ACCELERATING THE U.S. MANUFACTURING RENAISSANCE WITH PEOPLE AND ROBOTS. TOGETHER.

DIGITAL BRIDGE 2018
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Established: Jan 13, 2017 by Carnegie Mellon University (now separate entity)
Location: Pittsburgh, PA
Pursuing Mission on Three Fronts

Technology development

Education & Workforce (EWD) development

Building the right ecosystem
**Perfect Storm for US Manufacturing**

- Baby boomers retiring at 10,000 a day
- American youth STEM education is inadequate for the today’s shop floor
- Addiction and other factors diminish an effective pool of workers

Approximately 71% of the 34 million 17-to-24-year-olds in the U.S. would not qualify for military service because of reasons related to health, physical appearance and educational background, according to the Pentagon

*Industry Week, June 11, 2018*
1:2:7 RATIO OF TECHNOLOGY EMPLOYMENT

- 1: Masters Degree or above
- 2: Bachelors Degree
- 7: Certificate, Credential, or Associate Degree

Other Ways to Win (2006)
Six major challenges ARM can work to address to prepare US workforce for the future of advanced manufacturing:

1. U.S. education insufficient for advanced mfg. careers
2. Negative perceptions of robotics and manufacturing
3. SMEs have limited resources to prepare talent
4. Manufacturing workforce not prepared for continual re-skilling
5. Little coordination between initiatives in advanced mfg.
6. Regional skill gaps in manufacturing skills

ARM can use targeted actions, RRIC collaborations, or project calls to address each category.
# Skills Required for Robotics Manufacturing

## General skills
- **Social skills**
  - E.g., Coordination, persuasion, teamwork, communication, engagement
- **Resource management skills**
  - E.g., personnel management, time management, work ethic, priority development, focus, courage to ask questions

## Technical skills
- **Technical skills**
  - E.g., troubleshooting, quality control analysis, repairing
  - Foundational software development, electronics, metal working, CADD, etc.
  - Many specific skills are proprietary, or can be obtained through OTJ

## Adaptive skills
- **Basic skills facilitate learning**
  - E.g., critical thinking, mathematics
- **LEARN TO LEARN!**
  - Continuous learning
- **Complex problem solving skills**
- **Researching**
  - Web-based data
  - Use of apps
  - Subject Matter Experts
- **Systems skills**
  - E.g., judgment, decision making

Source: ONET Skills Data definitions, BCG analysis

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Basic skills  

Increasing complexity  

Complex skills
CURRENT PROJECTS

1. Teach-Bot Apprentice Education and Training System
   **Principal Investigator:** Massachusetts Institute of Technology (MIT)
   **Project Description:** Lowers the barriers of entry to careers in manufacturing with no coding, technical jargon, or complex reasoning involved in the introductory course. Use of robots to teach industrial robotics to pre-apprentices, American workers, and SMM managers. The robots play the role as an instructor and mentor by showing demos and executing experiments.

2. Revitalizing Apprenticeships for Small and Medium Sized Industries
   **Principal Investigator:** Clemson University
   **Project Description:** Creation of modules to facilitate stackable credentials in robotics and automation that culminate in a Robotic Systems Certificate. In addition to student-focused modules, the project includes a careers pathway focus to educate students, counselors, and parents about careers in robotics-enabled industries.
CURRENT PROJECTS (cont.)

3. SMART – Smart Manufacturing and Advanced Robotics Training
   **Principal Investigator:** The Robotics Academy (Carnegie Mellon University)
   **Project Description:** Creation of stackable credentials to provide students with robotic preparation skills. By integrating input from community colleges, manufacturers, and roboticists, SMART will help high school students gain fundamental training for future careers in robotics. This program will first target students in high school, but in the future will expand to target unemployed, underemployed, and incumbent workers.

4. Robotics Technician Apprenticeship Program
   **Principal Investigator:** Catalyst Connection
   **Project Description:** The Robotics Technician Apprenticeship Program is an expansive project that will enhance existing training resources, provide in-class training, offer lab/experiential, and secure industry-led training for participants at manufacturing job sites.
Apprenticeship Academy Mechatronics Pilot Program with NIMS Recognized Robotics Certification

Principal Investigator: The Commonwealth Center for Advanced Manufacturing (CCAM)

Project Description: Apprenticeship that focuses on Mechatronics as the foundation to create a NIMS-recognized Robotics Certification. Addresses the manufacturing talent gap for transitioning military, under/unemployed, and youth to fill 3.5 million manufacturing jobs needed in the next ten years. This is a learn-as-you-earn career path with a participating industry employer who sponsors the student’s training and pays their salary.

Connecticut Apprenticeship Program in Robotics & Automation

Principal Investigator: University of Connecticut

Project Description: Establishes a network of Connecticut manufacturers focused on robotics and automation with the following outcomes: 1) the launching of the first year of a modular dual-training apprenticeship program; 2) the implementation of a faculty in-residence program for technology development and insertion and; 3) long-term strategic planning to ensure program growth and sustainability.
NEXT EWD Project Call “Work and Learn”

1. MOS Match Making for jobs in robotics and automation
   Example:
   - Connect with 2 and 4-yr colleges near a military base to provide civilian training during 6-mo transition
   - Component of on the job training in a robotics/automated environment
   - Industry receives employees who meet employability (soft-skills) goals and closely matched MOS to industry’s civilian job
   - Provides crosswalk from military to manufacturing

2. Match making for under-employed or employment sector outside of manufacturing
   - Recruitment tool to attract employee from another sector (e.g. retail, service industry, construction)
   - Training for robotics or automated process job provided through member institution
NEXT EWD Project Call “Work and Learn”

3. **Open Topic**
   - Could develop a work and learn model/program or a non-paid internship as part of an academic/training program
   - Does not have to follow parameters outlined in #2 & #3
   - Supports talent attraction
   - Supports the talent pipeline from any level (K-Gray)

4. **Talent Attraction**
   - Programs targeting specific talent populations to increase the size and/or the diversity of the robotics workforce pipeline
   - Ex. programs: pre-apprenticeship programs, robot competition programs, robotics training programs, mentoring/shadowing programs, robotics boot camps
   - Ex. talent populations: women, underserved, veterans, disabled, ex-offenders, underemployed, workers from at-risk industries, residents from at-risk communities, 2-yr college students, high school students