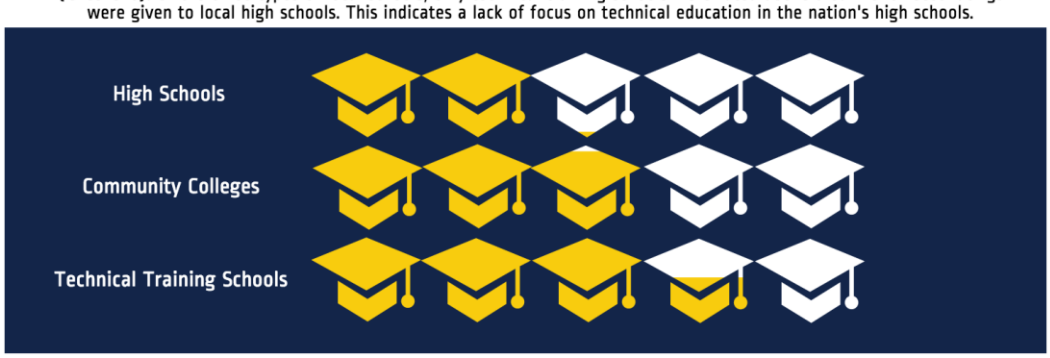
Highly technically skilled workers are in short supply in the wider manufacturing sector. This same shortage of skilled technical workers is also present with the members of the Associated Equipment Distributors.

AED Members and the Skills Gap

In a survey of AED members, company executives responded that the Skills Gap had a number of impacts on their businesses.

Local Education

Respondents to the AED Survey were asked to rate their local educational institutions on a scale from 1 (poor) to 5 (excellent). Of the three types of local schools, only technical training schools were rated above a 3. The loweest ratings were given to local high schools. This indicates a lack of focus on technical education in the nation's high schools.



Unfilled Job

Filled Job

Job Opening Rate=

The job opening rate is a measure of the percent of jobs that are going unfilled at a business. It is equal to the number of unfilled jobs divided by the total number of available jobs, filled and unfilled. The average value for AED survey respondents is 11.34%. This is more than 3 times the national average of 3.7%.

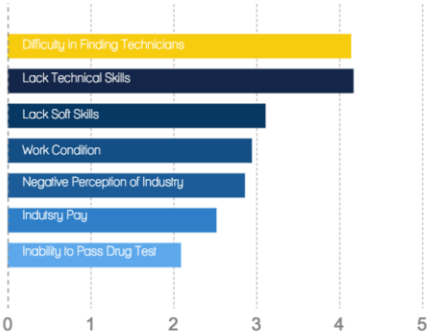
Source: 2015 AED workforce survey, Bureau of Labor Statistics (September 2015)

When asked, "Do you believe that local educational institutions in your area (high schools, community colleges, other technical schools) understand your company's workforce needs and align their curricula and train students to meet those needs?", a majority of survey respondents said "No".

Source: 2015 AED workforce survey

Lack of Technical Skills

Equipment distributors across the nation report a high difficulty in finding qualified candidates to fill open technicians positions. The #1 reason? Lack of technical skills.



Source: 2015 AED workforce survey

Difficult to meet demand

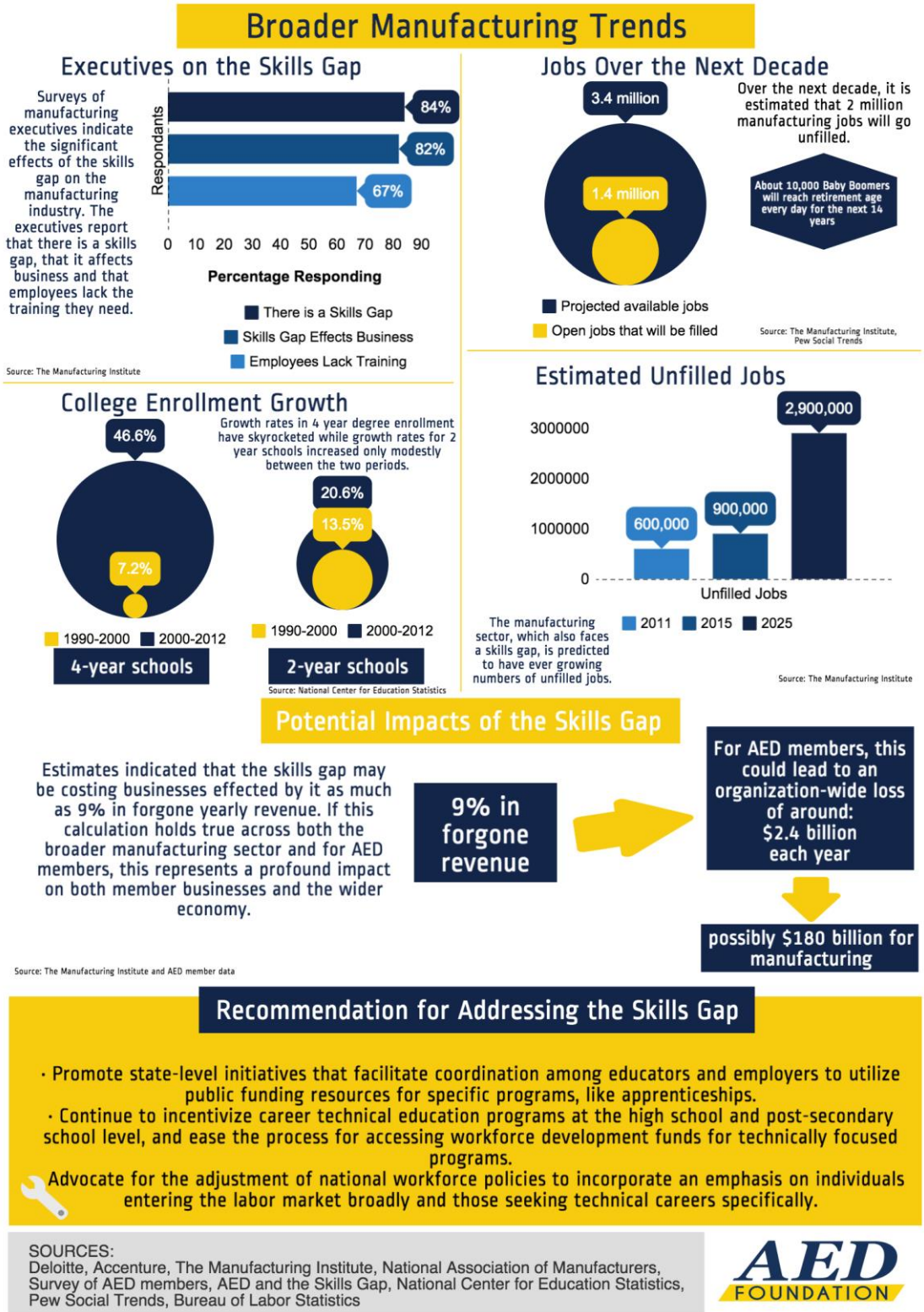
Increase costs & inefficeincy

Hinder company growth

Effects of the Skills Gap

Equipment distributors report that the inability to hire skilled technicians has had significant adverse effects on their businesses. More than 50% indicated that the skills gap hindered company growth and increased costs and inefficiencies. Almost 75% said that lack of skilled technicians made it difficult to meet customer demand.

Source: 2015 AED workforce survey


Broader Manufacturing Trends
Executives on the Skills Gap
Surveys of manufacturing executives indicate the significant effects of the skills gap on the manufacturing industry. The executives report that there is a skills gap, that it affects business and that employees lack the training they need.
Respondants
84%
82%
67%
0 10 20 30 40 50 60 70 80 90
Percentage Responding
There is a Skills Gap
Skills Gap Effects Business
Employees Lack Training
Source: The Manufacturing Institute
Jobs Over the Next Decade
3.4 million
1.4 million
Projected available jobs
Open jobs that will be filled
Over the next decade, it is estimated that 2 million manufacturing jobs will go unfilled.
About 10,000 Baby Boomers will reach retirement age every day for the next 14 years
Source: The Manufacturing Institute, Pew Social Trends
College Enrollment Growth
Growth rates in 4 year degree enrollment have skyrocketed while growth rates for 2 year schools increased only modestly between the two periods.
46.6%
7.2%
1990-2000
2000-2012
4-year schools
20.6%
13.5%
1990-2000
2000-2012
2-year schools
Source: National Center for Education Statistics
Estimated Unfilled Jobs
3000000
2000000
1000000
0
600,000
900,000
2,900,000
Unfilled Jobs
2011
2015
2025
The manufacturing sector, which also faces a skills gap, is predicted to have ever growing numbers of unfilled jobs.
Source: The Manufacturing Institute
Potential Impacts of the Skills Gap
Estimates indicated that the skills gap may be costing businesses effected by it as much as 9% in forgone yearly revenue. If this calculation holds true across both the broader manufacturing sector and for AED members, this represents a profound impact on both member businesses and the wider economy.
9% in forgone revenue
For AED members, this could lead to an organization-wide loss of around: $2.4 billion each year
possibly $180 billion for manufacturing
Source: The Manufacturing Institute and AED member data
Recommendation for Addressing the Skills Gap
· Promote state-level initiatives that facilitate coordination among educators and employers to utilize public funding resources for specific programs, like apprenticeships.
· Continue to incentivize career technical education programs at the high school and post-secondary school level, and ease the process for accessing workforce development funds for technically focused programs.
Advocate for the adjustment of national workforce policies to incorporate an emphasis on individuals entering the labor market broadly and those seeking technical careers specifically.
SOURCES:
Deloitte, Accenture, The Manufacturing Institute, National Association of Manufacturers, Survey of AED members, AED and the Skills Gap, National Center for Education Statistics, Pew Social Trends, Bureau of Labor Statistics
AED FOUNDATION

7.2 | Regional Statistics

Regional Key (Based on AED regional breakdown and company HQ data):

Canada (CA) – All Canadian Provinces

Midwest (MW) – Kentucky, Missouri, Ohio, Indiana, Illinois, Michigan, Minnesota, Wisconsin, Iowa, Kansas, Nebraska, South Dakota, North Dakota

Northeast (NE) – Maine, Vermont, New Hampshire, Rhode Island, Massachusetts, Connecticut, New York, New Jersey, Delaware, Pennsylvania

Rocky Mountains (RM) – Colorado, New Mexico, Arizona, Utah, Idaho, Montana, Wyoming

South Central (SC) – Louisiana, Texas, Oklahoma, Arkansas, Mississippi

Southeast (SE) – Maryland, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee

West (W) – California, Oregon, Washington, Nevada, Alaska

Definitions:

Job Opening Rate = Unfilled Technician Positions/(Unfilled Technicians Positions + Number of Technicians)

High School Rating = A rating of local high school's effectiveness on a 1-5 scale with 1 indicating poor and 5 indicating excellent.

Community College Rating = A rating of local community college's effectiveness on a 1-5 scale with 1 indicating poor and 5 indicating excellent.

Technical School Rating = A rating of local technical school's effectiveness on a 1-5 scale with 1 indicating poor and 5 indicating excellent.

	CA	MW	NE	RM	SC	SE	W
Count	6	31	15	13	13	21	6
Job Opening Rate	0.017	0.085	0.071	0.147	0.122	0.175	0.178
Days Job is Open	36	67.75	47.929	46.45	80.9	111.588	156.667
Employees	169.667	242.419	202.2	165.385	200.769	130.85	76.167
Technicians	63.667	87.3	73.8	49.538	65.154	47.857	24
Openings	2.4	6.306	4.8	1.909	5.25	3.5	4.667
Percent of Workers Age 18–25	18.5	8.795	9.2	15.308	7.308	10.524	7.333
Percent of Workers Age 25–35	19.833	25.295	20.533	21.462	17.669	26.333	23.167
Percent of Workers Age 35–45	20.167	26.51	25.4	14.769	28.054	24.619	34.833
Percent of Workers Age 45–55	18.333	21.419	22.067	23.846	18.869	18.238	22.167
Percent of Workers Age 55–65	6.167	11.097	15.267	8.462	11.285	9.286	8.333
Percent of Workers Age 65+	0.333	0.452	0.867	0.769	1.438	1.476	4.167
High School Rating	2.75	2.321	2.067	1.714	1.9	1.667	2.4
Community College Rating	3	3.333	3.067	3.125	2.7	2.235	2.8
Techincal School Rating	3.5	3.68	4	3.625	4	2.706	3.25

7.3 | Statistical Analysis

Below are presented two models that look at the effects of wages on a variety of indicators of the skills gap. The data for these models is taken from the AED survey data. The starting sample for each is the 105 observations in the survey, but missing data led to the models each having fewer data points than that. For both models the predictor variables are the same. The first predictor, Starting Wage is the starting wage of technicians in dollars per hour. The second predictor, Average Wage is the average wage of technicians in dollars per hour. These are the main predictors of interest. The models also control for the companies' revenues, measured in millions of dollars and for the region in which they were located. The coefficients presented for regional differences are based on difference from the Canadian region.

The first model presented is logged job opening rate values regressed the predictors noted above. Some observations were lost because you cannot take the log of 0 so any respondent who had a job opening rate of 0 was not included in the model. Fortunately, the firms that were used in the model appear to be representative of the full survey in terms of size, wages, and region. From the output table (namely the p-values in the last column) we see that the neither starting nor average wages have a significant effect on job opening rates.

The second model presented is of logged number of days a job remains open regressed on the noted predictors. The log transformation did not cause any observations to be lost since there were no respondents who had a value of 0 for Days Job Remains Open. Some respondents, however, didn't report any value for this measure. Again we see that neither measure of wages have a significant effect on the number of days a job remains open.

Model: Log(Job Opening Rate) ~ Starting Wage + Average Wage + Revenue + Region

	Estimate	Standard Error	t value	Pr(>|t|)
Intercept	–3.6397	0.9483	–3.838	3e–04
Starting Wage	–0.0029	0.0266	–0.1091	0.9135
Average Wage	0.0247	0.0274	0.8997	0.372
Revenue	–0.0014	4e–04	–3.1753	0.0024
Midwest	0.7864	0.5598	1.4048	0.1653
Northeast	0.7946	0.5867	1.3544	0.1808
Rocky Mountain	1.2185	0.6254	1.9484	0.0561
South Central	0.9701	0.6254	1.5511	0.1262
Southeast	1.3619	0.5804	2.3464	0.0223
West	1.0959	0.5961	1.8384	0.071

Adjusted R^2: 33.74%, n = 59

Model: Log(Days Job Remains Open) ~ Starting Wage + Average Wage + Revenue + Region

	Estimate	Standard Error	t value	Pr(>|t|)
Intercept	4.3825	1.1345	3.8631	3e–04
Starting Wage	–0.0491	0.034	–1.4434	0.1537
Average Wage	0.0157	0.0379	0.4131	0.6809
Revenue	–2e–04	2e–04	–1.163	0.2491
Midwest	0.0976	0.5725	0.1705	0.8652
Northeast	–0.121	0.6036	–0.2004	0.8418
Rocky Mountain	–0.5034	0.669	–0.7524	0.4545
South Central	0.1811	0.6837	0.2649	0.7919
Southeast	0.2879	0.6085	0.4731	0.6377
West	0.8639	0.6471	1.3352	0.1865

Adjusted R^2: 18.95%, n = 65