MAKING MAKERS: REBUILDING THE MANUFACTURING WORKFORCE THROUGH COMPETENCIES AND CREDENTIALS
ACKNOWLEDGMENTS

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Throughout the decades, the manufacturing sector has remained a key facet of the U.S. economy. It’s a crucial source of innovation, employment, competitive advantage and productivity growth. Despite its unwavering worth, the sector is faced with the constant challenge of the upgrading and diversification of necessary skills.

In *Missing Makers: How to Rebuild America’s Manufacturing Workforce*, Alcoa Foundation and Hope Street Group took a candid look at the skills gap and recommended ways to transform education and training programs to effectively support the industry. In *Making Makers: Rebuilding the Manufacturing Workforce Through Competencies and Credentials*, we take the conversation to the next level: framing solutions, identifying best practices, proposing an innovative model for competency-based hiring and providing definitive recommendations for action.

Committed to creating pathways to furthering opportunity for all Americans, we at Hope Street Group, along with Alcoa Foundation, believe that this dialogue is imperative in ensuring the success of the sector and providing access and economic mobility for the U.S. manufacturing workforce.

Martin Scaglione
President and CEO, Hope Street Group
EXECUTIVE SUMMARY

*Making Makers: Rebuilding the Manufacturing Workforce Through Competencies and Credentials* frames the competency and credentialing systems currently being utilized within the industry to overcome these challenges and proposes an ideal model for a fully integrated manufacturing ecosystem.
Last year, with support from Alcoa Foundation, Hope Street Group published *Missing Makers*. Now Hope Street Group is seeking to contribute to the ongoing dialogue through *Making Makers*, constructed to:

- Move from describing the problem to framing solutions
- Describe the unique needs of various manufacturers
- List the cumulative best practices that are in use among manufacturers and provide a snapshot of programs being launched across the country
- Develop and chart a typology of credentialing innovation that can be applied to the manufacturing field
- Offer key recommendations for action in the year ahead to advance the findings and efficiently rebuild the manufacturing workforce

*Making Makers* is directly informed by Hope Street Group’s national Sync Our Signals (SOS) initiative, which is working to reengineer America’s job market. This includes a community of practice of over 45 diverse leaders across supply, demand and the jobs market who have all committed to identifying best practices, building a common unit of competency measurement and connecting existing efforts. Specifically, SOS calls to transition employers to competency-based hiring practices, signal those competencies to the learning community and empower individuals with better information and tools to advance their career pathways. The information, findings and recommendations in *Making Makers* are directly aligned with SOS and will be disseminated and amplified by Hope Street Group’s Jobs Community of Practice.

As every stakeholder is aware, the U.S. labor market is changing.
This report begins with an overview of the problem as prescribed in *Missing Makers*, coupled with a connection pathway to the present research. While *Missing Makers* focused on the supply side, studying the challenges to the manufacturing field through the lens of youth and how to prepare them with the skills they need, *Making Makers* focuses on the demand side, working to uncover how leading manufacturers are already coping with and even overcoming the skills gap to secure future talent. This has led to a direct emphasis on understanding best practices in competency-based sourcing and hiring in the contemporary manufacturing industry.

Credentials and other competency-based measures are unquestionably gaining traction in many sectors of the economy. Employers are using them to define the talent they need and individuals are using them to signal the skills they possess. This emerging credentialing market, however, remains disordered. What is meant by key terms such as “competency,” “career pathway” and “validation” varies widely among stakeholders. To ensure the findings and recommendations of this report are perceived in the manner intended, *Making Makers* provides background and definitions on the use of such terms in the general sense.*

Unemployment and underemployment are down, and job openings reached the highest levels in recorded history in 2015—having reached 5.4 million job openings at one point. But despite this opportunity, the workforce participation rates continue to drop, remaining below 63% throughout the year. Clearly, the jobs market is not functioning as it should.

*See Appendix A for a full glossary of definitions and use of terms across industries.*
Hope Street Group collaborated with Metrics Reporting to design the research, conduct interviews and assist with the analysis of the findings. Included in this report are 14 profiles that represent different manufacturing companies, educators that partner with these companies and representatives of the credentialing and workforce bodies that support this work. Utilizing the expertise of Metrics Reporting and other members of Hope Street Group’s Jobs Community of Practice on competencies, competency models and evidence-based talent selection processes and tools, this report includes analysis and insights from both the field research conducted and best practices and research from other industries.

To go beyond confirming best practices and to move the conversation about credentialing markets forward, *Making Makers* suggests that competency-based career pathway systems can currently be described in terms of four types. While any of the four types are a significant starting point for employers to initiate investments in their workforce, Hope Street Group proposes a fifth model created and drawn from our field research.

This report is meant to provide insights to provoke a conversation about the type of credentialing ecosystem most appropriate to the manufacturing sector and propose a model that manufacturers can align with and eventually commit to advancing. However, the application of this model is not limited to the manufacturing sector.

*Making Makers* is written with the intention of providing common terms and definitions for the development of sourcing and hiring strategies, as well as common processes and tools that will support those strategies.

In conclusion, Hope Street Group proposes collaborative, actionable steps across employer engagement, the establishment of a credentialing body and the creation of a pilot series to test the findings within the manufacturing sector.
INTRODUCTION
MISSING MAKERS AND BEYOND

*Missing Makers: How to Rebuild America’s Manufacturing Workforce* identified some of the causes that have led to the skills gap in manufacturing and provided recommendations to improve the perception of manufacturing jobs to young adults and continuously prepare workers with essential job skills.
Drawing from targeted interviews with youth, educators, manufacturing employers and others, Hope Street Group offered a new viewpoint into the root causes of the current skills crisis. *Missing Makers* aimed to address two key questions:

1. **Career Exploration:** Why don’t more young people choose to pursue a career in manufacturing?
2. **Skills Development:** When young people choose to pursue a manufacturing career, how can regional education and training programs best align with the needs of regional demands for skilled workers?

For manufacturers, educators and any others interested in transforming manufacturing education, Hope Street Group proposed the following action steps to initiate change:

1. Build a technological link, or “portal,” that provides information resources to youth and connects them to local manufacturing jobs.

2. Invest in manufacturing education programs in local middle and high schools by exploring site visits, manufacturing-oriented coursework and other ways of introducing manufacturing concepts to youth.

3. Encourage communication and collaboration among employers and educators in local regions. It is critical for employers and educators to work in coordination to create more effective career education solutions.

In short, *Missing Makers* provided recommendations uniquely aimed at recruiting youths into middle-skill jobs. Additionally, *Missing Makers* provided flexible recommendations for manufacturing employers that can be tailored to individual regions, encouraging grassroots-level change.

**THE NEED FOR SKILLED WORKERS IS CRITICAL AND IS EXPECTED TO GROW SUBSTANTIALLY OVER THE NEXT DECADE.**
The attention employers are beginning to pay to identifying skills and abilities, developing and measuring competencies or seeking to signal skill-level attainment is highly encouraging and opens up a number of further questions for Hope Street Group and others interested in the manufacturing sector to pursue.

**For example:**

- What kind of manufacturing jobs fall into the “middle-skill” bracket?
- What types of skills and abilities do these jobs require and how do manufacturers assess prospective candidates?
- What place do credentials and career pathways play in skill development programs?
- What is the role of credentialing bodies in relation to employers and educators?
- Since the skills gap is now widely recognized, what steps are leading employers and educators currently taking to bridge it?

Specifically, Hope Street Group initiated the following action steps to advance the findings:

- A thorough review of recent white papers on career pathways and credentialing markets from other leading non-profit groups, government agencies and workforce professionals to define the foundational knowledge that has been collectively acquired.
- Active participation in numerous national conferences such as the Innovate + Educate Close It Summit, the National Aviation, Aerospace and Defense Workforce Summit and the National Career Pathways Network Conference.
- Collaboration with Metrics Reporting and other members of our Jobs network working on evidence-based talent supply chain management systems in the healthcare and manufacturing sectors.
- Conducting in-depth interviews with representatives from high-quality, employer-driven programs seeking to develop talent supply chains, as well as the educators and credentialing bodies they partner with.

As the conversation about the skills gap progresses in light of the contemporary manufacturing workforce, *Making Makers: Rebuilding the Manufacturing Workforce Through Competencies and Credentials* aims to understand how competencies and career pathways are being used today.
THE CURRENT RESEARCH RECOGNIZES THAT MANUFACTURERS ARE TARGETING A LARGER POOL OF POTENTIAL HIRES.

While *Missing Makers* focused on youth outreach and training, future talent is additionally being sought among adult learners, non-traditional students, returning military personnel and citizens in need of second chances. Accordingly, *Making Makers* uses the term “individuals” instead of “youths.”

The research conducted for this report signaled the critical role for detailed job analysis and validation work needed for wide-scale impact. Specifically, the following four gaps need to be addressed:

1. Employers and educators currently face a “Catch-22” regarding competency standards: the manufacturing market tends not to adopt new credentials until they have been proven effective; and educators will not incorporate such credentials into programs until there is marketplace acceptance and demand. How can employers, educators and credentialing bodies demonstrate ROI for competency-based career pathway programs?

2. *Missing Makers* emphasized the importance of foundational skills. *Making Makers* details the differences between technical, cognitive and character skills, and the importance of aligning educators and employers around these foundational skills. How do employers communicate their needs to talent providers in education and workforce development?

3. How do we develop curricula so that participants aren’t just connecting with manufacturing, but also know whether the foundational and occupational skills they already possess are measurably tied to job performance? How do we empirically show that skills and abilities are linked to job performance?

4. Finally, if employers at all levels can benefit from this information, what would an ideal competency-based credentialing ecosystem in manufacturing look like?

Thanks to the generous participation of leading employers, educators and other workforce professionals, the research reported in the pages that follow aims to highlight some of the best practices available to address these questions and move the conversation forward.
COMMON GROUND
BACKGROUND AND TERMS

There has been an exciting amount of progress in recent years on career pathways and stackable credentials in many sectors of the economy. But there is also a growing realization that the quality of the credentials in use varies greatly. In order to better frame the discussion about competencies and the credentialing market, this section outlines some core definitions and concepts.
BASIC DEFINITIONS*

**Competency**
A set of defined behaviors that provide a structured guide enabling the identification, evaluation and development of the behaviors in individual employees. Competencies describe the capability to apply or to use a set of related knowledge, skills and abilities required to successfully perform critical work functions or tasks in a defined work setting.

**Competency Validation**
The process of defining competencies that are measurably related to job performance, as well as gathering and organizing evidence to substantiate the relationships. This definition of competency validation covers a narrower set of practices than what is typically referred to as validation.

**Credentials**
The U.S. Department of Labor (DOL) defines credentials as “within the context of education, workforce development, and employment and training for the labor market, the term credential refers to a verification of qualification or competence issued to an individual by a third party with the relevant authority or jurisdiction to issue such credentials (such as an accredited educational institution, an industry-recognized association, or an occupational association or professional society).” For the purposes of this report, we will adhere to this definition.

**Stackable Credentials**
We will follow the DOL’s definition of a stackable credential as “part of a sequence of credentials that can be accumulated over time to build up an individual’s qualifications and to help them to move along a career pathway or up a career ladder to different and potentially higher-paying jobs.”

**Career Pathway**
A career pathway is an integrated collection of programs and services intended to develop students’ core academic, technical and employability skills and to provide them with continuous education, training and placement in high-demand, high-opportunity jobs.

**Occupational Competencies**
Most competency models contain a major distinction between occupational competencies and foundational competencies; further job analysis is often employed to identify and link these competencies.

Occupational competencies define the knowledge, skills and abilities that are either specific to a particular job (e.g. welder, nurse, lawyer, etc.) or to a broader industry (e.g. safety requirements, regulatory requirements, etc.).

Credentials are generally associated with occupational competencies and the most thorough credentialing organizations engage industrial psychologists to perform a job analysis and provide detailed occupational competency information. This information is then used as the basis for curricula, accreditation, assessment, credentialing and continuing education.

**Foundational Competencies**
Foundational competencies describe the cognitive, character and physical skills and abilities required for a particular job or job family. Character competencies are also often referred to as “soft” skills or “professional” skills.

Employment tests are generally based on foundational competencies because they are good predictors of job performance.

**For example:**

*A full glossary is attached as Appendix A.*
Rebuilding the Manufacturing Workforce through Competencies and Credentials

Linking occupational and foundational competencies is important because it makes predictive and defensible employment assessments possible and serves as the basis of the business case for competency-based sourcing and hiring.

**Occupational Competencies**
- **Job Specific Competencies:** also known as Tasks or Work Behaviors — are job specific work activities.
- **Industry-Wide Competencies:** industry specific work activities that are common across multiple jobs.

**Foundational Competencies**
- **Cognitive:**
  - Problem Solving
  - Critical Thinking
  - Listening
  - Speaking
  - Reading
  - Writing
  - Math
  - Time Management
  - Perception

- **Character:**
  - Initiative & Perseverance
  - Teamwork & Citizenship
  - Problem Solving & Ingenuity
  - Responsibility
  - Flexibility & Resilience

- **Physical:**
  - Vision
  - Strength
  - Steadiness
  - Dexterity
  - Coordination
  - Speed
  - Stamina
  - Flexibility

Image provided by Metrics Reporting as an example to recognize key features of the most popular competency models that align with professional standards and practices.
tests. According to the *Uniform Guidelines*, if there are differences in selection rates known as “adverse impact,” employers are required to validate assessments used for employee selection. In order to be legally defensible, validation must be done in accordance with professional standards.

If there is “adverse impact,” employers are responsible for demonstrating that their employment selection practices are “job-related” and “consistent with business necessity.”

Lack of compliance creates the risk of financial and legal liability, and compliance is demonstrated through validity studies.

- Defensible validation studies always include analysis of quantitative data, which observes the relationship between what a test actually measures and what it is intended to measure or predict.

- Since employers reasonably expect credentials and employment tests to be predictive of job performance, a validation process which links occupational and foundational competencies is now, and will become, increasingly crucial to successful sourcing and hiring strategies.

**Career Pathways**

Career pathway initiatives combine competency-based, stackable credentials in order to provide a path for individuals to move up a career ladder. These initiatives generally support individuals through career exploration, coaching experiences and provide career navigation support to help individuals advance along a career path.

**Notable References**

On competency-based credentials, see:

- *Making a Market for Competency-Based Credentials*, published by Corporation for a Skilled Workforce (CSW), November 2013.

- *Call for a National Conversation on Creating a Competency-Based Credentialing Ecosystem*, a collaborative effort of a group of stakeholders including: CSW, the Center for Law and Social Policy (CLASP), National Governors Association (NGA), American National Standards Institute (ANSI), New America Foundation (NAF), Manufacturing Institute (MI), National Skills Coalition, Global Skills X-Change and more, jointly published April 2014.

- *Connecting Credentials*, a beta credentials framework, building a system for communicating and connecting credentials, published jointly by the Lumina Foundation, CSW and CLASP, June 2015.
On career pathways, see:

- *Career Pathways Toolkit: Six Key Elements for Success*, developed on behalf of the U.S. Department of Labor by Social Policy Research Associates, September 2011. Shortly after the interviews were concluded, the DOL released an updated version of the document in November 2015.


And on building a talent pipeline, see:


The research and findings of the work in *Making Makers* is consistent with these references. For example, one of the key steps identified in the DOL toolkit is to “Review or develop competency models.” The definitions, metrics, features and essential functions identified in the AQCP framework were particularly helpful to guide the research questions.

The CSW publications frame the potential connection between competencies and pathways via competency-based, stackable credentials, while the U.S. Chamber of Commerce Foundation’s papers establish a model for employers to build talent supply chain management systems and talent pipelines.

Hope Street Group’s research has sought to build on this foundation by learning how leading career pathways initiatives identify foundational and occupational competencies that are related to job performance and documenting the current practices in the field. Within the manufacturing sector, the use of credentials is common but not universal. The most common occupational credentials are provided by the American Welding Society (AWS), the National Institute for Metalworking Skills (NIMS), Siemens, the Manufacturing Skills Standards Council (MSSC), the Association for Processing and Packaging Technologies (PMMI), the National Association of Manufacturers (NAM) endorsed Skills Certification System and more. While foundational competency assessments and observations have often played some role in the employee or program participant selection criteria, tools and resources such as ACT WorkKeys and the National Career Readiness Certificate (NCRC) have been applied in some instances.
The following 14 profiles represent our efforts to document current career pathway systems that develop highly competent and diverse talent, meet the needs of manufacturing sector employers and provide a reliable pathway for individuals to move from unemployment and low-wage jobs to family-sustaining jobs and beyond.
OVER THE PAST FIVE YEARS, THE MANUFACTURING INSTITUTE HAS DEVELOPED A STRONG NETWORK OF LEADERS IN THE MANUFACTURING CREDENTIALING SPACE.

These employers, educators and credentialing bodies are being profiled in accordance with the leadership and collaboration of the Manufacturing Institute (MI), which has been working to advance manufacturing credentials since the 2010 announcement of the National Association of Manufacturers (NAM) endorsed Skills Certification System. The companies and organizations profiled were identified by MI as operating manufacturing career pathway systems using the Skills Certification System and are perceived by NAM as national leaders.
EJ Ajax Metalforming Solutions is a third generation contract manufacturer of progressive metal stampings with 50+ full-time employees located in Minneapolis, Minnesota.

EJ Ajax developed and offered its first apprenticeship program in the early 1990s. The company now offers 4-year registered apprenticeships in Sheet Metal Fabrication, Tool and Die Making, Punch Press Operation and Machine Maintenance. Additionally, multiple Class A Journey Worker certificates can be obtained along the way.

2005: FOUNDED M-POWERED, A FAST-TRACK MANUFACTURING TRAINING PROGRAM

The program consists of a 12-week, industry-specific course. Students attend class at a branch of Hennepin Technical College and are supported with career counseling, mentoring and job-placement assistance from HIRED.

Specifically, EJ Ajax has made a special effort to educate and employ underserved populations and returning veterans and supports many of them through a tuition and reimbursement program.

EJ Ajax invests over 5.5% of their payroll in education and workforce development, up to $5,000 per colleague per year. EJ Ajax and other local manufacturers contribute to developing the criteria for enrollment and the curriculum for the M-Powered program to ensure that its graduates’ capabilities match the current demand for new employees. The competencies are largely determined by employer Subject Matter Experts (SMEs) and aligned with corresponding NIMS credentials. The program selects for foundational skills, which are regarded as crucial, at enrollment.
Siemens and Siemens Foundation run and participate in a large variety of programs, one being the Mechatronics Apprenticeship program in Charlotte, North Carolina.

2012: BEGAN MECHATRONICS APPRENTICESHIP PROGRAM

The Mechatronics Engineering Technology curriculum prepares individuals for jobs requiring the electrical, mechanical and computer skills necessary to work on complex systems found in manufacturing environments.

Students graduate with an AAS degree in Mechatronics Engineering Technology or Computer-Integrated Machining and are awarded a Journeyman’s Certificate by the North Carolina Department of Commerce and a certificate from the U.S. Department of Labor. The Associate of Applied Science in Mechatronics Engineering Technology degree is awarded upon completion of the program. Short of the degree, there are Level 1 and Level 2 certificates aligned with content from the Siemens Mechatronics Systems Certification Program.
Wacker Polysilicon LLC is a greenfield site located in Charleston, Tennessee, that will employ more than 650 people when complete. Wacker Polysilicon North America has partnered with Chattanooga State Community College (ChSCC) to form the Wacker Institute in order to produce chemical process-engineering technicians for Wacker and other employers in the region.

3 APPRENTICESHIP PROGRAMS: CHEMICAL OPERATIONS, ELECTRICAL & INSTRUMENTATION AND MECHANICAL SYSTEMS MAINTENANCE

The occupational competencies for each apprenticeship program were determined by a job task analysis, which ChSCC used to develop the curriculum.

Foundational competencies are generally selected for during admission to the programs, although various work behaviors are also learned on the job. Graduates receive an Associate of Applied Science in Engineering Technology, Engineering Systems Technology or Mechatronic Systems and there are also embedded technical certificates associated with each program.

Each apprenticeship program is a work/study that combines academic and practical experiences with paid, on-the-job training over the course of five semesters.
Robert Bosch Automotive Steering LLC (Bosch AS) led the chapter initiative for the Northern Kentucky FAME Advanced Manufacturing Technician (AMT) program under the direction of Mike Hirsch, Vice President of Operations. Cassar oversees the Bosch AS AMT program and collaborates with other Northern Kentucky Company Chapter members and Tri-Ed corporation, developing processes for program success.

2015: 24 PARTICIPANTS ACROSS 8 COMPANIES, 10 OF WHICH ARE AT BOSCH AS

Bosch AS sees the AMT program as a foundation for career paths within the company, leading to other jobs in operations, maintenance, process engineering and administration.

The students attend college classes two days a week and work an eight-hour shift three days a week. There is a three-year work commitment, and new hires may continue to pursue a bachelor’s degree.

The admissions process selects for foundational competencies and applying high school graduating students are expected to be high performers in math, science and English. SMEs determine the selection criteria. Besides an Advanced Manufacturing degree, AMT students at Bosch AS will also earn a B-level German Certification. Assessment of occupational competencies is handled by the educational institutions in connection with KY State, the German Embassy and the FAME chapter. Bosch AS is continuing to grow the program.
The Howmet Alcoa plant located in Whitehall, Michigan, has a partnership with Muskegon Community College in order to supply automation, robotics and electronics technicians.

**20 HOURS PER WEEK:**
**THE AMOUNT STUDENTS WORK WHILE THEY CONTINUE STUDIES**

The Alcoa certification is offered in connection with a co-op program.

A degree is awarded at two years and candidates may then be hired full-time. After the first year internships, tuition is covered for students who the company wishes to employ if the selected students also make a three-year work commitment beyond graduation.

The required occupational competencies were determined by meetings between the top technical leaders, hiring managers and college professors, as well as more detailed SME sessions that led to the development of the curriculum. Foundational skills are not assessed as part of the certification, but they are assessed as part of the degree.

The program combines a work/study with two-year needs forecasting to engage in continuous hiring of qualified candidates.
The apprenticeship program aims to effect a cultural transformation by standardizing knowledge, skills and abilities (KSAs).

Pepperidge Farm and its parent company, Campbell’s Soup Company, were recently recognized by the White House for their efforts in launching a new apprenticeship program (soon to be recognized by the Department of Labor) for production technicians in their U.S. manufacturing facilities.

**2016: BEING PILOTED AT A U.S. PLANT, WITH A GOAL OF GROWING THE PROGRAM TO OTHER U.S. BASED LOCATIONS**

The program aims to create a more participative and flexible structure by developing leadership, operations and maintenance skills in employees.

The program provides core training for associates to develop skills required to succeed in Campbell’s technician system and contains both in-classroom and on-the-job experiences. It standardizes the development approach across all U.S. operations and provides associates with a career development pathway.

The program seeks to develop a broad career path that focuses on the development of flexible foundational and occupational skills.

ACT WorkKeys profiled jobs and created task lists on the basis of a set of jobs that were grouped under a “production tech” job family. They put together a model of the required soft skills, a leadership model and descriptions of the more technical pieces of jobs. The credentialing began internally and now there are external partners including ACT WorkKeys, the Manufacturing Skills Standards Council (MSSC) and others for both occupational and foundational skills.
Since 1952, the Ingalls Apprentice School has produced more than 4,000 graduates in support of Ingalls’ operational needs.

**MORE THAN 1,500 APPRENTICE ALUMNAE FILL APPROXIMATELY 50 DIFFERENT TYPES OF JOBS.**

*Ingalls has developed successful career pathways, with half of its graduates having gone from journeyman into management or leadership roles.*

Apprentices in each program rotate through process areas, designated by their respective standards of apprenticeship, gaining skills and experiences unique to that area. Over 60 members of the faculty and staff deliver instructions in 13 programs with over 120 course offerings that enable apprentices to gain the knowledge and skills, as well as the educational foundation and personal qualities needed to fully meet the challenges of a shipbuilding career.

Ingalls Apprentice School covers 13 job families including Electrical, Pipe, Shipfitting, Welding, Sheetmetal, Paint, Carpenter and more. Joint apprentice and training committees meet monthly to discuss apprentice performance, discipline, curriculum or changes in the standards of apprenticeship.

Through the Haley Reeves Barbour Maritime Training Academy, Ingalls is entering into a new phase of partnership with Mississippi Gulf Coast Community College and will soon offer a path into bachelor’s degree programs.
Right Skills Now is an innovative program to help math-qualified candidates get the skills they need to start their career in CNC operations. Right Skills Now was founded by the President's Council for Jobs and Competitiveness as a way to help employers find, and potential employees get, the ‘Right Skills Now’ to be successful in precision machining.

12-16 WEEKS OF CLASS AND SHOP EXPERIENCE PLUS AN 8-WEEK FOR-CREDIT INTERNSHIP = JOB OFFER

Right Skills Now uses a modular curriculum to provide an accelerated route to credentials with immediate value in the workplace.

The hiring employers emphasize continuing education for working employees so that employees can advance within their career pathway.

Right Skills Now is a focused training experience that ensures graduates have skills that are in high demand by local employers.

Local Minnesota community colleges (13 total) provide the curriculum and training outlined by their partner employers and local employers provide paid shop experience internships after training. Leading employers include shops from the Precision Machined Products Association (PMPA) and Right Skills Now founding partner, the National Association of Manufacturers (NAM). The program offers career credentials that are recognized by employers nationwide including credentials from NAM, NIMS, ACT WorkKeys and the National Career Readiness Certificate (NCRC). The credentials are stackable and can be credited in future academic work towards an associate degree.
Mike used the Right Skills Now program through Dunwoody College of Technology. Prior to enrolling in the Right Skills Now program, he worked in construction, an industry that was feast or famine on account of weather conditions and/or seasonal layoffs. There was no paid time off nor any way he could begin to put away money. These challenges made it feel impossible to plan for the future, so Mike was extremely excited to start this new endeavor.

“I would have never experienced a good paying career in manufacturing without Right Skills Now. It changed my life and gave me so much opportunity to continue to advance my skills with on-the-job training.”
Parker leveraged his 36 years of experience in technical, occupational and leadership development in the automotive industry and nuclear power field to develop the Advanced Manufacturing Career Pathways (AMCP) program.

**2016: IN 8 STATES AT 19 COLLEGES AND 2 UNIVERSITIES**

**AMCP operates in coordination with the Federation for Advanced Manufacturing Education (FAME), which includes over 150 companies including Toyota, GE, Hitachi, 3M, Jack Daniels, Bosch AS and Stanley Black & Decker.**

AMCP primarily consists of the Advanced Manufacturing Technician (AMT) hub program for General Maintenance or Tool & Die, which then can continue on to Advanced Manufacturing Engineer (AME) and Business (AMB) career paths.

The AMT hub program is a five-semester, multi-skilled associate degree program with three core components: occupational competencies, LEAN practices and professional behaviors.

AMCP uses a rigorous DACUM job analysis and conducts SME sessions to define job families and competency requirements. It also collaborates with the Automotive Manufacturing Technical Education Collaborative (AMTEC). AMCP is a pull-style program that typically accepts top-tier high school students. These students tend to already possess the basic foundational competencies, but ACT/SAT scores serve as a rough measure for competencies like reading and math and various professional behaviors are learned on the job.
Sarah is a “star” employee for AutoGuide, a growing Georgetown manufacturer. She is one of the first graduates of the Bluegrass Community and Technical College’s Advanced Manufacturing Training program. She is charged with training employees on how to build and assemble automated guided vehicles used in manufacturing and material handling.

“She’s one of our superstars. She just has her cape tucked in. As opposed to getting a team member off the street, we know these guys came through a program that had specific disciplines prior to graduation. It’s a win-win for both the students and the companies they are working for.”

- Scott McElmurray, Vice President, AutoGuide
EDUCATORS & CREDENTIALING BODIES
Michigan Coalition for Advanced Manufacturing (M-CAM) is a coalition of eight community colleges in Michigan with funding from a Round III TAACCCT U.S. Department of Labor grant. M-CAM partners are creating comprehensive and systemic career pathways for four areas in advanced manufacturing: machining/CNC, mechatronics/multi-skill, production and welding.

WITH $24.9 MILLION IN FUNDING, THE GRANT WILL SERVE NEARLY 3,000 STUDENTS.

M-CAM is helping to redefine how Michigan’s manufacturing workforce is grown and sustained.

This is being done through significant upgrades in equipment, process innovation at each college and a first of its kind collaboration among eight distinct, autonomous community colleges.

The M-CAM approach has aligned competencies based on common learning objectives derived from national credentials.

Because the partner colleges are distinct and autonomous, the national credentials serve as the tool by which college courses, curricula and articulation agreements are aligned. This eliminates the need for each college to provide the same courses with the same titles and syllabi. Instead, each college can continue to provide their distinct course offerings that resonate with local employers while ensuring that learning objectives (and competencies) align with national standards. The four pathway credentials are as follows: for machining, faculty are using three credentials from NIMS; for mechatronics/multi-skill, faculty are using a combination of the Association for Processing and Packaging Technologies (PMMI) and Siemens; for production, faculty are using the Certified Production Technician (CPT) standards from MSSC; and for welding, faculty are using the American Welding Society’s (AWS) Sense Level 1 standards.

Each of the four career pathways within M-CAM is specifically designed around national credentials that have been vetted by the industry and are in demand by employers.
Although Edmonds Community College (Edmonds CC) is involved in a number of business partnership projects, this profile focuses on the Washington Aerospace Training and Research (WATR) Center, which is managed by Edmonds CC through an operating agreement with the Aerospace Futures Alliance (AFA).

2010: THE WATR CENTER OPENED

The WATR Center is one of the pilot programs that led to the formation of the National Aviation Consortium (NAC).

As an educational resource for career pathways in the aerospace manufacturing industry, the WATR Center offers several programs that are designed to get students trained and ready for high-paying jobs in the shortest possible amount of time.

Initially, as the lead employer, Boeing hired about 90% of graduates, but as the program expanded, the aerospace community benefited. Due to competition from suppliers, Boeing now employs 60% of graduates, while 40% are hired by other area aerospace and manufacturing employers. WATR also provides training to incumbent workers.

Under the NAC program, the WATR Center covers the Aerospace Manufacturing Technician job family. This model provides a Core Skills Certificate and Career Pathway Certificates for Assembly Mechanic, Electrical, Tooling, Composite and Quality Assurance. Foundational skills are assessed by the National Career Readiness Certificate (NCRC), testing during coursework, and soft skills.
JOEL HOBBS JR.

“I quickly jumped at this opportunity. The funding provided me a direct path into the program, which would not have existed because of my looming college and business expense debt. I am very optimistic about my future.”

Joel grew up in the flight path of Boeing Field in Seattle. After receiving his BA in Business Administration and Finance from Morehouse College in Atlanta, he returned to Seattle during a declining economy only to find work in car rentals and insurance sales. After making a visit to the WATR Center, he learned that he could qualify for short-term financial assistance from the Basic Food, Education and Training (BFET) program.

Following his graduation from the Aerospace Tooling Mechanic program, Joel was immediately hired by Honeywell to build accelerometers used for guided missiles. He now feels like he is in an industry that is stable and currently works for Boeing.
The National Institute of Metalworking Skills (NIMS) is the developer of quality competency-based skills standards and credentials for jobs in manufacturing and related industries. Through these efforts, NIMS helps build and maintain a globally competitive workforce.

NIMS was formed in 1994 by the metalworking trade associations to develop and maintain a globally competitive workforce. NIMS has a stakeholder base of over 10,000 metalworking companies and is supported by the major trade associations in the industry: the Association for Manufacturing Technology, the National Tooling & Machining Association (NTMA), the Precision Machine Products Association (PMPA), the Precision Metalforming Association (PMA) and the Tooling and Manufacturing Association (TMA).

2014: ISSUED NEARLY 19,000 INDUSTRY-RECOGNIZED CREDENTIALS TO OVER 8,000 INDIVIDUALS

2015: ISSUED 21,420 INDUSTRY-RECOGNIZED CREDENTIALS, RESULTING IN A 20% INCREASE

NIMS has developed skills standards for entry-level to master-level machining, metalworking operations and industrial technology maintenance.

NIMS certifies individuals' skills against these national standards via industry-recognized credentials that companies can use to recruit, hire, place and promote individual workers. It offers over 50 credentials to validate skills needed in 90% of manufacturing companies. Training programs incorporate the credentials as performance or completion measures of academic coursework in metal forming or machining programs. Currently, NIMS offers 52 distinct credentials, including metalforming (Stamping, Press Brake, Roll Forming, Laser Cutting) and machining
NIMS 1,500+ partners are coast-to-coast and include public and private education institutions, businesses, associations, government programs and military associations.

(Machining, Tool and Die Making, Mold Making, Screw Machining, Machine Building and Machine Maintenance, Service and Repair).

Aligned with these credentials, the NIMS Competency-Based Apprenticeship System enables companies to source and hire individuals with nationally-recognized skills and train them to company-specific needs. The blend of classroom and workplace learning provides individuals with training while they gain real-world experiences and skills by working and contributing to the sponsoring company.

Graduate/Employee Perspective:
“The NIMS apprenticeship program provided me with the skills and knowledge to succeed as a CNC Operator. The competency-based approach ensured that I mastered all the skills expected of Oberg employees. By aligning the program with NIMS, I was able to earn two nationally recognized credentials.”

- Paul Earley, CNC Operator, Oberg Industries

Credentialing/Employer Insight:
“We implemented a competency-based apprenticeship model to ultimately support each individual apprentice achieving success in direct alignment to Oberg Industries’ company values. By incorporating NIMS credentials as a means to validate progress, we have seen tremendous return on investment, with improved quality, productivity, profitability, enhanced customer satisfaction and stronger employee retention.”

- Greg Chambers, Director of Compliance, Oberg Industries, Inc. and Chairman of the Board, NIMS
The program consists of 2,000 hours of on-the-job training and 240 to 435 hours of related technical instruction.

Partners for a Competitive Workforce (PCW) partners with more than 150 organizations in Ohio, Kentucky and Indiana and is the umbrella organization created to coordinate all of the region’s workforce efforts and to establish joint priorities under a common mission: meet employer demand by growing the skills of the current and future workforce.

PCW’s Advanced Manufacturing Industry Partnership (AMIP) utilizes the Manufacturing Institute’s Skills Certification System (SCS). SCS is a model designed by industry, for industry, and is endorsed by the National Association of Manufacturers (NAM).

The industry partnership model utilizes employer leadership to align education with industry, design career pathways with portable and stackable credentials that meet industry needs, engage education and workforce stakeholders to train the workforce and utilize industry intelligence to develop long term strategies to improve the talent pipeline.

Tucker has a background working with underserved populations, returning military and those in need of second chances.

He facilitated a job analysis process with several manufacturers identifying core competencies, aligning knowledge, skills and abilities requirements, and qualifications and responsibilities required of newly hired machine operators and welders at their businesses. As a result, partner manufacturers developed common job descriptions and identified core educational requirements necessary to produce highly competent and skilled machine operators and welders, as well as developed apprenticeship programs for both occupations.

See right for welding spotlight and next page for machine operator spotlight.
Chelsee had bounced from job to job, landing in the fast food industry. Her journey to success began when her mother shared an article about a manufacturing apprenticeship program of PCW and J.P. Morgan Chase (JPMC).

Chelsee attended an information session, completed an application, obtained a Silver Level National Career Readiness certificate and secured a sponsorship for a welding apprenticeship with American Fan. She worked full time while attending Butler Technical and Career Development School at night. After completing 240 hours of welding coursework with a 3.7 grade point average, Chelsee earned an American Welding Society nationally-recognized credential and now receives employer-sponsored benefits.

“I was immediately interested. I’ve always liked working with my hands, however, I knew nothing about manufacturing. After just six months, I was given a raise that was higher than all of my increases combined over the last five years. This program has literally changed my life because I now have marketable skills and a career.”

PCW MODEL EFFECTIVENESS
MORE THAN 10,000 PEOPLE TRAINED FOR IN DEMAND JOBS SINCE 2009.

80% OBTAINED EMPLOYMENT
NEARLY 70% RETAINED JOB FOR AT LEAST 1 YEAR

ANNUAL EARNINGS INCREASED BY $7,500

SPOTLIGHT ON A WORKFORCE PROFESSIONAL

CHELSEE REESE

Chelsee attended an information session, completed an application, obtained a Silver Level National Career Readiness certificate and secured a sponsorship for a welding apprenticeship with American Fan. She worked full time while attending Butler Technical and Career Development School at night. After completing 240 hours of welding coursework with a 3.7 grade point average, Chelsee earned an American Welding Society nationally-recognized credential and now receives employer-sponsored benefits.
Since 2009, PCW has convened the AMIP to meet the needs of employers and employees in the industry. Richards Industries and StandardAero Component Services are two Cincinnati-based employers that have engaged PCW’s AMIP to find qualified candidates to fill middle- and high-skill job openings. In 2012, an advisory committee of manufacturers—led by Richards Industries and including StandardAero Component Services—partnered with Cincinnati State Technical and Community College to develop an accelerated entry level Machine Operator Training Program. Apprentices receive employer-sponsored benefits, college credit and nationally recognized industry certifications from the National Institute of Metalworking Skills (NIMS).

PCW’s AMIP employers recognize various credentials and certificates from the MSSC, NIMS and the AWS. PCW’s partners also accept ACT’s NCRC to validate job readiness and offer other forms of employability training.

Credentialing/Employer Insight:
“I was pleasantly surprised at the cost savings and the verified return on investment of this training initiative by significantly reducing our on the job training costs and time spent to become 100% productive for our middle-skill employees.”

- Cheryl Neiheisel, Vice President of Human Resources, Richards Industries

AMIP incorporates soft skills, fundamental academic skills and industry specific training into stackable credentials.
875%: ROI FOR THE PARTNERSHIP WITH CINCINNATI STATE TECHNICAL AND COMMUNITY COLLEGE TO DEVELOP AN ENTRY LEVEL MACHINE OPERATOR TRAINING PROGRAM

SPOTLIGHT ON A WORKFORCE PROFESSIONAL

PATRICK FOHL

“Although I was employed in the automotive industry, I’ve always had a strong desire to work in manufacturing and aerospace specifically.”

Patrick was a 2009 graduate of Hamilton Badin High School and completed automotive technician training by the end of his senior year. Patrick began his career at StandardAero as a composite technician bench hand and jumped at the opportunity to become a machinist through the manufacturing apprenticeship program. Patrick was placed under the mentorship of Rick Shelton and Doug Perdue, two highly-skilled machinists with over 35 years and 25 years of experience, respectively.

“I love the structure of this program combining on-the-job training simultaneously with the related technical instruction. Patrick can apply his education immediately, which accelerates his learning and reduces time spent in on-the-job training.”

- Rick Shelton, Senior Machinist, StandardAero
Chattanooga State Community College (ChSCC) runs nearly 20 Engineering Technology programs in Manufacturing, Engineering, Design, Chemical and more, including employer partnerships such as the Wacker Institute (discussed in our interview with Dr. Erika Burk) and the Volkswagen Academy Mechatronics program. Most programs are work/study programs combining paid work experience with college coursework.

ChSCC’s programs are specifically tailored to meet the needs of its employer partners. The employers are regarded as the source of the body of knowledge for each job and, where necessary, ChSCC engages in a job task analysis to refine it. The curriculum is then developed on that basis.

**Since manufacturing certifications are generally not included in job descriptions or otherwise required by employers, ChSCC has relied on its own reputation and employer network to get graduates hired.**
INSIGHTS FROM THE FIELD
FOUR KEY THEMES

After synthesizing the lessons and impact reported by the programs discussed in the profile interviews, the following four themes emerged.
1. **Employer leadership is critical to successful programs.**

   - Whether it was educators, credentialing bodies or employers themselves, all of the subjects emphasized that detailed and sustained employer engagement and leadership is crucial to success. This directly aligns with some of the previous references and research identified in this paper.

   - It is still a challenge, however, for some companies to get the demonstration of ROI they need to fully commit, and educators still struggle to respond to needs that are not clearly articulated. So there remains a Catch-22: employers want proven effectiveness, but validation requires investment in a program that is yet to be proven effective.

2. **There is a credentialing ecosystem in place, ready to be engaged.**

   - It remains typical in the manufacturing industry for a single employer to partner with a community college to provide for its specific needs. For those starting new programs, however, there is a full range of successful models to draw from. Whether from the U.S. Department of Labor, or Manufacturers Institute, or from international analogues, there is little need to reinvent the wheel.

   - A number of employers, as well as workforce professionals, highlighted that collaboration works in part because competencies can be commonly defined. A small portion of manufacturing expertise is specific to a particular employer, but the majority of skills and abilities are generalizable.

   - Defining common competencies for manufacturing, however, is more challenging than in other sectors. Other sectors tend to have facilities and equipment that are common to different employers and work environments. But in manufacturing, it is common to build plants that are filled with custom-designed equipment. Coping with this challenge takes some ingenuity. Yet commonality can be found at the sub-system level. Mechatronics programs, for example, have focused on sub-system commonalities such as electronics, electrical systems, pneumatics and hydraulics with great success.

   - Furthermore, it is possible to align the common competencies with national credentialing bodies. NIMS, MSSC, AWS and more have become catalysts for change and have done much good work for employers in defining credentials and establishing validity. Similarly, the U.S. Department of Labor and workforce professionals like Corporation for a Skilled Workforce & Jobs for the Future (JFF) have done an excellent job organizing and connecting the often fragmented elements of competency mapping, increasing the opportunity for more industry engagement.
3. **Smart data collection is critical.**

   - Good data starts with professional job analysis. There are multiple levels of job analysis: simple review of job descriptions, job shadows, SME sessions and rigorous practices like ACT Job Profiling or DACUM job analysis. The O*NET is another very useful tool for organizing job families based on similar work activities and gathering data on job-related competencies.
   
   - Rigorous job analysis is critical to establishing ROI for employers.
   
   - Job analysis is the beginning, but the end of the program is important too. Tracking graduates and new hires is another critical piece of the business case for competency-based sourcing and hiring.
   
   - As mentioned in the background section, employment tests generally measure foundational competencies. Foundational competencies are widely recognized as crucial, but very few companies are investing in developing them. Most of the time they are simply selecting candidates that already possess the required foundational competencies. That practice will not be viable as programs scale up. Professional job analysis and validation studies are critical to establishing which foundational competencies link to occupational competencies for each job family.

4. **Long-term talent sourcing is a motivating goal.**

   - Employers are thinking holistically about jobs and how employees move within the company, which has allowed career pathway models to have more merit.
   
   - The realities of job demands, however, can make continuing education difficult for employees. Work/study programs that combine schooling with paid on-the-job training are a best practice employers are pursuing to attract and retain talent. There are many other opportunities to pursue and leverage in this space, as well.
TEN BEST CREDENTIALING PRACTICES

The following ten best practices are used in various kinds of workforce development programs across the country.

While this list is primarily based on reports released by major organizations or independent researchers, each point was echoed by one or more of the subjects we interviewed. Since each report studied multiple programs, this list represents the “best of the best” in the credentialing market and those most relevant to the field research and manufacturing industry.

1. **Engage the field of practice intentionally.**
   - Convene stakeholders to secure buy-in.
   - Secure buy-in and commitment of senior staff leadership especially.
   - Engage stakeholders to develop a plan as partners, not just customers.
   - Know all the participants’ needs before designing a program.
   - Facilitate close communication between leadership and stakeholders.
   - Build relationships around a shared vision and mutual advantage.
   - Consider using sector-strategy principles.

2. **Develop evidence-based standards for improvement.**
   - Use data to prioritize actions.
   - Establish systems for gauging participant readiness and performance.
   - Build broad-based institutional research and data capacity.
   - Establish how data will be collected, stored and shared.
   - Use evidence-based standards for refreshing and validating credentials.

3. **Career Pathways: Institutional/educational structures and services should be integrated and aligned.**
   - Align the programs serving participants.
   - Integrate instruction strategies with work experience and support services.
   - Cross-agency teams can help strengthen alignment and collaboration.

*The indicated abbreviations can be referenced in Appendix B.*
• Make career pathways about transforming institutions, not just a specific program.
• Common language and definitions are crucial for transparent competency-based career pathways and credentials.

Sources: BT, SG, SCCI, SVSS, OSCR, BCPS, CPHG, CCBCE, CPT, MMCBC.*

4. Stackable Credentials and Certificates.
• “Chunking”: break up a program into sections that each culminate in a useful credential.
• Create “lattice credentials” to allow students to move up or across career paths.
• Modularize credits by breaking them into mini-courses that can be completed one step at a time in a compressed time frame.

Sources: OSCR, SSC, CCBCE, CPT, MMCBC.*

5. Use accelerated learning and contextualized learning strategies.
• Teach and test (math and English, for example) by using examples relevant to the program.

Sources: OSCR, BT, CPT.*

6. Embed existing industry certifications in career and technical programs.

Sources: SSC, CCBCE.*

7. Offer comprehensive supports.
• Financial aid, family support (child care and transportation, for example) and motivational guidance are often necessary.

• Plan how to grow amid funding challenges.

Sources: BT, SVSS, WWDS, BCPS, CPT.*

8. Demonstrate labor market payoffs.
• Connect to employers who have a stake in graduates.
• Focus on quality job placement.
• Demonstrating ROI is a critical component of employer engagement.

Sources: BT, WWDS, BCPS, CCBCE, CPT, MMCBC.*

9. Engage state administrative policies in order to make the changes necessary to support program practices and strategies.
• Make an attempt to influence public policy.
• Tap all partners for collective advocacy.
• Align programs and policies with state and local stakeholders.

Sources: SG, AD, SVSS, WWDS, BCPS, CPHG, CPT, MMCBC.*

10. Educators and employers should collaborate with workforce organizations, credentialing bodies and other stakeholders.
• Seek out regional partnerships.
• Community organizations can help shape the services offered and provide support.
• Key players are striving to organize a credentialing ecosystem that includes employers, educators, individuals, workforce developers and credentialing bodies.

Sources: WWDS, SVSS, BCPS, CCBCE, CPT, MMCBC.*

*The indicated abbreviations can be referenced in Appendix B.
FOUR TYPES
COMPETENCY AND CREDENTIALING SYSTEMS

The following four types of competency and credentialing systems were identified through our series of interviews and research with employers, educators and credentialing bodies.
Based on our research, interviews and the common themes and best practices we uncovered, Hope Street Group has concluded that competency-based and credentialing programs tend to be organized in roughly four ways. In this light, we began to raise questions about how the more fragmented parts of the credentialing landscape could be more efficiently organized.

**For example:**

1. In precisely what ways are employers, educators, credentialing bodies, standards bodies, workforce developers and accreditation bodies organized?

2. What role does each play in a successful program?

3. How are competencies determined, measured and used?

In addressing these questions and the current landscape, Hope Street Group proposes that there are essentially four types of competency and credentialing systems.* The types increase in complexity or comprehensiveness; the first type is extremely local and the fourth involves a nationwide manufacturing ecosystem. This does not intend to imply rank in value. As each type serves different needs, a more complex system is not necessarily a better one. These distinctions, however, are ultimately intended to foster a conversation about what the most effective arrangement for the manufacturing industry might be.

*The types are offered only as a useful model. In practice, many of the profiles contain elements from more than one type. Please see each profile for more details.*
TYPE ONE: EMERGING NEEDS

Type one programs are targeted, local partnerships between individual employers and training institutions. They typically form when employers sense a need and reach out to community colleges that are willing and able to respond to that need. These programs can be put together very quickly, maximizing efficiency and impact. This type may also be referred to as “customized training.”

Employers in conjunction with training professionals or educators develop the training program and define the required competencies through discussion. Sometimes employers might utilize tools like ACT WorkKeys Job Profiles or DACUM job analysis to define job tasks. Trainers and educators seek input from employers, and employers often provide subject matter experts (SMEs) to co-develop or review the curriculum, but there is generally no third-party validation.

Assessments and credentials, if any, are generally based on faculty observations of participants.

Credentials tend to be limited to local certificates with local value. These programs are typically not accredited, so there are no continuing education or renewal requirements. The programs are simply intended to fulfill specific needs quickly and efficiently.

Examples:
• Type one programs may be the most common in the U.S. It just takes one employer to partner with one provider, either a community college or workforce training institution.

  • Recently, McKinsey Generation has revitalized this type by setting up boot camps. This highly efficient set-up moves participants into employment with 450 hours of training within 12 weeks.

  • Chattanooga State Community College has become a hub in its region for programs of this type. They partner with and support Volkswagen, Wacker-Polysilicon and others.

  • Large companies can also leverage this model regionally, as Alcoa does with Muskegon Community College for its White Hall plant in Michigan.
TYPE TWO: REGIONAL AND MULTI-STATE COLLABORATIONS

Type two programs are collaborations of multiple organizations that have identified common needs. They tend to form when colleges and training institutions collaborate via meetings at regional conferences and form networks, consortia or alliances. Regional employers too might band together to more effectively influence local education providers or other stakeholders.

Collaborative discussion among local employers and training consortia members determines the competencies. Some employers may leverage or utilize tools like ACT WorkKeys Job Profiles or DACUM job analysis to determine knowledge, skills and abilities. There is usually no third-party validation.

Curriculum tends to be locally or regionally defined, though informed by collaboration. Like type one programs, assessments are generally based on faculty observation of participants. Credentials are limited to local certificates with local value, though they may also introduce credentials from bodies like MSSC, NIMS, or AWS. Continuing Education Units (CEUs) are usually not granted in these programs.

Examples:

- M-CAM in Michigan and CWDA in Denver are both TAACCCT programs and the conditions of these federal grants require multi-state collaboration and evidence-based procedures.

- Small regional employers especially benefit from type two arrangements. For example, Erick Ajax referenced the early stages of “coopetition” (cooperation among competitors) in his region that helped them fund and customize curricula at community colleges in ways they would have been unable to achieve individually.*

*The EJ Ajax M-Powered program is currently better characterized as a type three program.
TYPE THREE: CREDENTIALING ORGANIZATIONS

In this type of program, credentialing organizations have emerged, perhaps out of the collaborations characteristic of type two programs. Sometimes there may be multiple credentialing organizations for the same occupation.

Organizations recommend or use professional job analysis to detail occupational competencies and possibly foundational competencies, as well. In rare cases, foundational competencies are defined and linked to occupational competencies.

In these programs, the professional credentialing organizations that partner with educators hire industrial psychologists to perform content validation of their credentials. In the best circumstances, practice analysis outcomes guide curriculum development and guide the educational publishing industry.

Type three programs typically feature multiple accreditors, and some accreditation bodies will reference the competency map from the job analysis. Assessments and credentials too are based on the competency map. Finally, the better credentials have specific expiration periods and require continuing education units (CEUs) or retesting to recertify.

What is most often missing from type three programs in the current manufacturing ecosystem is the element of third-party validation and accreditation in connection with credentials. Such validation and accreditation is more common, by contrast, in the healthcare sector. (For example, occupations tend to have professional memberships like those for Medical Assistants or Radiology Technicians.)

Examples:
- Many of the manufacturing companies interviewed have type three programs, involving credentials from credentialing organizations like AWS, MSSC and NIMS. Some utilize ACT’s National Career Readiness Certificate (NCRC) for foundational skills.
Companies like Bosch, Siemens, Caterpillar and Pepperidge Farm as well as collaborations like FAME AMT have the multi-state reach and standards of a credentialing organization system, career pathway options and incorporate third-party credentials.

Finally, Partners for a Competitive Workforce (PCW) excellently engages the whole workforce ecosystem in its regional programs in Ohio, Indiana and Kentucky.

**TYPE FOUR: NATIONAL ORGANIZATIONS**

The fourth and rarest type of competency and credentialing program emerges when strong, nationwide credentialing organizations begin to dominate. In this type, state licensing requirements are tightly aligned with professional requirements so that employers, educators and credentialing bodies are in harmony. Professional organizations, publishers and accreditors work independently and meet national and international standards. Competencies are defined by professional job analysis, with specialties and subspecialties also being defined and analyzed. Professional credentialing organizations hire industrial psychologists to perform content validation, and the best professional organizations run additional validation studies to correlate education levels, program accreditations and other important predictors with significant organizational outcomes.

(For example, in healthcare, it has been demonstrated that a higher

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“Our industry will need to fill over 100,000 jobs over the next decade, which begins with equipping students and workers today with industry-recognized credentials that prepare them for current and future jobs. These jobs will require more advanced skills, particularly around the use of technology, so training candidates to industry standards is imperative.”

- Jim Wall, Executive Director, NIMS
percentage of BSN educated nurses is correlated with better hospital outcomes.)

Curriculum standards too are based on job analysis, and major publishers align with job analysis competency maps. Accreditation is nationwide, and there are independent accreditation reference standards to assure quality curricula and faculty. Assessments are developed by independent professional testing organizations, and credentials are based on the completion of accredited programs and the successful completion of assessments. Credentialing organizations require continuing education units (CEUs) or retesting, and multiple conferences offer opportunities to earn CEUs.

Examples:
• There were no type four examples found in our field research in the manufacturing sector, but it is a familiar model in other sectors. While manufacturing credentials backed by credentialing organizations are widely in use, these credentials and the assessments and curriculum based on them are not yet independently accredited.

• Examples of this type from other sectors include: Certified Public Accountants (CPAs), Attorneys, Registered Nurses. All of these are driven by standards that shape curricula on a national level and are portable nationally as well, given small modifications for individual states. In healthcare in particular, competencies and curricula at this level are increasingly shaped by third party job analysis and validation.

• In nursing, longitudinal validation studies have correlated credentials with organizational outcomes.

• Within the manufacturing ecosystem, it is possible to imagine ANSI and ISO playing an important role in shaping type four programs.
TYPE FIVE
THE IDEAL MODEL

The ideal model presents a potential option garnered from the collection of best practices applied in the manufacturing sector, combined with best practices from other sectors of the economy. The ideal model operates as an interconnected ecosystem with unified governance over professional organizations, ensuring continuous improvement and efficacy.

Credentialing organizations have a tight focus and serve their stakeholders well, conducting consortium-style job analysis and validation studies. Emerging needs are managed professionally by the credentialing organization to vet need and ensure quality. This evidence-based approach, including longitudinal validation related to organizational outcomes, quantifies the value of quality talent to manufacturing employers, policymakers and all stakeholders.
Dennis Parker from Toyota/FAME explained that while they were developing the program, Toyota’s training program was focused on continually asking and re-asking: what is the ideal manufacturing technician? The point was to refine existing programs and forge new pathways in light of a vision of the technician they intended to develop.

Similarly, it is necessary to pose the question of how an ideal credentialing system model might be built for the manufacturing sector: how can the system embed a collaborative structure to ensure employers, educators and credentialing bodies have the ability to seamlessly interact and evolve? To answer these questions, continuous innovation needs to be applied in the competency and credentialing process, which leads us to the ideal model.
TYPE FIVE: THE IDEAL MODEL
In this model, curriculum, accreditation, credentials and continuing education are independent and aligned. Clear career pathways with feeder occupations and next step occupations are defined. Credentials are in demand because the value is clear to employers and the public.

Competencies are determined by professional job analysis. Competency models detail occupational and foundational competencies with quantified linkages. Comprehensive job analysis is refreshed at least every three years to ensure continuous improvement, and specialties and subspecialties are monitored for need.

Professional credentialing organizations hire industrial psychologists to perform content validation. Employer organizations regularly run additional validation studies to correlate education levels, program accreditations and other important predictors with significant organizational outcomes.

Curriculum standards too are based on job analysis with the findings openly available. Foundational competencies are defined, linked to occupational competencies and utilized as prerequisites to training.

With respect to accreditation of programs and assessments, an independent accreditation body references clearly defined standards and an independent organization oversees test development. Nationally portable credentials are based upon these standards. Finally, well-developed and highly relevant continuing education units are offered extensively.

While the manufacturing industry may not currently have the tools to apply the operations of type five, the purpose of the model is to imagine a fully integrated ecosystem in order to guide the ongoing discussion about what will be efficient for the manufacturing industry and identify the common needs of employers. This strategizing and thinking will provide a common starting point to build processes and tools that could operate under this ideal model.
<table>
<thead>
<tr>
<th>Stage</th>
<th>1 Emerging Needs</th>
<th>2 Collaboration</th>
<th>3 Professional</th>
<th>4 National</th>
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</thead>
</table>
| **Characteristics** | • Sense new need  
• Customized training solution | • Organizations collaborate via conferences | • Professional organizations emerge (multiple) | • Strong national organizations dominate |
| **Competencies** | • Defined via employer-faculty discussions | • Employers and training consortia define | • Professionals hired for practice analysis | • Professionals hired for practice analysis |
| **Validation** | • Generally none  
• Job Profile | • Usually none  
• Job Profile  
• DACUM | • Content validation | • Content validation  
• Longitudinal validation studies |
| **Curriculum** | • Local faculty guided by employers | • Locally defined  
• Informed by collaboration | • Practice analysis guides curriculum | • Practice analysis guides curriculum and publishing |
| **Accreditation** | • None | • None | • Multiple accreditation bodies | • Independent accreditation |
| **Assessments and Credentials** | • Generally faculty observations of students  
• Credentials limited local value | • Observations  
• Credentials limited based on competencies | • Assessments and credentials based on competencies | • Assessments and credentials based on competencies |
| **Continuing Education and Renewal** | • None | • None | • Expiration periods and continuing education (CEUs) | • Expiration periods and continuing education (CEUs) |

This chart, contributed by Metrics Reporting, summarizes the four types of competency and credentialing systems, and summarizes the ideal type.
5 Ideal

- Professional organizations emerge (multiple)
- Professionals hired for practice analysis
- Content validation
- Practice analysis guides curriculum
- Multiple accreditation bodies
- Assessments and credentials based on competencies
- Expiration periods and continuing education (CEUs)
Testing and building: working towards the ideal model

Making Makers: Rebuilding the Manufacturing Workforce Through Competencies and Credentials seeks to build common understanding of competency and credentialing terms and applications, synthesizing both field interviews and extensive research to highlight the best practices and operating themes that manufacturing employers and organizations are investing in.

There is a demonstrable commitment of many employers and stakeholders to apply the most effective program to increase access and upward mobility for manufacturing career pathways, and there is good progress underway. We propose that the manufacturing industry continue this effort and collaboratively work towards developing, piloting and amplifying the ideal model.
RECOMMENDATIONS FOR IMPLEMENTATION

Enhance and improve manufacturing employer understanding and use of competency and credentialing applications that yield wide-scale impact.

This could be achieved by an organized series of national level convenings and the development of a sustained Manufacturing Community of Practice (COP). The COP would provide various opportunities to uniquely share information, and would build commonalities and fundamental agreements on effective competency and credentialing practices applied by various manufacturing employers and industry representatives. Most importantly, the COP would commit to and lead the “new” practice and ideal model once developed and tested. While it will be necessary for the employers to actively participate in the COP activities, Hope Street Group proposes itself to act as a backbone organization to manage and provide the technical support to advance the dialogue and work in a manner that leads to results and practice playbooks.

Specifically, this COP could focus on defining common competencies and needs and selecting appropriate, nationally portable credentials, no matter how “local” the need. These common competencies would be universally defined, common and portable across the industry at the sub-system level, allowing for the remaining skills and abilities to be locally trained and customized.

Additionally, the employer COP would further clarify and develop the operating infrastructure for the ideal credentialing system model and help advance model implementations across the country. This would involve hosting a series of public and private meetings to engage various employers in a discussion on the current competency and credentialing system types, allowing for a forum and opportunity to gather cross-sector input and improve the current state. The ideal model would serve as the ultimate framework for employers to continue to refine and eventually adopt and amplify.
Establish a manufacturing “cooperative center” to support employers and credential practitioners across industry sectors with job analysis and validation services so they can identify and validate competencies for high-quality, evidence-based credentials.

The mission of the organization should be to define, validate and openly communicate the competencies that can be demonstrated to be related to job performance. By filling this void, the center will set the foundation for a cooperative and openly shared competency-based talent supply chain system that aligns employers, educators and individuals across the U.S. economy. Furthermore, the center will organize the credentialing market for the manufacturing sector and will create common standards for foundational and occupational credentials within it.

The organization should play two roles in the manufacturing sector: first, it needs to organize the sector process for defining and validating the foundational competencies that are directly linked to high performance for the sector’s leading job families; second, it should act as an oversight group that audits, evaluates and reports on the quality, cost and value of occupational credentials. We would not recommend that such an organization issue credentials. The organization would thus be able to provide clarity to the phrase “industry recognized credentials” by publishing a list of manufacturing credentials that are recognized as valuable to the industry. Such an organization would represent the unified voice of the industry to communicate talent requirements to employees and to education and training organizations.
Launch two pilot roll-outs and coordinate/manage for wider industry amplification.

After the initial operating structure is finalized by the employer COP and there are industry recognized credentials, Hope Street Group proposes to launch a series of pilots across the country to implement the ideal model and a new competency validation practice to confirm the impact is significant to the other industries that have adopted similar practices. Most importantly, the pilots will ensure an opportunity for various employers, across size and region, to test the structure and provide ample feedback to continuously improve the competency and credentialing process. This will involve a smaller pilot roll-out focused on defining and validating manufacturing competencies as described in this report, and a larger pilot roll-out utilizing the results and improvements from the initial roll-out along with leveraging current, regional collaboratives/partnership frameworks.

To gain buy-in and traction, employers must be involved and lead from the start. The pilots will empower existing efforts by accelerating the adoption of competency validation with employers through “confirmatory analysis” at the job site, helping them work harder with an even richer data set about employee performance against those standards. The data gathered would be maintained in real time and openly shared in the industry.

Following the initial pilots focused on the job task and confirmatory analysis, a much wider pilot roll-out will need to occur that Hope Street Group has deemed Manufacturing Pathways. Currently, Hope Street Group has already launched an initiative, Health Career Pathways, which will provide leadership and technical assistance to sites across the U.S. that are implementing a common approach to career pathways for the healthcare sector. Hope Street Group is defining the processes, tools and metrics that can be implemented uniformly at 30 sites; managing data quality and analysis on an ongoing basis to ensure process compliance at all sites; completing a validation study and publishing the validity and utility of the Health Career Pathways career portfolio elements; and articulating the value of the program to employers, workforce agencies, colleges, regions, states, the healthcare industry and the nation.

The Hope Street Group Manufacturing Pathways project would be a compatible project that would benefit from the processes, tools and metrics developed for Health Career Pathways. These elements would be adapted for manufacturing and leverage the information gathered and published by the organization discussed above. The Manufacturing Pathways project will provide a set of “applied R&D sites” for the implementation of the foundational and occupational credential standards developed by that organization and vetted and validated by the COP. This will shorten the development cycle time and allow rapid prototyping and movement to industry-wide adoption.
APPENDIX A
GLOSSARY OF KEY TERMS AND ABBREVIATIONS
Definitions marked with an asterisk are taken from Career Pathways Toolkit: Six Key Elements for Success (DOL, 2011); definitions marked with a double asterisk are taken from Shared Vision, Strong Systems: Alliance for Quality Career Pathways Framework Version 1.0 (CLASP/AQCP, 2014).

**Abilities**
Enduring attributes of the individual that influence performance. O*NET ability statements refer to the power to perform an observable activity at the present time. This means that abilities have been evidenced through activities or behaviors that are similar to those required on the job, e.g., ability to plan and organize work.

*Apprenticeship*
Apprenticeship is a combination of on-the-job training and related instruction in which workers learn the practical and theoretical aspects of a highly skilled occupation. Apprenticeship programs can be sponsored by individual employers, joint employer and labor groups, and/or employer associations. The Department of Labor's role is to safeguard the welfare of apprentices, ensure equality of access to apprenticeship programs, and provide integrated employment and training information to sponsors and the local employment and training community.

*Assessment*
The use of standardized instruments, interviews, or other means to determine factors that may contribute to the success of students in career and technology programs. These factors may include interest, aptitude, academic achievement, work experience, learning style, work values, and other traits. Assessment may also be administered to determine progress attained by students during training or areas of need to address through remediation.

**Assessment**
The process of gathering and documenting information about the achievement, skills, abilities, and personality variables of an individual. The process and tools used for the assessment must be reliable, valid, and diagnostic and must be used appropriately to place individuals in educational levels and programs and measure their progress.

**Career Pathway**
A career pathway is an integrated collection of programs and services intended to develop students’ core academic, technical and employability skills; provide them with continuous education, training, and placement in high-demand, high-opportunity jobs.

*Career Pathways*
The term “career pathway” means a combination of rigorous and high-quality education, training, and other services that:

- Aligns with the skill needs of industries in the economy of the state or regional economy involved;
- Prepares an individual to be successful in any of a full range of secondary or postsecondary education options, including registered apprenticeships;
- Includes counseling to support an individual in achieving the individual's education and career goals;
- Includes, as appropriate, education offered concurrently with and in the same context as workforce preparation activities and training for a specific occupation or occupational cluster;
- Organizes education, training, and other services to meet the particular needs of an individual in a manner that accelerates the educational and career advancement of the individual to the extent practicable;
- Enables an individual to attain a secondary school diploma or its recognized equivalent and at least one recognized postsecondary credential; and
- Helps an individual enter or advance within a specific occupation or occupational cluster.
**Career Pathways**

An operationalization of the career pathway approach that includes three essential features:

1. well-connected and transparent education, training, credential, and support service offerings within specific sectors or cross-sector occupations (often delivered via multiple linked and aligned programs);
2. multiple entry points that enable well-prepared students as well as targeted populations with limited education, skills, English, and work experiences to successfully enter the career pathway (targeted populations served by career pathways may include adult education or other lower-skilled adult students, English language learners, offenders or ex-offenders, certain high school students; disconnected or “opportunity” youth, former military personnel, un- or under-employed adults, or others); and
3. multiple exit points at successively higher levels leading to self- or family-supporting employment and aligned with subsequent entry points. Career pathways also include four essential functions: (a) participant-focused education and training; (b) consistent and non-duplicative assessments of participants’ education, skills, and assets/needs; (c) support services and career navigation assistance to facilitate transitions; and (d) employment services and work experiences.

*C* **Career Technical Education (CTE)**

Career and technical education is a term applied to schools, institutions, and educational programs that specialize in career-focused programs that prepare students both for college and careers. Career and technical education programs offer both academic and career-oriented courses, and many provide students with the opportunity to gain work experience through work-based learning, such as internships, on-the-job training, and industry-certification opportunities. Career and technical education programs provide a wide range of learning experiences spanning many different career fields and industry sectors. Career and technical education may be offered in middle schools, high schools, vocational-technical schools, or through community colleges and other postsecondary institutions and certification programs.

**Character Competencies**

Soft skills, behavioral skills and personality factors.

**Cognitive Competencies**

Mental processing skills.

**Competency**

A set of defined behaviors that provide a structured guide enabling the identification, evaluation, and development of the behaviors in individual employees. Competencies describe the capability to apply or use a set of related knowledge, skills, and abilities required to successfully perform critical work functions or tasks in a defined work setting.

**Competency-Based**

Indicates that the decision is based on or has integrated the assessment of competency rather than some other method. Example: Competency-based education (CBE) awards credits based on mastery of competencies rather than time-in-seats.

***Competency-Based Curriculum***

A program of study based on competency models that identify the knowledge, skills, and abilities necessary to successfully perform critical work functions in an industry or occupation.

**Competency-Based Credentialing**

Model or method of awarding credit that uses defined learning outcomes and competencies instead of measuring learning through clock or credit hours.
**Competency Validation**
The process of defining competencies that are measurably related to job performance as well as gathering and organizing evidence to substantiate the relationships.

*Credential*
An attestation of qualification or competence issued to an individual by a third party (such as an educational institution or an industry or occupational certifying organization) with the relevant authority or assumed competence to issue such a credential. A credential is awarded in recognition of an individual’s attainment of measurable technical or occupational skills necessary to obtain employment or advance within an occupation. These technical or occupational skills are generally based on standards developed or endorsed by employers. Credentials include degrees, diplomas, certificates, certifications, and licenses.

*Credentials*
There are many different types of credentials offered or awarded by various types of organizations. Within the context of education, workforce development, and employment and training for the labor market, the term credential refers to a verification of qualification or competence issued to an individual by a third party with the relevant authority or jurisdiction to issue such credentials (such as an accredited educational institution, an industry-recognized association, or an occupational association or professional society).

**The range of different types of credentials includes:**
- Educational diplomas, certificates, and degrees;
- Registered apprenticeship certificates;
- Occupational licenses (typically awarded by state government agencies);
- Personnel certifications from industry or professional associations; and
- Other skill certificates for specific skill sets or competencies within one or more industries or occupations (e.g., writing, leadership, etc.).

**Evidence-Based Practices or Processes**
Practices or processes of demonstrated effectiveness as shown by theoretical knowledge, practice data, program evaluation results, implementation data, and/or synthesis research.

**Evidence-Based Selection Process (EBSP)**
Evidence-based selection processes use data on candidate competencies to manage the talent acquisition “pipeline” from a large pool of potential candidates to final hires. Key steps in this pipeline are sourcing, screening, selection, hiring, and on-boarding. Competencies that have been determined to correlate to job performance through job analysis and validation studies are measured via cognitive assessments, character assessments, reference checks, and structured interview guides (SIGs) with behaviorally anchored rating scales (BARS).

**Fast-Track Programs**
Fast-Track programs are accelerated programs that allow non-traditional learners to pace themselves according to their time availability and skill level. Fast-Track programs are designed to learn basic skills like literacy and math in the context of their career interest, making learning more relevant. Fast-Track programs are paced to meet the time commitments of non-traditional learners and may be offered on different schedules than conventional courses, thereby addressing their barriers to attending traditional course schedules. The goal of any Fast-Track program is for the learner to obtain some type of industry-recognized credential.
Foundational Competencies
Cognitive, Character and Physical competencies.

*Industry or Sector Partnership
A workforce collaborative convened by or acting in partnership with a state board or local board that:
Organizes key stakeholders in an industry cluster into a working group that focuses on the shared goals and human resources needs of the industry cluster and that includes, at the appropriate stage of development of the partnership, a broad base of representatives including businesses, institutions of higher education, representatives of government, workforce agencies, labor organizations, and workforce boards.
• May also include representatives of state or local government, state or local boards, state or local economic development agencies, state workforce agency other state or local agencies, business or trade associations, economic development organizations, nonprofit organizations, community-based organizations, philanthropic organizations, and industry associations.

*Industry-Recognized Credentials
An industry-recognized credential is one that either is developed and offered by, or endorsed by a nationally recognized industry association or organization representing a sizable portion of the industry sector, or a credential that is sought or accepted by companies within the industry sector for purposes of hiring or recruitment, which may include credentials from vendors of certain products. Consumer should be aware that in some industry sectors there may be more than one major industry association and that they may endorse or promote different credentials, and that the credentials that are sought by individual companies in an industry can vary by geographic region, by company size, or based on what product or equipment the company uses and needs workers to be able to operate. This is merely to point out that there may not be a single readily identifiable national credential for all industry sectors or occupations.

Job Analysis
The process of grouping jobs into a job family; analyzing the knowledge, skills, abilities, and work styles required to perform tasks in the job family; observing job functions via job shadows; and working with SMEs to evaluate the importance level of each competency related to performing the job.

Job Family
A group of jobs defined by a set of similar O*NET occupation codes that perform similar tasks and require similar competencies (knowledge, skills abilities and work-styles).

Job Shadow
An activity performed as part of job analysis in which analysts follow a worker to observe the work behaviors (tasks), tools, and technology used to perform the job.

Job Taxonomy
Specific jobs can be organized in a taxonomy. The Bureau of Labor Statistics (BLS) utilizes the Standard Occupational Classification (SOC) System to organize jobs into a four-level taxonomy of: major groups, minor groups, broad occupations, and detailed occupations. The O*NET begins with SOC codes and adds a 5th layer in the taxonomy by adding two decimal digits to the end of the SOC code. Employers can use the job taxonomy to organize job codes into coherent groups for validation studies.
Knowledge
Organized sets of principles and facts applying in general domains. O*NET Knowledge statements refer to an organized body of information (usually of a factual or procedural nature) which, if applied, makes adequate performance on the job possible. Each knowledge statement discusses a separate body of information applied directly to the performance of a function.

Key Performance Indicators (KPI)
Outcomes that can be measured, examples include: first year turnover, time to fill positions, ratio of recommended to hired candidates, hiring diversity, job performance and other organizational outcomes.

Middle Skills Jobs
Jobs that require education beyond high-school but short of a four-year degree.

Occupational Competencies
Specific job tasks and work activities that are specific to particular job families.

O*NET
The O*NET program is the U.S. Department of Labor’s primary source of occupational information. The O*NET database contains information on hundreds of standardized and occupation-specific descriptors. Developed by Department of Labor.

*Portable Credential
A credential is considered portable when it is recognized and accepted as verifying the qualifications of an individual in other settings – either in other geographic areas, at other educational institutions, or by other industries or employing companies.

*Return on Investment (ROI)
As it relates to career pathways, ROI is a measure of the net economic impact of an employment and training program. The ROI considers all the costs associated with design and implementation of the career pathway program, including costs to the participant, and compares the sum of those costs to the economic benefits achieved by all participants upon exiting the program and/or over time.

*Sector Strategies
Regional, industry-focused approaches to workforce and economic development that improve access to good jobs and increase job quality in ways that strengthen an industry’s workforce. Although not a new approach, it is gaining national momentum as a proven framework for addressing skill gaps and engaging industry in education and training. The new Workforce Innovation and Opportunity Act (WIOA) makes significant changes to the nation’s workforce development system, expressly incorporating the sector strategies approach throughout and requiring regional planning and alignment with local labor market needs for in-demand sectors and occupations.

Skills
Developed capacities that facilitate learning or the more rapid acquisition of knowledge. O*NET Skill statements refer to the proficient manual, verbal or mental manipulation of data or things. Skills can be readily measured by a performance test where quantity and quality of performance are tested, usually within an established time limit.

Standard Occupational Classification (SOC)
The system of job codes developed by the Bureau of Labor Statistics.
*Stackable Credential*
A credential is considered stackable when it is part of a sequence of credentials that can be accumulated over time to build up an individual’s qualifications and help them to move along a career pathway or up a career ladder to different and potentially higher-paying jobs. For example, one can stack a high school diploma, an associate’s degree, and then typically obtain two more years of appropriate postsecondary education to obtain a bachelor’s degree. An individual can also stack an interim career/work readiness or pre-apprenticeship certificate, then complete an apprenticeship, and later earn a degree or advanced certification.

**Stackable Credentials**
A credential that is a part of a sequence of credentials that can be accumulated over time to build individuals’ qualifications and help them move along a career pathway or up a career ladder to different or potentially higher paying jobs.

*Subject Matter Expert (SME)*
An incumbent working in the job family or a manager with extensive job knowledge whose role is to help facilitators identify and prioritize tasks, knowledge, skills, abilities, and work styles important to performance in the job family.

*Talent Supply Chain Management (SCM)*
Talent SCM is the application of supply chain management principles to the supply of talent. Talent SCM is a sourcing strategy that is well suited to solving talent shortages.

**Tasks**
Work behaviors, elements of a job and the things an individual does to perform a job.

**Task Families**
Groups of related tasks used for job analysis.

*Validation*
Defining competencies, and demonstrating that they are measurably related to job performance in accordance with Industrial and Organizational Psychology professional principles and standards.

*Workforce Innovation and Opportunity Act (WIOA)*
The Federal statute that establishes Federal policy direction and appropriates Federal funds for employment and training programs. WIOA is designed to help job seekers access employment, education, training, and support services to succeed in the labor market and to match employers with the skilled workers they need to compete in the global economy. WIOA was signed into law on July 22, 2014. WIOA brings together, in strategic coordination, the core programs of Federal investment in skill development:

- Employment and training services for adults, dislocated workers, and youth and Wagner-Peyser employment services administered by the Department of Labor (DOL) through formula grants to states; and
- Adult education and literacy programs and vocational rehabilitation state grant programs that assist individuals with disabilities in obtaining employment administered by the Department of Education (ED).
- WIOA also authorizes programs for specific vulnerable populations, including the Job Corps, YouthBuild, Indian and Native Americans, and Migrant and Seasonal Farmworker programs as well as evaluation and multistate projects administered by DOL. In addition, WIOA authorizes other programs administered by ED and the Department of Health and Human Services. WIOA replaces the Workforce Investment Act of 1998 and retains and amends the Adult Education and Family Literacy Act, the Wagner-Peyser Act, and the Rehabilitation Act of 1973.
APPENDIX B
DETAILS AND REFERENCES OF BEST PRACTICES FROM LEADING WORKFORCE DEVELOPMENT PAPERS
Notes of clarification on the ten best practices identified in the report:

1. The interviews focused on employer-driven programs, but most of the research presented here focuses on the educator side of employer/educator partnerships, mainly community and technical colleges.
   - Despite the different focus, the best practices are largely the same.

2. Not every paper describes each best practice in the same way and not every heading is listed as an independent best practice in each document.
   - We have exercised judgment in grouping documents under the headings and only mean to indicate that the reader can expect to find good information relevant to the topic in the source cited.

3. The report focuses on competency-based credentials, but not all the papers discussed here studied competency-based programs. There is a substantial variety represented in these documents, which is in part why it seems useful to collect the recurring themes in one place.
   - Similarly, not every company we interviewed uses or issues competency-based credentials.
   - The practices described are still important for the information they provide about key components such as employer-engagement, using other elements of the workforce system and the benefits of work/study set-ups, for example.

SOURCE KEY FROM PAGES 56-57

- AD - Field Guide for Improving Student Success (Achieving the Dream, 2009)
- BCPS - Building a Career Pathways System (Workforce Strategy Center, 2002)
- BT - Breaking Through (Jobs For the Future, 2004)
- CCBCE - Call for a National Conversation on Creating a Competency-Based Credentialing Ecosystem (a collaborative effort from a large group of stakeholders including: CSW, CLASP, NGA, ANSI, NAF, MI, National Skills Coalition, Global Skills X-Change and more, 2014)
- CPHG - The Career Pathways How-to Guide (Workforce Strategy Center, 2006)
- MMCBC - Making a Market for Competency-Based Credentials (Corporation for a Skilled Workforce, 2013)
- OSCR - Ohio Stackable Credentials Report (Community Research Partners, 2008)
- SCCI - Scaling Community College Interventions (Achieving the Dream, 2011)
- SG - Shifting Gears (Joyce Foundation, 2012)
- SSC - Scaling Stackable Credentials (CLASP, 2014)
- WWDS - What Makes Workforce Development Programs Successful? (ChapinHall, 2012)
Hope Street Group is a national organization that works to ensure every American will have access to tools and options leading to economic opportunity and prosperity.

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