# ADVANCED MANUFACTURING INDUSTRY

## Addressing the Workforce Challenges of America's Advanced Manufacturing Workforce

AN ETA/BUSINESS RELATIONS GROUP REPORT

# *Preface*

The following report, prepared by the U.S. Department of Labor (DOL), Employment and Training Administration (ETA), details the efforts around former President George W. Bush's High Growth Job Training Initiative (HGJTI) for Advanced Manufacturing. It provides an overview of the advanced manufacturing industry, outlines the goals and activities of the HGJTI, examines the workforce challenges facing the industry, and discusses possible solutions to address the industry's challenges.

ETA recognizes and commends the ongoing commitment of the advanced manufacturing industry to workforce development, and will work collaboratively with the industry to support and replicate its successes. As this report details, the industry faces pressing workforce development challenges, ranging from the need to raise career awareness to upgrading the skills of incumbent workers. Comprehensive partnerships among education, employment, and economic development are needed to effectively address these challenges, and ETA seeks to partner with industry to model such collaborations.

This report is intended to describe the outcomes from a series of forums held with U.S. manufacturers, workforce development professionals, and other stakeholders regarding the state of the U.S. manufacturing workforce. It presents the challenges and offers ideas for specific solutions, as well as guidance for investments. In this way, the report provides a basis for developing strategic partnerships among manufacturers, the public workforce investment system, and educators, leading to solutions to workforce challenges. It is organized into the following sections:

ETA thanks all who participated and contributed to this work. The thoughtful insights and genuine concerns expressed by manufacturers, educators, and all stakeholders give this document the credibility and potency that will be required to create and drive the changes needed. It is a document generated by those most directly involved and most likely to be impacted. To those who generously gave their time, effort and other resources to this work, thank you for your thoughtful contributions. To those reading about this initiative for the first time, ETA looks forward to your contributions to address the challenges that stand before America's manufacturers.

# *Executive Summary*

## Introduction

This document is a tool that will assis t ETA, as well as t he national Workforce Investment System, to model sound inves tments in local, r egional, state, and national projects that promise to address the workforce challen ges facing advanc ed manufacturers. The document will inform the reader about ETA's processes to gathe r information and to c ollaborate wit h key stak eholders, which lead to the implementation of model "solutions" grants in Advanced Manufacturing.

A top prior ity for ETA is to s erve America' s workers by partnering with employers. These gov ernment/business collabor ations result in programs that effectively meet the workforce needs of employer s, whic h then lead t o more, higher paying jobs fo r American workers. The reas oning behind this "demand-driv en" workforce system i s straightforward; healthy, growing businesses that are able to hire cap able, skilled workers will grow and, in turn, hire more workers. Moreover, workers who attain needed skills in dyna mic industries have the potential to progress along a fulfilling , lifelong career path.

## American Manufacturing

The manufacturing industry in the Un ited St ates is undergoing a dramatic transformation. A mo dern manufacturing fa cility bares little resem blance to a traditional factory of decades past. Popular perceptio ns of manufacturing jobs as dark, dangerous and dirty are largely outdated as advanc ed robotics and other "intelligent" syste ms become pervasive t hroughout the manufactur ing process. To re main globally competitive, U.S. manufactu rers are implementing proce ss improvement techniques , incorporating quality management systems, and overhauling t heir production operations with advanced technology. In this way, the U.S. manufacturing industry has achieved remarkable productivity growth in recent years.

The transformation of manufacturing has pr ofound implications for the incumbent manufacturing workforce and for the new worker s that employers demand. In order to operate a modern production f acility, manufac turers require workers with advanced skills. Rather than hiring a worker to perfo rm a specific task, em ployers increasin gly need workers who are contin ually focused on innovati on of both products and processes. Modern manufacturing worker s require advanced academic, workplace, and technical skills to enable their employers st ay competitive. Indeed, even as overall employment in the manufac turing industry has dec lined, many employers report difficulty finding and hiring the highly-skilled employees they need.

## The High Growth Job Training Initiative (HGJTI)

The High Growth Job Training In itiative is designed to provide nation al leadership for a demand-dr iven workforce system. It is a strategic effort to prepare

workers for new and increasing job opportunities in high growth/high demand and economically vital industries of the American economy. Through the Initiative, the Employment and Training Administration (ETA) works with industry leaders to identify their critical workforce challenges, and invests in demonstration projects that help ensure individuals gain the skills they need for successful careers in these expanding or transforming industries. The foundation of this initiative is partnerships between the publicly funded workforce investment system, business and industry representatives, economic development entities, and education and training providers. The purpose of these partnerships is to develop innovative solutions or replicate models that address a targeted industry's workforce challenges.

Advanced Manufacturing was included in the HGJTI because of its importance to the U.S. economy, the dramatic transformation in technology and skill requirements, and the difficulty that manufacturers report in hiring skilled workers. ETA defines "Advanced Manufacturing" as the accelerated use of high-tech processes in the manufacturing plant. This definition is not synonymous with "high-tech manufacturing," as the emphasis is on the high-tech processes used in production, rather than the output of high-tech products. ETA believes that a primary goal of this initiative, and of the broader public workforce system, should be to encourage and assist more manufacturers to adopt these advanced techniques, with workforce training as a critical ingredient for that transformation.

## The Workforce Challenges Facing Manufacturers

Over the course of five Executive Forums, ETA met with senior executives from more than 120 manufacturing firms and trade associations, representing a broad cross-section of the manufacturing industry. The research conducted over the course of this Advanced Manufacturing Initiative provides insight into what industry executives identify as their key workforce development concerns. It is clear that there is demand for *new* workers, recruited from *new* sources, trained with *new* skill sets, while incumbent workers need training to upgrade their skills. The following is a snapshot of workforce issues that were discussed in those forums:

1. Training for innovation: maintaining the competitive edge.

The capacity for innovation is the primary competitive advantage for U.S. manufacturers in the global marketplace. Thus, employers need workers who are continually focused on improving processes and products.

2. Enhancing the flow of new workers: "pipeline development."

Too few young people consider the possibility of manufacturing careers and are unaware of the necessary skills. Similarly, the K-12 system does not adequately impart the skills needed or educate students about manufacturing career opportunities.

3. Confronting a negative public image.

Manufacturing confronts a negative public image, characterized by: "moving offshore," "declining," "dirty," "low pay," etc. Consequently, too few highly skilled workers seriously consider manufacturing careers.

4. The challenges of employing workers from "alternative sources": immigration.
The manufacturing workforce is increasingly foreign-born, meaning that English language skills are becoming a prominent challenge for the industry. Employers have experienced difficulty finding English as a Second Language (ESL) programs that suit their particular needs.

5. Hiring employees with adequate foundational skills and competencies
Manufacturers experience difficulty finding workers with basic employability, academic and technical skills and competencies. Moreover, the industry does not have accepted standards for industry-wide skills and competencies.

6. The added challenges to small and medium-sized manufacturers
Many small and medium-sized manufacturers do not have human resources departments or enough experience organizing training programs for their workers.

7. Matching training providers to business needs
There is difficulty finding training providers that align with employer needs, for example: coordination of work and training schedules, transportation of workers, and finding programs that meet specific technology or process needs.

8. The challenges to incumbent worker training
Rising health care and other costs limit the resources available for incumbent worker training. The Workforce Investment Act (WIA) performance standards may discourage incumbent worker training because wage gain compliance is difficult to measure. The standards are easier to meet by training unemployed workers. Additionally, businesses face the dilemma that once trained, the worker will leave.

9. Training the Supply Chain
Manufacturers increasingly need integrated training programs for workers throughout the supply chain.

## The Solution Clusters

Following the Executive Forums, ETA convened a meeting of industry experts to review the challenges and suggest solutions. Those solutions are gathered in three categories:

- Capacity-Building: Ensuring that the infrastructure of training and education programs exists to train an adequate supply of workers for advanced manufacturing.
- Pipeline Development: Maintains practices and processes to ensure that an ongoing supply of new and incumbent workers are recruited and prepared to meet the needs of manufacturers.
- Training for Innovation: Ensuring that training and education programs are aligned with the needs of employers, and that trainees can provide innovative and creative solutions for employers.

## Demonstrating Model Solutions

ETA supports comprehensive partnerships of business, education, and workforce development in order to demonstrate how a demand-driven workforce system can more effectively serve the needs of business and workers. Grants awarded under the HGJTI support innovative, industry-driven skills training, certification, and career ladder development programs that address the workforce and economic development needs of the advanced manufacturing industry.

Based on the challenges identified by the industry and highlighted in this report, ETA has made a series of investments totaling nearly $70 million to address the range of workforce needs identified by the industry, including the needs of the industry broadly, as well as those of specific industry sectors.

ETA is committed to identifying successful models and resources through the HGJTI for Advanced Manufacturing and disseminating the lessons of those investments with the public workforce system. In this way, industry stakeholders around the country may replicate these effective partnerships that simultaneously help the industry address its key workforce challenges and help prepare workers for successful careers in high growth industries.

# *I. Introduction*

## The American Workforce

America's labor market is facing a serious challenge arising from two primary sources: an insufficient supply of people with required skills and the "leveling off" of the number of American-born people available for jobs. In addition, economic and international concerns may overshadow the slowing of educational attainment and its long-term economic impact. For example, the percentage of the workforce with college degrees is expected to grow very slowly.[1] It is projected that in the next twenty years, there will be virtually no growth in the prime age workforce and a marked slowdown in skill growth.

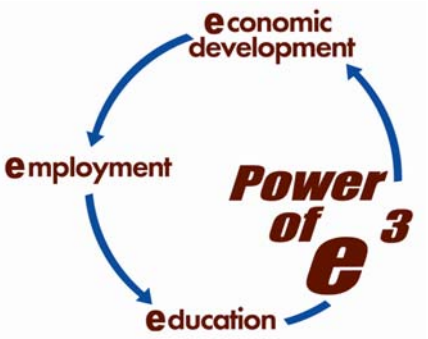
In recent decades, the U.S. has seen a marked increase in both the size and educational level of the labor force, and as a result, the country has experienced strong economic growth. The depth and breadth of the labor pool has been driven by the large numbers of Baby Boomers, women, and immigrants entering the workforce, as well as large increases in the number of college-educated workers. However, growth in numbers of new and educated American-born workers is ending. In the next 30 years, the number of native-born workers age 35-44 will decrease, while more than 60 million employees are likely to retire.[2] It seems probable that growth in the labor force will need to come from older workers, immigrants, and other underutilized labor pools.[3] Similarly, the changing demographics of the workforce create new challenges and opportunities for employers.

In addition to these demographic trends, it is important to note that many industries also face many other pressing workforce challenges. For example, the public image of many high growth industries could be improved – jobs in the industries are seen as undesirable and youth are not aware of the skills they need. Furthermore, difficulty recruiting both youth and individuals in non-traditional labor pools is an additional challenge facing the advanced manufacturing industry. These are just two examples from manufacturing – many industries are also coping with a range of other workforce challenges, in addition to the demographic trends described above.

The economy of the United States, similar to that of other developed nations, is fueled by innovation. In the face of a global economy, employers are using new productivity-enhancing technologies to remain competitive. Two thirds of America's economic growth in the 1990s resulted from the introduction of new technologies. This continual process of innovation and technological change has resulted in jobs that demand ever-higher skill levels. For example, sixty percent of the new jobs of the 21st century require some post-secondary education. However, currently only one third of America's workforce has this level of post-secondary education.[4]

## Building a Demand-Driven Public Workforce System

The mission of the Department of Labor's Employment and Training Administration is to contribute to the more efficient and effective functioning of the U. S. labor market by providing high quality job training, employment assistance, labor market information, and temporary, partial wage-loss replacement. These services are provided primarily through state and local workforce investment systems. While the federal government invests $15 billion annually in workforce development programs, private sector employers and individuals invest far larger amounts. Therefore, ETA must ensure that the federal funding is utilized in the most effective manner possible.




In pursuit of its mission, ETA strives to provide America's employers with the highest quality workers possible, and to link employers and job seekers for their mutual benefit. ETA has compressed this mission into a formula called the "Power of e$^3$." The "3 e's" are employment, education and economic development, with the power of each of those e's multiplied against the others to produce an exponential return on investment. The "Power of e$^3$" describes a demand-driven system that allows workers to live more productive and prosperous lives, businesses to be more competitive in the global economy, and communities to thrive in the 21st Century. Only by ensuring that available workers have the specific skills needed by employers can we begin to address the skills gap mentioned above.

Capitalizing on the power of e$^3$ will allow ETA to create a demand-driven approach to workforce development, which focuses the workforce investment system on giving workers readily useable skills, knowledge and information that are most needed by employers, particularly in high-growth occupations with career potential, like advanced manufacturing. In the past, the U.S. workforce investment system has focused on the supply of workers, and on helping workers secure and keep jobs. Such a strategy meant that workers were often trained for jobs that did not exist, and also meant that the workforce system was not helping American businesses to remain competitive in the global economy. In addition, workers often did not receive the benefits of gaining skills in demand, including higher wages and improved job security.

Alternatively, the goals of the demand-driven workforce investment system are to (1) meet the demands of businesses by providing adults, youth, and untapped labor pools with the educational, occupational, and other skills training and services needed for high demand occupations, and (2) bringing together resources devoted to employment, education, and economic development and use them strategically to create opportunities for workers.

A demand-driven workforce investment system will help the U.S. economy meet the increasing challenges of globalization, changing demographics, and the rapid pace of

technological innovation. These challenges make it critical that every available worker be prepared with skills to join the workforce and enable the continued competitiveness of American businesses.

## Demonstrating Solutions: the High Growth Job Training Initiative

While demographic changes and other trends pose daunting hiring and training challenges for employers, ETA believes these challenges can be overcome through collaborations among key industry stakeholders. Through the High Growth Job Training Initiative (HGJTI), ETA is demonstrating these partnerships and supporting innovative solutions in 14 high growth industries. These industries were selected based on such factors as: employment growth; dramatic workforce transformation; impact on the nation's economic viability and development; and emerging industries. In addition to advanced manufacturing, the fourteen industries include: aerospace, automotive services, biotechnology, construction, energy, financial services, geospatial, healthcare, homeland security, hospitality, information technology, retail, and transportation.

ETA believes that successful strategies for workforce development depend on the leadership of industry in the development and implementation of those strategies. Only the leadership and commitment of industry can guarantee that workers are being trained to the skills and competencies that are in demand in the labor market

Over the course of the HGJTI, ETA conducts a series of Executive Forums in order to solicit industry leaders to describe their workforce challenges, such as current and anticipated demand for workers, skill shortages, views on pipeline capacity, promising workforce practices, and knowledge of the existing public workforce system at the local, state, and federal levels. Through Workforce Solutions Forums, ETA works with a wide array of stakeholders to explore potential solutions to the industry's challenges, and ultimately invests in innovative partnerships. In this way, the HGJTI promotes an industry-led approach to identify the most critical workforce challenges and implement solutions to those challenges.

The HGJTI is also a strategic effort to improve the publicly funded workforce system's response to the needs of the labor market by transforming the workforce system to become demand-driven. The HGJTI is specifically designed to demonstrate how the public workforce system may serve as a catalyst for collaborations among employers, business associations, workers, educators, trainers, community and technical college systems, and economic development organizations. The purpose of these partnerships is to model how a demand-driven workforce system can more efficiently serve the workforce needs of business, while also effectively helping workers find good jobs at good wages.

By supporting the local workforce system's transformation to be demand-driven, ETA is actively promoting workforce quality, enhanced productivity, and economic competitiveness. The ability to respond to evolving labor market demands will require strong, collaborative relationships between the private and public sectors. With its partners, the HGJTI seeks to leverage the publicly funded workforce system to prepare

new and incumbent workers with the general and industry-specific knowledge and skills required by employers.

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[1] DT Ellwood. 2001. "The spluttering Labor Force of the 21st Century. Can Social Policy Help?" National Bureau of Economic Research, June 2001.
[2] Facts on Immigration, National Immigration Law Center, March 2003, p. 1.
[3] The Aspen Institute Domestic Strategy Group. Grow Faster Together. Or Grow Slowly Apart. How will America Work in the 21st Century. p 11.
[4] United States, The White House, Better Training for Better Jobs (Washington, DC: 5 April 2004).

# *II. Manufacturing in the U.S. Economy*

## Advanced Manufacturing as a High Growth Industry

Advanced Manufacturing was identified as a "high growth industry" under the High Growth Job Training Initiative for several reasons. First, the U.S. manufacturing industry is undergoing a dramatic transformation in terms of the technology being used, the market dynamics, the demographics of the workforce, and the skills needed to work in an advanced manufacturing environment. A modern manufacturing facility bares little resemblance to the gloomy factories that are the common public perception. To remain viable in the face of intense global competition, U.S. manufacturers have become (or need to become) high-tech enterprises. Successful U.S. manufacturers are implementing process improvements, increasing quality controls, and installing advanced robotics and other intelligent production systems. This transformation recognizes that U.S. manufacturers face increasing difficulty competing on the basis of low costs, especially low-cost labor. Rather, through technological and process advancements, U.S. manufacturers are competing successfully based on higher productivity and greater value to customers. This new competitive advantage is based on such factors as speed to market, flexibility to changing customer demands, mass-customization, and higher quality.

The transformation of the industry is often not widely recognized or fully understood, and has certainly not come without costs, particularly for workers who have become dislocated. Nevertheless, in the face of intense global competition from developing and developed countries alike, this transformation is necessary and needs to continue, if not accelerate. Fortunately, U.S. manufacturers have proven they can succeed despite the challenges. The decline in total manufacturing employment and a rising trade deficit are commonly portrayed as evidence that U.S. manufacturing is in a steep decline. However, the true state of the industry is both more complex and more hopeful. Consider that from 1977 to 2002, productivity in manufacturing rose 109 percent, compared to a 53 percent increase in the overall economy. [5] Even as overall employment has declined, U.S. manufacturing output has nearly doubled since 1977 in real terms, and U.S. exports of manufactured goods have increased at a healthy average of 5.7 percent annually for 20 years.[6] While some sectors of the industry have been hit quite hard by downsizing and off-shoring (textiles, toys, steel), other sectors have proven resilient and have even attracted substantial "in-sourcing" investment from foreign-based manufacturers (semiconductors, automotive). The new reality is that the U.S. manufacturing industry has become integrated into the global economy, producing more goods with fewer workers, all made possible by the transformation in technology, business practices, production processes, and by an increasingly high-skilled workforce.

The second reason that ETA identified advanced manufacturing as a high growth industry was that it remains a powerful engine of economic growth. The following facts highlight the continued importance of this industry to the U.S. economy. The manufacturing industry:

- Accounts for 14 percent of U.S. Gross Domestic Product and 11 percent of total U.S. employment -- more than 14 million workers;[7]
- Funds 60 percent of the $193 billion that the U. S. private sector invests annually in research and development;[8]
- Provides average compensation of more than $54,000 -- highest in the private sector;[9]
- Contributes two-thirds of U.S. exports;[10]
- Generates an additional $1.43 of economic activity for every $1.00 in manufactured goods produced – the greatest "multiplier effect" of any economic sector. [11]

The third reason advanced manufacturing was identified as a high growth industry is that manufacturers face a critical shortage of skilled workers. The transformation of the manufacturing process has profound implications for the incumbent manufacturing workforce and for the new workers that employers demand. In order to operate a modern production facility, manufacturers require workers with advanced skills. A strong back and hands may or may not still be necessary, but all manufacturing workers need adequate foundational competencies like math, science, reading comprehension, and writing; They need strong workplace competencies like computer literacy, teamwork, and critical thinking; And they need strong technical competencies in quality and process control, supply chain management, integrated production systems, and more. On top of these foundational skills, manufacturing workers may then need further education and training for specific skills related to the particular sub-sector, company, or job requirements. Experienced workers with these advanced skills are in high demand, are critical to their company's survival or growth prospects, and are in critically short supply.

***"A survey by the National Association of Manufacturers found that 80 percent of respondents reported a moderate to serious shortage of qualified job applicants."***

Indeed, even with the decline in total employment, many employers report difficulty finding and hiring the highly-skilled employees they need. A survey by the National Association of Manufacturers found that 80 percent of respondents reported a moderate to serious shortage of qualified job applicants. [12] This skilled-labor shortage is already impeding the industry's ability to achieve its full productive potential, but it will become even more acute as the aging workforce approaches retirement. ETA recognizes that in order for the transformation of manufacturing to continue, and for U.S. manufacturers to remain competitive in the global marketplace, they must have access to an innovative, technology-savvy, highly-skilled workforce.

## U.S. Manufacturing in a Global Context

U.S. manufacturers confront multiple challenges to their ability to remain competitive, such as high domestic costs of energy and health care, low-cost global competition, and policy issues like currency manipulation and trade barriers. As has already been described, over the past 30 years, manufacturing output has increased while

employment has declined, indicating that the advancements in manufacturing processes have produced greater efficiencies. The decline in manufacturing employment is a reflection of long-term structural forces, such as:

- the shift from low-tech manufacturing to advanced manufacturing;
- the greater integration of technology in production; and
- the globalization of production.

These trends are not unique to the United States, but are found in many developed and developing countries. The January 2004 report by the U.S. Department of Commerce entitled, "Manufacturing in America" provides a comprehensive discussion of the range of challenges confronting U.S. manufacturers. Among the report's conclusions was that: "To remain globally competitive, education and worker training strategies must be at the top of the national priority list." [13] We must have a higher educated skilled workforce to maintain America's competitive advantage in the global economy and for continued economic growth. Thus, the Department of Labor and the larger public workforce system have a pivotal role to play. The following list briefly describes several other challenges confronting manufacturing in greater detail:

- Business Cycle: Manufacturing is generally a cyclical industry, experiencing recession earlier and recovering later than other sectors. Between 2001 and 2004, manufacturing lost nearly three million jobs. While manufacturing orders and profits are recovering, job growth is recovering more slowly.

- Technology Infusion: Businesses are pushed by development of technology, forced to purchase expensive equipment in order to prevent falling behind the competition.

- Rising costs: Manufacturers are struggling with the increasing costs of regulation, litigation, health care, energy, and raw materials. Corporate tax rates are higher in the U.S. than elsewhere. State corporate taxes are increasing faster than other forms of taxation.

- Globalization: As global competition increases, manufacturers' profit margins are decreasing. Manufacturers located in developing countries have lower wage and production costs, enabling them to undercut the prices of U.S. manufacturers and claim marketshare. Whereas the price of producing goods in the U.S. is increasing, global competition keeps prices low.

- Demographics: The demographics of the workforce are shifting so that the percentage of skilled laborers is decreasing. Soon the baby boomers will begin to retire in larger numbers, taking their experience and skills out of the workforce.

## The Future Manufacturing Workforce

In 1979, manufacturing employment peaked at 19.6 million jobs; since then, there has been a downward trend. The U.S. is not unique in this respect as nearly all industrialized countries have experienced declines in manufacturing employment over the past decade. However, despite the decline in employment, manufacturing output has increased due to more efficient productivity. The manufacturing sector was among the hardest hit in the recent recession, but it is now showing signs of recovery.

American manufacturers have employed advanced technology to elevate their productivity, but this requires a workforce with the skills to fully exploit the productive potential of such technology. Unfortunately, U.S. manufacturers are experiencing serious difficulties in finding such workers. Considering the net loss of manufacturing jobs, it was widely assumed that recruiting workers would not be problematic. In fact, while many workers seek employment, too few have the required skills. There is a well-documented skills gap between the manufacturing workforce we have and the workforce we need, now and in the future. This shortage of qualified workers will worsen as new technologies require significantly higher skills. Manufacturing is not attracting enough skilled workers to keep up with demand. Moreover, this skills problem will be exacerbated by the retirement of skilled workers in the next several years.

To remain competitive, manufacturers have adopted a variety of advanced technologies. That technology supports continued productivity growth, but "masks a looming shortage of highly skilled, technically competent employees who can fully exploit the potential of new technologies …" Increasingly, jobs requiring two-year degrees or shorter skills certification training remain unfilled, adding further pressures for firms to move operations to countries that are preparing such workers.

As experienced workers retire, they are difficult to replace because too few entry-level workers are equipped with the advanced skills required by today's technologically sophisticated companies. Compounding the challenge, research by the National Association of Manufacturing indicates that few new workers are interested in manufacturing careers. [14] Two factors may generate this lack of interest. First, manufacturing suffers from a poor and outdated image. There is a common misperception that the opportunities in a manufacturing career are diminishing. This perception is often accentuated by policy makers and economists who accept off-shoring as an inevitable and natural transition. Still others have become enamored with the belief that a "knowledge-based" economy will replace a manufacturing economy. As a result of those inaccuracies, new workers do not consider a career in manufacturing. The American public often views manufacturing as dark, dirty, and dangerous, a stigma leftover from the 1950s. Industry must change this image to compete for talent and attract kids, parents, and educators.

An additional set of challenges comprises the negative image of manufacturing jobs, including: the lack of career information and guidance on manufacturing career opportunities; the limited number of high quality education and training programs for

manufacturing; and the limited number of applicants for the programs that do exist. Education and training programs for manufacturing are limited, and many are outdated. Moreover, school teachers and counselors provide little or no information on manufacturing career options. Educators with the above misperceptions do not recommend manufacturing as a good career choice, instead promoting college as the only step following high school.

## The Employment and Training Administration Response

Advanced Manufacturing is one of 14 industries identified for the HGJTI and encompasses many different sub-sectors of the industry, including: aerospace, automotive, metalworking, food processing, shipbuilding, and plastics. Although each industry and each sub-sector faces unique workforce challenges, all of the industries have certain challenges in common. For example, the industries confront image problems and demographic changes in the work force, in addition to the struggles associated with meeting the training needs of integrating technology into their operations.

ETA has made the industry's need for enhanced workforce skills in manufacturing a high priority. Skills and education are now a dominant, if not decisive, factor in the ability to compete in the global economy, and a skilled workforce remains this country's competitive advantage. The manufacturing workforce must possess the foundational skills that will make each worker more flexible, adaptable, responsive and prepared for innovation and technology. By listening to industry representatives and working with business, education, and the public workforce system, ETA is committed to facilitating the change required to address the advanced manufacturing industry's workforce challenges.

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[5] U.S. Department of Commerce, "Manufacturing in America," January 2004, p. 1
[6] "Manufacturing in America," p. 25
[7] "Manufacturing in America," p. 14
[8] "Manufacturing in America," p. 15
[9] The Manufacturing Institute, "The Facts About Modern Manufacturing," p. 12
[10] "The Facts About Modern Manufacturing," p. 22
[11] "The Facts About Modern Manufacturing," p. 14
[12] Center for Workforce Success, "The Skills Gap 2001," p. 5
[13] "Manufacturing in America," p. 71
[14] National Association of Manufacturers, "Keeping America Competitive"

# *III. The Voice of Manufacturers*

## What is "Advanced Manufacturing?"

Among ETA's first challenges in working with manufacturing was to define the scope of its engagement with what is an exceedingly broad and complex industry. Initial contacts with industry leaders helped to develop a definition of "advanced manufacturing," as well as conceptualize the organization of the manufacturing industry. These contacts defined advanced manufacturing as the accelerated use of high-tech processes in the manufacturing plant. This definition is not synonymous with "high-tech manufacturing," as the emphasis is on the high-tech processes used in production, rather than the output of high-tech products. ETA believes that a primary goal of this initiative, and of the broader public workforce system, should be to encourage and assist more manufacturers to adopt these advanced techniques, with workforce training as a critical ingredient for that transformation.

Early on, ETA recognized the difficulty of identifying a clear, well-defined organization of the "advanced manufacturing industry," as even the production of basic products could be considered advanced manufacturing if advanced processes or manufacturing techniques are used. ETA settled on a definition of "advanced manufacturing" that refers to -- and is limited to -- activities, processes, and job categories centered around the manufacturing plant. The emphasis here is on those activities, processes, and job functions that should, and should not, be considered within the scope of the manufacturing plant. For example, in addition to actual production activities, this formulation includes product design, process engineering, and software support, as well as product packaging, shipping (though not the actual transportation), inventory management, and maintenance of capital equipment.

ETA recognized that the Initiative would quickly lose focus and become diluted in its effectiveness if it took on activities unrelated to the manufacturing plant. Therefore, the Advanced Manufacturing Initiative specifically excluded such functions as market research, sales, accounting, and other "back office" activities, as well as other activities such as around raw materials, product transportation, dealerships, and aftermarket activities like product repair.

## Information Gathering: the Executive Forums

The commitment to engage industry leaders and document their workforce challenges is a fundamental underpinning of the HGJTI. ETA believes that it is only by identifying the industry's specific needs that national, state, or local workforce professionals can craft or broker effective solutions. For the HGJTI, this objective was accomplished through "Executive Forums." The dialogue in these forums focused on three general areas:

- Identifying current and future workforce needs.

- Exploring how manufacturers can better access the services of the state and local workforce investment system.
- Ensuring that the workforce investment system understands the skill requirements and meets the needs of business.

Over the course of several months, Assistant Secretary for Employment and Training Emily Stover DeRocco met with manufacturing industry leaders to gather pertinent information about critical workforce issues, and to hear their recommendations on how to address these issues. Throughout the forums, she had the opportunity to share the ETA's plans to meet skilled workforce needs, and to elaborate on current public workforce initiatives. Additionally, the forums provided the opportunity to secure a commitment from leading manufacturers to follow-up with ETA staff.

Using information garnered at the forums, the ETA, manufacturers, educational institutions, and the public workforce system identified workforce gaps, developed training initiatives and strategies to address the needs of business, and fostered their alliance to support demand-driven responses to the needs of the labor market.

As part of a series of Advanced Manufacturing Roundtables held by the U.S. Department of Commerce, the first forum was held on August 14, 2003, with the Commerce Department as co-host. The ten participants emphasized the economic importance of manufacturing and the ongoing transformation of U.S. manufacturers. They described the increasing importance of technology to their operations and urged innovative solutions to address the need for skilled workers.

The second forum, held on March 18, 2004, was organized around a meeting of the National Association of Manufacturers (NAM) Board of Directors in Naples, FL. Fifteen manufacturing executives attended. They emphasized the importance of training for innovation and continuous improvement.

The third forum was held on March 29, 2004, and was coordinated around a meeting of the National Association of Manufacturers Employer Association Group (NAM EAG) in Coral Gables, FL. Nearly 40 representatives of regional manufacturing associations attended. Each of the attendees was the CEO of a local or regional association of employers. An employer association (EA) often represents its members in government relations and/or provides human resource services to companies that need them. The EA executives are among the most knowledgeable individuals concerning the manufacturing workforce in their regions. They emphasized the need for market-driven training solutions that are responsive to the real needs of businesses.

On April 13, 2004, the fourth advanced manufacturing forum was held in Chicago, IL, sponsored by the National Coalition for Advanced Manufacturing (NACFAM) and the Chicago Manufacturing Center. Twenty-six CEOs or senior management personnel attended. This group emphasized the importance of using innovative approaches to improve K-12 education and develop the youth pipeline.

The final forum was held in Washington, D.C. on May 27, 2004. Twenty-one individuals representing both individual businesses and manufacturing-oriented associations attended. The associations that helped identify participants for this forum included the Association for Manufacturing Technology, National Tooling and Machining Association, U.S. Chamber of Commerce, Precision Metalforming Association, Precision Machined Products Association, Society for the Plastics Industry, and the U.S. Department of Commerce's Manufacturing Extension Partnership. The forum participants emphasized cost and competitive pressures on U.S. manufacturers and worker skills needed in order to remain competitive.

## Questions for Manufacturers and Other Stakeholders

Prior to each forum, participants were encouraged to review their manufacturing environment and the questions listed below, providing the structure of each forum:

- Identify workforce challenges:
  - How does the culture and environment within the advanced manufacturing industry, or your organization, support or prevent attracting and retaining a well-trained workforce?
  - How does the emerging nature of the industry present a challenge?
  - What are the critical workforce challenges facing your organization and the industry?
  - How are you addressing these challenges?
  - With whom are you partnering?

- Future concerns:
  - Will changes in the emerging advanced manufacturing marketplace and new applications have an impact on the overall industry labor force? How?
  - What will your future workforce needs be, and how will you plan for these?
  - How do you respond to worker shortages?

- New hires and incumbent workers.
  - What are your education and skill expectations for entry-level workers?
  - Where does your organization find its best hires?
  - Do you have any current initiatives designed to prepare qualified advanced manufacturing workers?

- The public workforce system:
  - Are you aware of the services of One-Stop Career Centers, Workforce Investment Boards and other programs offered through the public workforce system?
  - To what extent have you used the system?
  - What type of support or resources would you like to receive from the public workforce system?

## What Manufacturers Say: The Workforce Challenges

The Executive Forums and other meetings produced significant information around the manufacturing workforce challenges, summarized here into nine areas:

1. Training for innovation

The capacity for innovation is the primary competitive advantage for U.S. manufacturers in the global marketplace. Employers note that effective manufacturing companies adjust themselves continually as they react to new information coming from many sources. Innovation does not come solely from engineers and managers; rather, the most effective changes often come from employees involved in production and/or supporting processes within the plant. Thus, employers need workers who are continually focused on improving processes and products. For example, manufacturers are implementing lean manufacturing techniques and Six Sigma quality controls in order to control costs and remain competitive. Companies assert that they need employees who understand these concepts and will be proactively involved in their implementation. Employers state that they find it difficult to convince employees to be part of the innovation process and are seeking methods to motivate and include them.

2. Confronting a negative public image

As experienced workers retire, they are difficult to replace because entry-level workers are not equipped with the advanced skills required by modern technologically sophisticated companies. The situation is compounded by recent research that shows few potential workers are interested in a manufacturing career. Too often, the phrases one hears in regard to manufacturing are "a dying industry," "moving to China," "grunt work," and "low pay." Similarly, there is a widely held perception that the economic importance of manufacturing is diminishing. This perception may be accentuated by policymakers and economists who accept off-shoring as an inevitable and natural transition. Still others have become enamored with the belief that a "knowledge-based" economy will replace a manufacturing economy. The result is that Americans have little interest in and are weakening support for manufacturers. The result of these negative and often incorrect perceptions, is that too many young people and other potential workers shy away from careers in manufacturing or are reluctant to invest the time and resources to get advanced training. Therefore, those negative perceptions have real consequences for the industry.

3. Enhancing the pipeline of new workers

Educators who have misperceptions about manufacturing resist making investments to improve the education/training needed to enlarge the "pipeline" for future skilled workers. Further, these educators do not recommend manufacturing as a good career choice. School counselors promote college as the only step following high school graduation; however, many students do not actually complete college and lack alternate career plans. Not enough young people consider an advanced manufacturing career and are not aware of the skills needed to work in this environment. Similarly, the K-12 system does not provide students with these skills or educate them about manufacturing career opportunities.

There are at least two major issues: the 'intake' end of the pipeline and the 'outflow' end. Flexible 'intake' points for education and training programs are needed for career ladders and lattices. Providers, employees and workforce professionals identify significant barriers at entry points where the next step on a career ladder is a certificate or degree program. While trying to work, students find that programs involve full-time attendance at the community college or traditional academic requirements. Employers claim that many students graduate from programs that are not applicable to the modern advanced manufacturing industry, are not well prepared, and do not have the basic performance skills.

4. <u>The challenges of employing workers from "alternative sources": immigration</u>

Immigrants have become crucial to the maintenance and growth of the U.S. workforce. At 20.3 million workers, immigrants constitute 14% of the U.S. workforce.[15] In the last ten years, the number of foreign born workers increased at a faster rate than the native workforce.[16] According to an Aspen Institute study, from 1980 to 2000, there was a 44% increase in the native-born workforce aged 25-54 years.[17] Over the twenty years from 2000 to 2020, growth of this population segment will be 0%. Many immigrants lack secondary education credentials or higher level job skills. Eighteen per cent of all persons in the U.S. over the age of five speak a language other than English at home, and almost eight percent are Limited English Proficient (LEP). Of the total immigrants in the U.S., about 46% are LEP.[18]

Clearly, immigrant workers require support programs and special training to assimilate into the workforce and to advance up the career ladder. Language training is the most critical need, but employers have experienced difficulty finding programs that can deliver training at the workplace.

5. <u>Recruiting employees with foundational skills and competencies</u>

Manufacturers experience difficulty finding and hiring workers with adequate foundational skills and competencies. At the most basic level, manufacturers (as with any employer) need workers with personal effectiveness, or what are often called employability or soft skills. As the graphic indicates, these personal effectiveness competencies include: integrity, motivation, dependability, and willingness to learn. At the next level, manufacturers need workers with adequate academic competencies, including: applied science, basic computer skills, applied math/measurement, reading for information, business writing, listening/following directions, locating/using information, and speaking/presentation skills. Like most employers, manufacturers also need their employees to have adequate workplace competencies, including: business economics, adaptability/flexibility, teamwork, customer focus, planning and organizing, problem solving and decision-making, and applied technology. Finally, the manufacturing industry has certain technical competencies that are foundational across companies and sub-sectors. These include: production, maintenance, installation and repair, manufacturing process development and design, health and safety, supply chain management, and quality assurance and continuous improvement. ETA has undertaken a special effort to further define and standardize these competencies, and to disseminate them broadly so that employers, educators, workers, and the public

workforce system know what is required for entry-level employment in the advanced manufacturing industry.

6. The added challenges to small and medium-sized manufacturers

Small and medium-sized companies face more complex challenges due to a scarcity of resources, expertise, and staff. Limited experience and resources to organize and offer training programs exacerbate the challenge created by a lack of human resources departments. An additional challenge to these manufacturers (often individual entrepreneurs or family-owned businesses) is the pressure from their customers to absorb costs or price decreases, which further reduces resources. These companies are unlikely to be able to shift operations overseas and often lack the depth in management, staff, and other resources to compete with those that do. Moreover, they tend to be individualists and rarely band together to meet common needs, challenges, and opportunities. ETA recognizes the need to serve this important class of entrepreneurs and to support their contributions to the economy and local communities.

7. Matching training providers to business needs

Manufacturers turn to a variety of organizations to serve their workforce training needs, such as community colleges, employer associations, Manufacturing Extension Partnership centers, training intermediary organizations, and others. Manufacturers have also described obstacles and difficulties when partnering with outside organizations. For example, community colleges serve a number of missions within their local communities and may be unable to commit to a single, or even limited, constituency. Although most colleges do place resources toward serving the business community, they cannot meet all business needs. The business community is large, complex, and varies considerably within each community. The needs of the service industry (e.g., banking, retail, real estate) are quite different from the needs of manufacturers, yet, the college must serve all.

Similarly, manufacturers report difficulty finding training providers who coordinate training with work and production schedules or who make transportation available. Many companies experience difficulty acquiring training providers that meet their specific technology or process needs. Moreover, the rapid evolution of manufacturing technology makes it difficult for training providers to purchase and maintain state-of-the-art equipment.

Training providers are faced with limited resources and obtaining adequate funding is a challenge for organizations providing manufacturing programs. As many state budgets are reduced, training is becoming more expensive due to equipment costs. Special programs are having problems finding and affording special faculty.

8. The challenges to incumbent worker training

Manufacturers assert that rising health care and other costs limit the resources available for incumbent worker training. Furthermore, the Workforce Investment Act's performance standards may impose a barrier to incumbent worker training because wage gain compliance is difficult to measure and the standards are easier to meet by

training unemployed workers. Additionally, businesses face the dilemma that "the trained worker will leave, but the untrained worker will stay."

Training providers and human resource administrators report a need for alternative methods and vehicles by which employees can attain skills. Often mentioned is skill training by distance education and/or computer-assisted learning that is available at times and places convenient to all workers, regardless of work shifts or distance. Distance learning could assist all sectors in incumbent worker training, particularly in rural areas. Parallel to alternative delivery methods for training is the underlying need for structured paths of training. Competency models and career ladders need to be clearer in order to provide career development opportunities for incumbent workers. Finally, at a time when resources are scarce, trainers have great need for auxiliary funding for training.

Training dollars, too, are described as being in short supply for new or incumbent worker programs. WIA funds, however, may be difficult to secure for the long-term. Also, rules for the use of employment and training funding from various sources are perceived as quite restrictive.

9. Training the Supply Chain

The problems and challenges that directly affect manufacturers apply with equal strength to the suppliers and supply chains serving manufacturers. Initiating improvements and making investments in training and education may not benefit a company if the suppliers to that company are not achieving similar levels of improvement. Given the intense pressure to maintain low prices, it is difficult to find the resources to invest in supplier workforce development and to create systems that enable multiple companies to participate in common training programs.

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[15] Capps, Randolph, et al. "A Profile of the Low-Wage Immigrant Workforce." October 2003.
[16] Grieco, Elizabeth. "The Foreign Born in the US Labor Force: Numbers and Trends." January 2004. p. 1
[17] The Aspen Institute. "Grow Faster Together or Grow Slowly Apart." p. 31
[18] Capps, Randolph, et al. "A Profile of the Low-Wage Immigrant Workforce." October 2003. p. 1

# IV. Solutions for Manufacturing Industry Challenges

## The Solutions Forum

Following the Executive Forums, the information and data obtained from manufacturers was organized and analyzed by the BRG in preparation for the Workforce Solutions Forum. The primary purpose of the Solutions Forum was to gather experts from a very of perspectives to develop innovative solutions to those workforce challenges identified by the industry executives. With that goal in mind, approximately 65 individuals came to the Advanced Manufacturing Workforce Solutions Forum in Dallas, Texas. The solutions group numbered in excess of 65 individuals, including: manufacturers who attended the Executive Forums or who were experts in the challenge areas; representatives from national or regional manufacturing organizations; and representatives from education and the public workforce system.

Over the course of the two-day Forum, participants validated and analyzed the manufacturing challenges that had emerged from the Executive Forums. The participants then brainstormed potential solutions to those challenges, and prioritized the solutions as a group. The participants then spent more time working on the top priority solutions, discussing and identifying the critical attributes of each solution; the key stakeholders needed for success; the financial, human, and technical resources needed; implementation barriers; and other important aspects of each solution. The result was a set of "solutions matrices" documenting the workforce challenges and preliminary strategies for pilot projects. The following are the three broad challenge areas and brief overviews of the priority solutions:

**Challenge Area One: (Capacity)** Ensuring that training and education capacity exists for an adequate supply of advanced manufacturing workers.

**Challenge Area Two: (Pipeline)** Establishing and operating a series of practices and processes to ensure a supply of new and incumbent workers prepared to meet the employee-demand and skill needs of manufacturers.

**Challenge Area Three: (Innovation)** Ensuring that training and education programs are aligned with the needs of employers. Ensuring that trainees are capable of being innovative and providing creative solutions for employers.

## Solutions for Capacity-Building

The Solutions Forum Working Group on “Capacity” focused first on the need for qualified instructors. To address this challenge, the group suggested creating a national-level training academy with regional access, so that colleges may send instructors there when new or additional skills are required. Such an academy would work from industry approved standards, would create credentials accepted by industry, and leverage existing public and private research and practices. A second potential solution to the need for qualified instructors was to target career switchers and those skilled employees looking to retire. The group suggested a recruitment program with

scholarships, tax breaks, and employer incentives that would be effectively marketed to individuals and supported by a range of industry and educational stakeholders. A third potential solution for qualified instructors was to establish partnerships for training the emerging, transitional, and current workforce through job share programs, rotations, and corporate trainers.

The Capacity Working Group focused next on the need for defining manufacturing competencies and career ladders and lattices. The first solution the group proposed was to fund learning demonstration projects that help individuals gain industry defined competencies. This solution would promote best practices for community colleges to work with the K-12 system, universities, and manufacturers to crosswalk competencies. A second suggested solution regarding defining competencies was to increase flexibility in how Workforce Investment Act funds can be spent on incumbent workers. The group suggested educating Workforce Investment Boards on the flexibility within WIA, particularly regarding waivers, as well as disseminating best practices for flexibility. A third potential solution was to create a national repository of industry competencies. This repository would be an accessible database, with a web-based search tool, to allow stakeholders to identify and access current information about competencies, certifying bodies, and certifications.

The Capacity Working Group also focused on the common need among training providers for up-to-date equipment. On this issue, the group suggested partnerships between business, education and training providers, and the public workforce system. Such solutions need to be demand-driven and incentive-based, with clear outcome measures and assessments.

## Solutions for Pipeline Development

The Solutions Forum Working Group on Pipeline Development focused first on the need to improve the public image of manufacturing. The group agreed that the public perception or image of manufacturing as a career choice must be improved, with the belief that an improved national perception would lead to an increase in the number of individuals who may choose manufacturing as a career. The first solution that the group suggested was marketing directed at specific groups and targeted audiences. Key stakeholders in such an effort would include state departments of education, teachers unions and associations, professional organizations, employers and industry associations, and labor organizations, among others. A second potential solution to the image problem was a national image-building campaign. This campaign would be organized by national, regional, and local partnerships, and utilize the range of resources provided by career counselors, foundations, business associations, as well as federal and state funds. A third potential solution was to prepare and deploy a series of electronic and Web-based products that support the improved image of manufacturing and support the choice of manufacturing as a career.

The Pipeline Working Group focused next on ensuring that individuals have the necessary foundational and employability skills for jobs in manufacturing. In response,

the Group proposed developing special bridge programs within training providers that provide employees with the technical and soft skills needed. The Group noted the lack of incentives for trainers to continually update curriculum and maintain personal technical competencies. A second potential solution was to establish skill standards and career ladders within each industry sub-sector, building on the foundation of existing skills standards like NIMS and MSSC. A third potential solution was to establish local employer-based task forces to identify basic employability skills for entry-level workers and to assist with recruiting. These task forces would address basic skills for adults looking to enter or re-enter the workforce through One-Stop centers or other entities.

The Pipeline Working Group also discussed how to design and conduct "21st Century" recruiting programs to draw individuals into manufacturing careers or manufacturing training. Their first proposed solution was to expose non-traditional students to successful careers in manufacturing. This strategy would work with community-based organizations, professional organizations for target groups, TANF programs, and One-Stops to reach out to various populations. A second solution was to establish direct-marketing campaigns for targeted audiences, in part by mining existing databases. A third solution was to provide scholarships, loan forgiveness, and similar incentives for critical skill areas in manufacturing.

Lastly, the Pipeline Group discussed new initiatives for addressing the changing demographics of the manufacturing workforce. One solution would be to provide all of the critical stakeholders a local or regional "picture" of business skill needs. This would be a regular scan of both the business environment as it applies to workforce issues and a summary of emerging and changing employer skill needs. A second solution would be to create real career pathways and multiple entry-exit points that reflect where an individual is and the education programs needed to obtain the skills required by local employers. Third, the group proposed identifying what is working and not working in business to attract and retain employees, and to produce an environmental scan of recruiting practices.

## Solutions for Innovation

The Solutions Forum Working Group on Training for Innovation discussed first how to ensure that training programs align with the needs and constraints of local employers. Their first solution was to develop an assessment tool to allow WIBs, community colleges, and other stakeholders to know what employers need in terms of skills. Institutions could then assess and adjust their programs to meet specific employer needs. Their second suggested solution was to develop validated, industry-designed certificates for competencies and create training that leads to the completion of certificates. Such a project would require sites to pilot the program, funds for workshops, databases and materials, as well as employer contributions of paid employee release time to test the program. The third suggested solution was to provide convenient and flexible training through "alternative delivery" methods, such as distance learning and self-paced learning.

The Innovation Working Group also discussed the challenge of creating integrated training programs for the value-added manufacturing supply chain. Their first potential solution was to convene established leaders in training within the manufacturing community to create a repository of best practices and information to benefit small businesses. The second solution was to create an information and education sharing model to distribute knowledge, technology, and training assets throughout the industry supply chain. Such a model would include Web-based knowledge systems, training resources, best practices, existing curriculum, training courses, certifications and standards, and a strong learning management system. The third potential solution involved creating and deploying a training curriculum for the robotics and automation manufacturing supply chain, including multi-delivery methods. This solution would require multiple stakeholders to test its validity, a central repository of quality content, and standardized training across a supply chain.

Lastly, the Innovation Working Group discussed strategies for enhancing the skills of incumbent workers for new technologies. The group pointed to the need for seamless, industry-driven strategies across government, as well as the need for public-private partnerships to expand, improve, and provide incumbent training. In addition, incentives are needed to recognize and reward skill acquisition and certification. The group emphasized that there must be a return on investment for both the individual and the company, as well as a career ladder system and access for employees to participate. And third, the group proposed to create and deploy industry-driven portable skills certifications and standards that are sector specific with career ladders.

**Follow-up to the Solutions Forum**

The proposed solutions outlined above formed the basis for ETA's review of grant proposals under the High Growth Job Training Initiative to address workforce challenges in the advanced manufacturing industry. Proposals were reviewed to determine how they would implement the ideas and strategies that arose from these brainstorming sessions. Moreover, we hope that these ideas will prompt implementation projects at the state and local level, using state and local resources, and that the nationwide public workforce system will play a key role in facilitating the partnerships that are necessary for successful and sustainable implementation. ETA is grateful to all of the participants who volunteered their time and expertise to the Workforce Solutions Forum, and who generated these innovative, forward-thinking, demand-driven ideas.

# *V. Implementation of Solutions and Next Steps*

## Implementing Solutions

The Employment and Training Administrati on (ETA) supports comprehensive business, education, and workforce development part nerships to develop in novative approaches or replicat e models that operationally demons trate how a demand-driven workforce system can more effectively s erve the workforce needs of business while also effectively helping workers find good jobs with good wages and promising caree r pathways. Grants awarded under the High Grow th Job Training Initiative implement unique and innovative, industry-driven skills training, certification, and career ladder dev elopment programs t hat suppor t identified manufacturing work force and economic development needs.

Based on the challenges identified by the industry and highlighted in this report, the U.S. Depar tment of Labor (DOL) has made a series of 34 inv estments totaling nearly $70 million to partnerships between business es, training providers , workforce investment boards, and others to address the workforce needs of the advanced manufacturing industry. These investment s address the following challenges, among others:

- Expanding the pipeline of youth entering the industry;
- Enhancing the capacity of secondary schools to prepare youth to enter postsecondary programs and employment in the industry;
- Providing a career lattice approach to the recruitment, education, training, professional developmen t, and job placement of advance d manufacturing workers;
- Helping alternative labor pools gain skills needed in the industry;
- Enhancing the capacit y of community co lleges and the public wor kforce system to help alternative labor pools enter the industry; and,
- Creating comprehensive partnerships that help entry-level workers enhance their skills and utilize apprenticeship and other training programs.

Solutions are national, stat e, and local in scope and addr ess industry challenges in unique and innovative ways. The Appendix includes brief summaries of model solutions in which ETA invested in order to address the aforementioned industry challenges. For more detailed information on these inves tments, including gr antees, partners, and outcomes, please visit www.doleta.gov/BRG.

## Next Steps

ETA plans to announc e a second round of fundi ng under the High Growth Job Training Initiative for advanced manufac turing this fall with the publication of a Solicitation for Grant Applic ations (SGA). The SGA will o utline crite ria for the submission of partnership -based applications for the advanced manufacturing and

construction industries. The full notice will be available on the Employment and Training Administration's web site, http://www.doleta.gov.

The results, products, and knowledge gained from the all HGJTI demonstration projects will be disseminated widely to the public workforce system and our strategic partners in business, industry, and education. ETA's commitment to sharing new approaches and the actual products that will be developed from these grants, such as industry-defined competencies, curricula, and new ways to partner around solving these complex workforce issues, ensures that we are maximizing our investments nationwide. The Department has launched the www.Workforce3one.org web site to provide information and tools for employers, educators, and workforce professionals as they implement the demand-driven vision on in their communities.

ETA also sponsors another website where young people, guidance counselors, parents, and career changers can access information and tools to build careers in high-growth, high-demand industries, including advanced manufacturing, at www.careervoyages.gov. Career Voyages is an exciting new web site the Department has developed in partnership with the U.S. Department of Education, which has already proven extremely popular with people interested in learning about the outstanding career opportunities in high growth industries.

Over the course of the HGJTI for advanced manufacturing, ETA learned about numerous efforts to document the skills and competencies needed for successful careers in the industry. It became clear that many organizations have created curriculum, educational programs, and other training tools to help prepare America's future manufacturing workforce, particularly in the secondary school context. Nevertheless, ETA continues to hear from the industry that there is a significant need for a standardized set of foundational skills and competencies so that they know they are hiring workers who are prepared to succeed in 21st Century advanced manufacturing. Moreover, prospective workers want to know what skills they need to take the first step toward a successful career in manufacturing; training providers need to know what standards to train to, and that those standards are directly relevant to industry requirements; and the public workforce system needs to know that the training programs they are supporting are producing workers that will find employment.

In order to make this a reality, ETA will make this issue a priority of the Workforce and Education Subcommittee on the new Interagency Working Group on Manufacturing, led by Assistant Secretary of Commerce for Manufacturing and Services Al Frink. A primary goal of the subcommittee will be to focus on developing core competencies and curriculum that can be utilized industry-wide and nationwide in support of manufacturing workforce education. This subcommittee will support industry collaboration for the development and ongoing maintenance of a cross-cutting, comprehensive foundational competency model for manufacturing that can, in turn, support additional competency models for specific industry sectors. In addition, the subcommittee will support the development and ongoing maintenance of curriculum for use by educational institutions and businesses in training the manufacturing workforce.

A separate goal of the Workforce and Education Subcommittee will be to develop a national vision and implementation strategy for technical education that supports the skill needs of the advanced manufacturing industry. This new vision for technical education would:

- Cross the full continuum of education from K-12 through advanced degrees as well as the technical education that occurs in the workplace;
- Fully align with No Child Left Behind and the Administration's high school reform initiative;
- Embrace innovative learning methods such as use of simulation, distance learning, and real-time workplace learning; and
- Serve as a model for technical education in other industries.

In collaboration with the manufacturing industry and the education system broadly, the Subcommittee will develop recommendations for a national agenda in support of the vision and strategies for implementation, and support development of innovative technical education models.

Finally, ETA recognizes the many communities with a significant manufacturing base in need of transforming the skills of their manufacturing workforce in response to changing industry needs. Therefore, ETA will work with the Workforce and Education Subcommittee to develop a manufacturing "education and training" assessment tool to support evaluation of the current state of play of education and training needs and gaps. For example, this tool will include education strategies, current investments by business, use of apprenticeship models, pathways to engineering degrees, and more. The Subcommittee will also support development of a resource guide for strategic partnerships that address workforce challenges and education/training gaps for the manufacturing industry in state or local economies.

## Conclusion

The advanced manufacturing industry is vital to the American economy. However, the industry faces a wide array of workforce challenges, from an outdated industry image to difficulty recruiting youth and individuals in non-traditional labor pools. These challenges must be addressed to ensure the continued vitality of advanced manufacturing and other industries.

Through the High Growth Job Training Initiative for Advanced Manufacturing, ETA has invested in innovative workforce partnerships to address industry-defined challenges. These investments were made after ETA worked closely with industry leaders to determine the primary hiring and training challenges facing the industry. In addition, these investments reflect the preferred solutions of industry, with the vital input of other stakeholders. Most importantly, these model partnerships demonstrate how a demand-driven workforce system can more efficiently serve the

workforce needs of business while effectively helping workers find good jobs with good wages and promising career pathways.

These investments are just one step in ETA's ongoing commitment to the advanced manufacturing industry and to workforce development generally. ETA is committed to identifying more successful models and resources through the High Growth Job Training Initiative and sharing their successes with the public workforce system. But the investments made by ETA in these HGJTI models represent only a small percentage of the total investment made by the public workforce system in our nation's workforce every year. The true test of success for this initiative will be to drive change locally by replicating these national models and by local leaders promoting local solutions to local challenges. Our hope is that by sharing these ideas, models and resources, stakeholders around the country will develop their own successful partnerships that help high growth industries address their workforce challenges while preparing workers for successful careers.

# *VI. APPENDIX*

## High Growth Job Training Initiative
## Summary of Grants for Advanced Manufacturing

***Integrated Systems Technology,*** a $9,236,026 grant to train dislocated workers for jobs that entail setting up and maintaining high-tech integrated systems involving electrical, mechanical, and electronic equipment found in today's industrial environments. ($16,830,867 in leveraged funds)

***Tri-County Industrial Training Consortium,*** a $2,991,840 grant to "re-skill" the area's new and incumbent workforce by providing existing and emerging manufacturers and related employers with job profiling, testing and assessment, pre-employment and incumbent worker training, and placement. ($1,306,661 in leveraged funds)

***National Institute for Metalworking Skills (NIMS)***, a $1,956,700 grant to establish an effective and efficient competency-based apprenticeship system and develop a credentialing system for metalworking occupations, such as Tool and Die Maker and Machinist. ($1,720,000 in leveraged funds)

***Delaware Valley Industrial Resource Center (DVIRC),*** a $3,000,000 grant to help advanced manufacturing sector in the Greater Philadelphia region to recruit students for new technical education programs in order to develop a steady supply of skilled workers for technology-intensive industries. ($2,350,000 in leveraged resources)

***Oregon Manufacturing Extension Partnership,*** a $3,199,709 grant to provide lean manufacturing training for at least 2,000 workers in 48 value-added food processing companies in Oregon, Washington, Idaho, and Nevada. ($2,043,110 in leveraged resources)

***Lancaster County Workforce Investment Board,*** a $1,354,585 grant to develop career ladders and provide training in partnership with four regional industry consortia, including the Lumber and Wood Consortium, Food Processing Consortium, Plastics Consortium, and Powdered Metals Consortium. ($60,000 in leveraged resources)

***St. Louis Workforce Investment Board,*** a $1,499,998 grant to provide more cost effective training for workers in four local auto plants, including training in: integration of automated systems; predictive maintenance for advanced manufacturing systems; enhanced mechanical technology; and enhanced electrical technology. ($2,443,954 in leveraged resources)

***National Association of Manufacturers,*** a $498,520 grant to launch the "Dream It, Do It" Career Campaign in Kansas City, Missouri, and to use this Kansas City pilot project to create the tool-kits and strategies that will be replicated in at least five other regional campaigns. ($1,075,000 in leveraged resources)

***National Institute for Metalworking Skills (NIMS***), a $939,815 grant to develop flexible training modules that may be delivered "just-in-time," meaning as they are needed on the shop floor. Separate training models will be developed for, and piloted with, five targeted sub-sectors. ($318,000 in leveraged resources)

***San Bernardino Community College District,*** a $1,618,334 grant to implement a pilot program to certify the manufacturing skills of workers in Southern California and to develop a pipeline of trained workers. ($1,184,624 in leveraged resources)

***Greater Peninsula Workforce Investment Board,*** a $1,965,000 grant to implement a 10-part program that will deliver a highly skilled workforce for a growing, high-performance manufacturing sector in Southeast Virginia, including job task analysis, curriculum development, outreach materials for local One-Stop Centers. ($2,405,866 in leveraged resources)

***Nebraska Central Community College,*** a $1,639,403 grant to create a Mechatronics Education Center (MEC) that will work with regional companies to provide individuals with industrial training for high skill, high wage manufacturing jobs. ($1,410,928 in leveraged resources)

***The Workplace, Inc.*** (Southwestern Connecticut's Regional Workforce Development Board), a $2,000,000 grant to implement an incumbent worker training program built around the skill needs of ASML US, Inc., its suppliers, and small and medium manufacturers in southwestern Connecticut. ($4,402,870 in leveraged resources)

***Lower Rio Grande Valley Workforce Development Board***, a $2,000,000 grant to form a regional partnership to develop a curriculum and a five year Apprenticeship Strategic Plan for tool & die, industrial maintenance and plastic process technicians. ($2,000,000 in leveraged resources)

***Illinois State University,*** a $5,774,420 grant to implement the next stage of the Integrated Systems Technology project, including expanding the program curriculum to create an associate degree; enhance the highly successful apprenticeship model; create a comprehensive career ladder and lattice by standardizing the career competencies; and replicate the entire program in four additional states through the creation of regional centers of excellence. ($1,926,564 in leveraged resources)

***Pennsylvania Workforce Investment Board***, a $3,750,000 grant to develop a statewide network that supports multiple facets of the plastics industry's development, including: incumbent worker training, curriculum transfer, occupational forecasting; supply chain analysis; a plastics occupations toolkit; internships/co-ops; scholarships; and R&D symposiums. ($1,075,000 in leveraged resources)

***360vu Research and Education Foundation,*** a $2,000,322 grant to develop a nationally-recognized, industry-led credentialing system for lean manufacturing, to be piloted through the nationwide network of Manufacturing Extension Partnership Centers. ($5,799,750 in leveraged resources)

***Alabama Workforce Investment Board***, a $3,543,253 grant to create a highly flexible training program for Industrial Maintenance and Machine Tool Technology, utilizing modularized curriculum and multiple delivery options that will allow students multiple entry/exit points. ($3,535,835 in leveraged resources)

***Maine Department of Economic Development,*** a $2,996,724 grant to provide accelerated training for Computer-Numerically Controlled (CNC) workers for on-demand production opportunities in six New England states. ($10,770,000 in leveraged resources)

***Training for Auto Alliance International Vehicle Production***, a $5,000,000 grant to Downriver Community Conference in Flat Rock, Michigan to train automotive workers for new production processes. ($25,000,000 in leveraged resources)

***Automotive Youth Educational Systems***, a $2,200,000 grant to extend the reach of a demand-driven automotive technician curriculum and training process through a new blended training delivery model (including on-line features). ($5,170,315 in leveraged resources)

***Automotive Retailing Today***, a $150,000 grant to gather, validate, and deliver information and data about career opportunities in the automotive industry to career-related websites and portals and to public workforce development professionals. ($323,070 in leveraged resources)

***ASE Bilingual Outreach Program***, a $300,000 grant to the National Institute for Automotive Service Excellence to identify and certify more automotive service technicians by translating some of the most in-demand certification exams into Spanish and by having these exams administered throughout the country. ($300,000 in leveraged resources)

***Eastfield College***, a $837,424 grant to offer training to over 120 individuals in Texas, including support services, internship experiences, and an English as a Second Language component. ($2,770,705 in leveraged resources)

***Gateway Technical College***, a $900,000 grant in Wisconsin to assist training programs in pursuit of the industry-driven certification by the National Automotive Technicians Education Foundation (NATEF) using a blended training delivery system including on-line features. (more than $2.1 million in leveraged resources)

***Girl Scouts of the USA***, a $200,000 grant to develop and distribute information and obtain hands-on experience at an employer, geared toward young girls, educating them about automotive services as a career option and building their skills in car repair and maintenance. ($400,000 in leveraged resources)

***Shoreline Community College***, a $1,496,680 grant in Washington to develop curriculum based on a new set of industry-driven competency requirements and to train approximately 175 automotive technicians in the new curriculum. ($1,615,778 in leveraged resources)

***Harrisburg Career and Technology Academy***, a $95,000 grant in Pennsylvania to develop a work-based training opportunity, or on-the-job mentor/intern program to strengthen business connections and to provide career opportunities to students facing social and economic barriers. ($121,200 in leveraged resources)

***United States Hispanic Chamber of Commerce Foundation***, a $136,000 grant to recruit, train, and foster career paths for twenty Hispanic-Latino automotive technicians within Miami, Florida and Los Angeles, California. ($296,000 in leveraged resources)

***The Aerospace Industry Training Project (AITP)***, two grants totaling $4,028,400 to Community Learning Center, Inc., (CLC) in Dallas, Texas to train incumbent aerospace workers for new high technology manufacturing processes. Under the continuation project, CLC will provide at least 320 dislocated workers with technical training, related supports, and subsequent employment with industry partners such as Lockheed Martin-Aero, Bell Helicopter TEXTRON, Interconnect Wiring, and Southwest Airlines. (more than $1,000,000 in leveraged resources)

***Project Genesis***, a $98,560 grant to Brevard Community College in Florida to provide hands-on learning opportunities for students to develop technical aerospace skills and improve awareness of the skills required for aerospace careers. The initiative will provide support for the operation of launch facilities and to conduct six sub-orbital launches at historic Launch Complex 47 at Cape Canaveral Air Force Station. ($50,000 in leveraged resources)

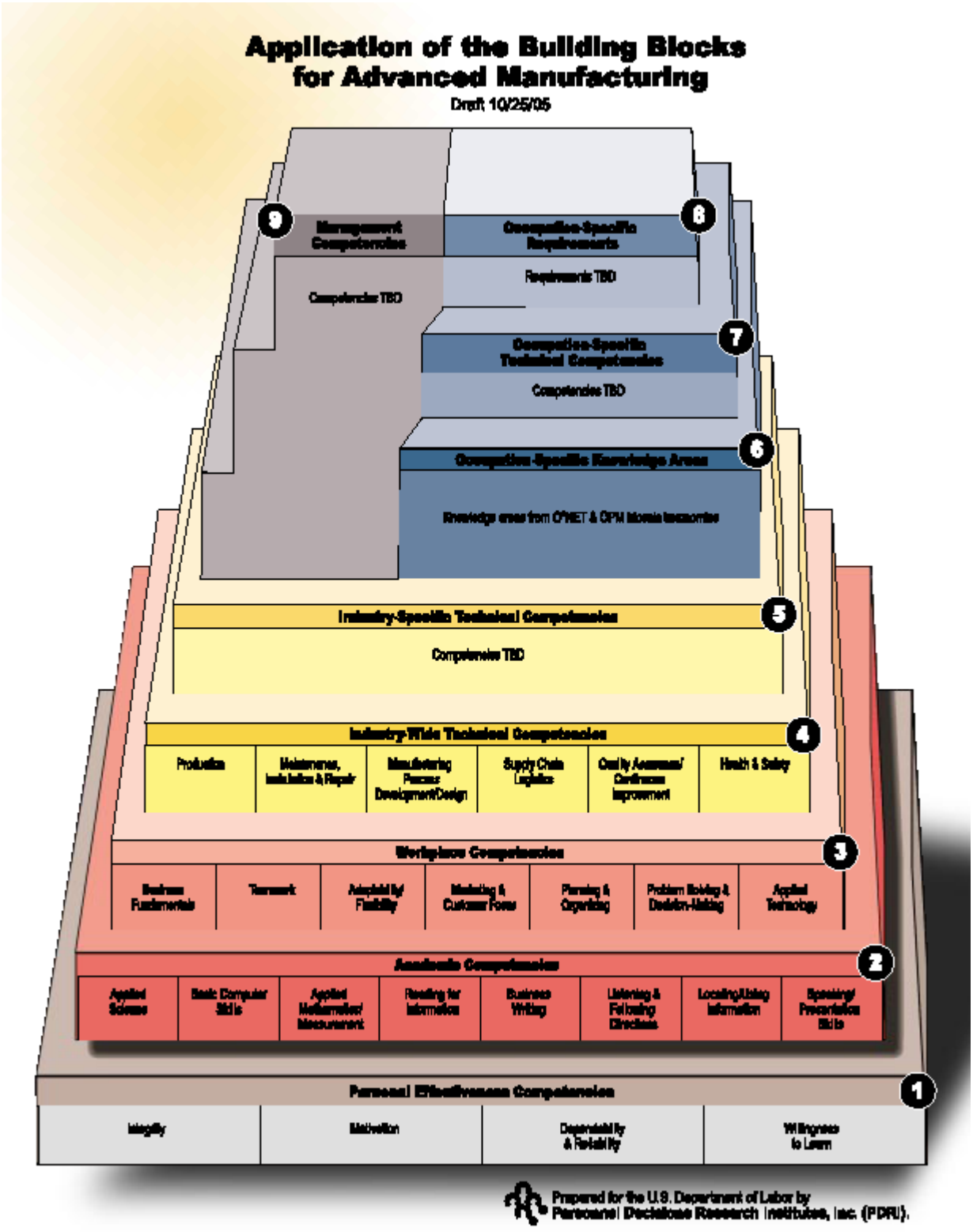
***The Triad Initiative***, a $1,475,045 grant to Edmonds Community College in Lynnwood, Washington to focus on developing advanced aerospace technician curriculum, career ladders and distance learning approaches associated with the Boeing 7E7 supply chain. ($794,064 in leveraged resources)

***Teachers Immersed in Aerospace***, a $355,628 grant to the Florida Space Research Institute to provide two aerospace mentors, covering seven counties and 25 teacher externships for technology teachers to improve hands-on knowledge and awareness of the skills required for aerospace careers in Florida. ($174,703 in leveraged resources)

***Aerospace Skills Training***, a $1,000,000 grant to the Houston-Galveston Area Council for Gulf Coast Workforce Board to reduce H-1B visa worker dependency in several high technology, high skill aerospace job occupations on the Texas Gulf Coast, among the fastest growing aerospace regions nationwide. ($537,606 in leveraged resources)

***Alameda County Workforce Investment Board***, a $2,000,000 grant to develop career pathways in bio-tech manufacturing, facilities management, quality control, and product engineering, as well as to create a "bridge" program to prepare lower skilled individuals for entry-level employment in biotechnology. ($665,000 in leveraged resources)

***Forsyth Technical Community College***, a $5,000,000 grant to develop a National Center for a Biotechnology Workforce by five community college partners, including New Hampshire Community and Technical College taking the lead on biomanufacturing. (at least $7,490,000 in leveraged resources)


Application of the Building Blocks
for Advanced Manufacturing
Draft 10/25/05
9
Management Competencies
Competencies TBD
8
Occupation-Specific Requirements
Requirements TBD
7
Occupation-Specific Technical Competencies
Competencies TBD
6
Occupation-Specific Knowledge Areas
Knowledge areas from O*NET & OPM Mosaic taxonomies
5
Industry-Specific Technical Competencies
Competencies TBD
4
Industry-Wide Technical Competencies
Production
Maintenance, Installation & Repair
Manufacturing Process Development/Design
Supply Chain Logistics
Quality Assurance/ Continuous Improvement
Health & Safety
3
Workplace Competencies
Business Fundamentals
Teamwork
Adaptability/ Flexibility
Marketing & Customer Focus
Planning & Organizing
Problem Solving & Decision-Making
Applied Technology
2
Academic Competencies
Applied Science
Basic Computer Skills
Applied Mathematics/ Measurement
Reading for Information
Business Writing
Listening & Following Directions
Locating/Using Information
Speaking/ Presentation Skills
1
Personal Effectiveness Competencies
Integrity
Motivation
Dependability & Reliability
Willingness to Learn
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