



WHITE PAPER

THE MANUFACTURING WORKFORCE PIPELINE

Collaboratively Addressing
The Challenges In
Manufacturing Career
Technical Education



National Manufacturing Challenge

Manufacturing is a major driver of national economic growth and innovation and is critical to national security. Yet, manufacturers struggle now more than ever to staff their operations with a sufficiently skilled workforce. Aligning manufacturing Career and Technical Education (CTE) with industry needs and expanding the pipeline of students participating in manufacturing CTE programs can help alleviate the manufacturing workforce challenge. The Alabama Defense Advanced Manufacturing Community (ADAMC) is seeking to address this challenge and believes the manufacturing-rich regions in Alabama are ideal to pilot an effort to extend the manufacturing workforce pipeline upstream and ensure alignment with defense industrial base needs.

Importance of Manufacturing

The U.S. Department of Commerce, as far back as 2004, states in its *Manufacturing in America* report that “a healthy manufacturing sector is key to better jobs, fostering innovation, rising productivity, and higher standards of living in the United States.” (U.S. Department of Commerce, 2004). The U.S. Department of Defense also recognized that “as an engine of economic growth, American manufacturers contribute more than \$2.35 trillion to the U.S. economy — every dollar spent in manufacturing results in an additional \$2.79 added to the economy. (Bistarkey, 2019) Some key economic benefits also include:

- Manufacturing represents just 11% of U.S. gross domestic product, yet it accounts for 35% of American productivity growth and 60% of our exports
- Manufacturing is the main engine of innovation in the U.S., responsible for 55% of all patents and 70% of all research and development spending
- Manufacturing employs over 12.5 million people and provides rewarding, living-wage jobs
- Every manufacturing job spurs 7 to 12 new jobs in other related industries, helping to build and sustain our economy

However, despite being a leading driver of employment growth, manufacturing employment has declined 36% from its peak in 1979 of 19.6 million.

Workforce Obstacles for Manufacturers

Addressing the skills gap remains a foremost challenge for manufacturers in the US, who face ongoing obstacles in sourcing, training, and retaining talent. A recent study from Deloitte and The Manufacturing Institute (Deloitte, 2021) presented some key findings related manufacturers’ challenges, including:

- US manufacturing is expected to have 2.1 million unfilled jobs by 2030.
- The pace of digital transformation in the manufacturing industry will likely continue to redefine work for humans.
- The economic impact of protracted job openings in manufacturing is significant.
- Diversity, equity, and inclusion (DEI) is an imperative for manufacturers.
- Manufacturers should create pathways to tomorrow's jobs today.



In this study, 77% of manufacturers say they will have ongoing difficulties in attracting and retaining workers. Manufacturers clarified two important aspects that define the immediate shortages the industry faces involving entry level positions and finding skilled talent. These positions are described in more detail:

Entry Level Positions

- Jobs that do not require technical know-how or industry knowledge, such as team assemblers, production work helpers, and hand-held tool cutters and trimmers.
- Require basic level of “human capabilities,” such as following directions, willingness to learn, and follow-through.
- Could be filled by people recently displaced from other industries (hospitality, food services) or high school graduates.
- Starting wages in manufacturing are notably higher than local minimum wage levels.

Skilled Talent

- Typically requires some level of technical training or applied skills and can be referred to as ‘middle-skilled talent’.
- Examples include computer numerical control (CNC) machinists, welders, and maintenance technicians.
- Jobs often require a hands-on, applied training program that can take between several months to more than a year (with some also requiring licensing and certification).

The Manufacturing Career Technical Education Challenge

To fill and maintain the pipeline of talent entry-level and skilled positions, efforts must start early in the education process and be aligned with industry needs. It remains a necessity and priority that regional industry-driven CTE programs be developed and sustained to promote manufacturing careers and prepare students to be career ready. Unfortunately, as American manufacturing faced declines over the past several decades, the workforce development system has seen foundational declines. As a result, businesses stopped investing in workforce development efforts for middle-skill workers, relationships between employers and educators weakened, and educators lost focus on industry needs.

In CTE state program guidance studies, ExcelinEd, cites that, “too many state CTE programs are not fulfilling the promise of improving students’ career readiness, expanding their access to postsecondary credentials, or providing opportunity for long-term advancement and success in the workforce.” (ExcelinEd, 2017). As it relates to manufacturing needs for the talent pool, many CTE programs “do not align with regional workforce needs or provide clear pathways to careers.”

CTE Availability and Participation

Another challenge that has plagued manufacturing is the perception of both manufacturing and CTE programs. While Americans are realizing more and more the importance of manufacturing, many still consider manufacturing as dark, dirty and dangerous jobs or are reluctant to pursue manufacturing as a career due to fear that the jobs will be moved offshore. In a national survey (Deloitte, 2014), manufacturing ranked 5th as a career choice out of seven occupational fields and last among Generation Y respondents. Further impacting this perception gap, only 37% of respondents indicate they would encourage their children to pursue a



manufacturing career, and only 19% of the children surveyed noted their parents encouraged them to do so. These perceptions must be corrected for parents, teachers, counselors, administrators, policy makers, and especially students. The sooner students are exposed to the reality of manufacturing careers the better. By the time students reach 7th grade, they may not know what they want to do for a career but have determined what they do not want to do.

In addition to manufacturing, the CTE programs themselves are suffering from a perception gap. ExcelsinEd notes that too many policymakers, advocates, educators and parents still view CTE as an alternative to rigorous academic study and post-secondary attainment. The legacy term of “Vocational Education” was viewed as an alternative pathway reserved for students who were not deemed “college material” and could be due to the school community culture, economic status, or race (ExcelsinEd, 2017).

Additionally, investing in the potential workforce in underserved regions and in groups historically underrepresented can close the workforce gap while prompting equity. It is imperative that educators provide skills development opportunities and ensure that learners have ready access to the skills they will need to succeed. They should also provide proven workforce development programs targeted at underserved groups and get students on paths to careers before they graduate from high school. Renewed investment in workers is needed, including resources for education in foundational sciences ranging from elementary school through post-graduate degrees, technical training programs with industry-recognized credentials, apprenticeships and internships, and leadership development programs. These efforts must include individuals from groups historically underrepresented and/or from underserved regions.

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Collaboratively Address the Challenge

These challenges must be addressed on a broader national level, but regionally, Alabama faces unique challenges as manufacturing and the defense industrial base strive to expand across the region. These efforts will need to be a whole-of-community approach including stakeholders across the entire manufacturing and education ecosystem. The community must first be made aware of the manufacturing careers in the region as well the value of those careers. Further, the industry, educators and community organizations must all engage in promoting manufacturing value to the community and nation, but also, the value to the employee and their families as a preferred career pathway at many levels of education. Industry needs-driven curriculum should be created in education pathways and should be promoted and made available as early as possible in K-12 education. Resources that enable more educators and more hands-on-learning should be expanded to increase access to these programs and encourage and ensure increased participation from underserved or underrepresented groups that otherwise may not enter the manufacturing education and workforce pipeline.



Finally, communities must collaborate, share resources and provide needed services that expand access to these programs.

The Alabama Defense Advanced Manufacturing Community (ADAMC) is embarking on several initiatives to engage manufacturing ecosystem stakeholders in collaboratively addressing these regional and national challenges to expand the manufacturing education and workforce pipeline. To learn more, visit our website at www.adamc.tech or contact us at ADAMC@uah.edu.

About ADAMC:

The Alabama Defense Advanced Manufacturing Community consortium was created to promote visibility, awareness, and adoption of advanced manufacturing technologies. To fulfill ADAMC's mission, our focus emphasized on three thrust areas: workforce development, technology adoption, and technology development.

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