

Breaking Down the Silos – Intra- and Inter-Institutional course development and deployment (an update of the 2013 Bellwether Award Finalist program)

Prepared for: Southern Association of Community, Junior and Technical Colleges (SACJTC)

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Background

The Engineering Technology and Advanced Manufacturing (ETAM) initiative addresses the ongoing challenge to corporate training and academia, namely linking both sides of the college to the current demands of industry via industry certifications and articulated credit ladders on the talent development pathway that provides a route to success for all learners. Further, it creates a scalable model for inter-institutional corporate training course sharing that links shared learning outcomes, joint content development, shared instructional delivery and industry recognized credentials. The project incorporates five core elements: 1) evidence-based design; 2) stacked and latticed credentials; 3) online and technology-enabled learning; 4) transferability and articulation; and 5) alignment with industry talent needs.

Due to the fluidity and the rapidly changing demands of industry, it is imperative that academia position itself as the conduit to provide relevant, current and cutting edge training solutions to meet this demand. This includes both credit and non-credit offerings that provide a pathway to success for all employees. As industry creates a more entrepreneurial mindset, academia must transform their mindset as well. The evidence of this limitation is evident with the existing skills gap shortages. Even though there are numerous reasons for the skills gap shortages, the disconnection between workforce development and continuing education is one that must be addressed. Knowing that the costs of training are increasing and the margins of our industry partners is shrinking, it is more critical than ever to design, develop and deploy relevant content, with on-ramps and off-ramps to educational degrees, that yields value for both the company and the individual employee. Only then can we begin to impact the skills gap shortages that industry is facing today.

Program Design

ETAM was designed to address the manufacturing skills gap using evidence-based models comprised of key strategies tied to best practices in infrastructure enhancement, training access, and delivery. It leveraged earlier grant-funded initiatives and moved forward to focus on:

- 1) creating a unified system of advanced manufacturing training and education in Florida,
- 2) developing engaging and effective curricula to prepare participants with the competencies they need to earn industry credentials, and

- 3) using technology-enabled teaching tools and innovative inter-institutional cost-sharing models to reduce costs while increasing student access to and completion of programs leading to credentials with labor-market value, and
- 4) reducing time to academic credential completion through statewide articulation agreements linking industry-recognized certifications to college credit.

It presents an expansion of the statewide talent development pathways created by Polk State College's Manufacturing Talent Development Institute (ManufacturingTDI - *formerly the Banner Center for Advanced Manufacturing*). These statewide pathways connect high school career academies, registered apprenticeship, corporate training for incumbents, workforce training for displaced workers, certificate programs at technical centers, A.S. degree programs at community and state colleges, with industry certifications and statewide articulated college credit. This vision for workforce education starts with industry and the employer to determine their short-term (training) and long-term (academic pathways) workforce requirements, links those needs to national industry certifications, and creates the statewide, industry-certification-based, training programs with articulation agreements linked to relevant degree programs to allow learners the ability to move into higher education and gain college credit for the skills and knowledge validated by the industry certification. Inter-institutionally ETAM also created a mechanism by which three colleges could jointly offer corporate training via technology-enabled learning and enroll participants at their own institution while sharing instructor costs and quality procedures.

Developing and deploying this model for the ETAM initiative was a joint partnership project of Polk State College, State College of Florida, Tallahassee Community College, and the statewide resource center for advanced manufacturing talent development – ManufacturingTDI. Content developed by the ETAM initiative are training/educational modules that are being used by both the corporate college and the academic degree program with opportunities for articulated credit and industry certification attainment. To facilitate wide deployment and working learner schedules, the training sessions are conducted by e-learning via a synchronous webinar platform. In the academic classroom the modules are integrated by faculty into their traditional classroom or distance learning system based on their local needs.

ETAM's business model created an environment where each college partner could focus on their unique/strategic core competencies to develop shared content and then deliver any, or all, of the courses needed by industry in their service area. Aligned with the statewide strategy for talent development, ETAM focused on broad access to short-term certification with labor-market value leading to employment and pathways to academic credit. ETAM was designed to offer individuals the opportunity to participate in high-quality training by decreasing barriers such as local subject matter expertise, high tuition, long program duration, and course location (through cloud-based delivery).

The ETAM initiative has successfully deployed curricula utilizing open enrollment workforce development training and incumbent worker training funded by both a Federal Congressionally-directed grant and QRT funding from Workforce Florida. All of these trainees, gain relevant skills and knowledge that open the door to employment or advancement within their organizations and provide them the pathway to college credit via industry certification-based articulation into the Engineering Technology degree. Beyond the MSSC CPT competencies, corporate training providers address higher level automation, electromechanical, and maintenance training through customized courses aligned with Rockwell Automation's certificates and competencies defined by the employer, as well as certifications offered through IPC, ASQ, NIMS, IS CET, and ISA. This has resulted in an employer driven system that addresses the workforce skills gap that can be deployed quickly and flexibly.

A unique aspect and a major benefit of the program is the cost savings associated with shared delivery and instructors. The organization that offers the class takes care of the instructor costs and opens up the class to other institutions so they can enroll their students. By taking advantage of this methodology and process, institutions can offer additional classes to their constituencies without having to have the subject matter experts on staff. The webinar platform provides the ultimate in flexibility and the sessions are recorded to accommodate scheduling or employment conflicts.

The stacked and latticed ETAM offerings are:

- **Foundational** - The Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) is the foundational certification that the manufacturing industry accepts as the demonstration of core competencies needed in the following four areas:
 - Safety
 - Maintenance
 - Production and Processes
 - Quality

The CPT provides employers with the confidence that these individuals have the basic knowledge required to handle the rigor of the new Advanced Manufacturing industry. Additionally, completion of the CPT provides multiple pathways, such as: employment, additional training leading to advanced certifications and college credit articulation. The CPT provides fifteen college credits toward an AS Degree in Engineering Technology and is accepted at all institutions in Florida offering that degree program.

- **Quality** – Courses supporting sectors beyond just manufacturing, quality courses were created and offered for:
 - **Certified Quality Improvement Associate (CQIA):** Obtain the basic knowledge of quality tools and their uses in this 45 hour course, which prepares learners for the American Society of Quality's (CQIA) exam and certification.
 - **Bronze Level Lean Certification:** Master the basics of Lean principles and tools, and the skills to drive improvement and results. The 45-hour course prepares learners for the

Knowledge Certificate. Along with an approved portfolio of experience, learners will be eligible for the coveted American Society for Quality (ASQ/Shingo/SME) Bronze Level Lean Certification.

- **Instrumentation/Automation**

- **Mathematics for Instrumentation Technicians:** Content is focused on fundamental problems and solutions that an instrument technician continuously works with from entry to supervisory level experience and can lead to an ISA Certification. The 15 hour course is designed for the technician who may be experiencing challenges with mathematical computations. This course comprises 1/3 of the content leading to the International Society of Automation (ISA CCST) certification.
- **Introduction to Process Instrumentation:** The 36 hour course combines lecture and hands-on lab work to provide an overview and understanding of the role of automation and control processes. Course content includes the application of specific ISA standards used for interpretation of drawings and symbols and an understanding of the application methods and devices used in temperature, pressure and level and flow measurement. This course comprises 1/3 of the content leading to the International Society of Automation (ISA CCST) certification.
- **Fundamentals of Process Control:** The 36 hour lecture based course provides an overview and understanding of the role of industrial measurement and control, compare continuous, batch, and discrete control and their uses, interpret terminology, identify concepts of controller tuning and control system architectures and single loop controllers such as distributed control systems (DCS) and programmable logic controllers (PLCs). This course comprises 1/3 of the content leading to the International Society of Automation (ISA CCST) certification.
- **Safety Instrumented Systems – Design, Analysis and Justification:** Content focuses on the engineering requirements for the specification, design, analysis and justification of safety instrumented systems. In the 32 hour course, participants will learn how to determine safety integrity levels and evaluate whether proposed or existing systems meet the performance requirements and aligns with competencies found in the ISA-84 Fundamentals Specialist Certification.

- **Mechanical/Electrical**

- **Surface Mount Technology (SMT):** this 45 hour course will prepare the student in the technology of circuit board manufacture. Learn about the world of microelectronics and soldering. This course leads to the J-Standard certification with the Association Connecting Electronics Industries (IPC) regarding soldering and surface mount technology.
- **Electrical Technology:** an introductory course of 52 hours that covers AC and DC principles. Passive and active components are introduced as well as manufacturing

related topics encountered in industry. This course leads to a certification with the International Society of Certified Electronics Technicians (ISCET) at the Associate level.

- **CNC Machine Operator:** this two part course (60 hours each) leads to a certification from the National Institute of Metalworking Skills (NIMS). Students will learn all about safe and precise operation and programming fundamentals of Computer Numeric Control (CNC) machine tools which are in high demand in the advanced manufacturing sector.
- **Robotics**
 - **Robotics Applications:** Master the basics of working with robotic equipment, including electrical and pneumatic analysis, fine tuning, and basic PLC programming. The 45-hour hybrid course includes on-line instruction with hands-on training with the SMC MAS-200 robotic work cell at each partner college.

Delivery & Portability:

Through ETAM, students were able to take advantage of multiple training delivery formats (i.e., synchronous online, hybrid, face-to-face, and asynchronous online) accessible at multiple delivery points, allowing students to learn from a worksite, home, and onsite in a classroom

The ETAM partner colleges have implemented a de-facto cost-sharing model for specific synchronous online non-credit courses. Using a shared common curriculum, each college hosts the online synchronous or hybrid course on a rotating basis. The college responsible to deliver the course, based on the rotation schedule, is also responsible for the costs associated with its delivery (e.g., faculty, technical support). Students from any consortium college may enroll in the course through their college's LMS system and pay the course fees to their college; regardless of which college is hosting the course. Students are provided a link to the hosting college's LMS platform for non-credit course access. This model increases student access by allowing access to courses offered at multiple colleges, while reducing the cost of course delivery to individual colleges because they won't host the course as often, resulting in cost savings that can be passed on to the students.

Non-credit courses have also been delivered in a hybrid format where an instructor at one college facilitates classes that are simultaneously broadcast to students physically located at other colleges, in classrooms/labs manned with lab assistants to provide one-to-one or small group support. To bring this delivery model to scale, a modified version of the above cost-sharing model may work.

Where the course content or student population required, face-to-face courses were deployed by the partner college. In this model delivery costs were not reduced, but development of course content and student support mechanisms were.

Local Customization with Shared Resources

Given that each partner of the ETAM consortium had ongoing relationships with their respective manufacturing constituencies, they chose to convene focus groups to develop a clear understanding of the competencies required by incumbent workers and new hire prospects. The results of the meetings helped each partner determine the available content resources, content voids, delivery preferences, [synchronous or a- synchronous] web-based and/or hybrid. The outcomes of the discussions further enabled the consortium to meet specific needs of both the employer driven training initiatives and the employee desire to obtain current occupational competencies, credentialing and technically relevant certifications offered and validated by 3rd party organizations and articulation to college credits (with degree outcomes if desired). By sharing the focus group outcomes, the partners were able to address content requirements in process instrumentation, robotics, quality, machining and assembly technologies. This enabled the consortium partners to develop and deploy course content for specific certification and/or degree outcomes.

Armed with the industry content requirements and settling on the appropriate resources to deliver the content and validate credentials, the ETAM consortium partners again consulted with their respective focus groups to define the marketplace. This core of manufacturing customers would serve as the Beta test group for the ten separate course curricula being developed. The courses represented relevant content needed by the manufacturers, critical skills to meet workplace requirements, credentialing that met the employee need to validate competence and 3rd party recognition of skill competencies attained.

Marketing templates with customizable fields were developed, usually by the partner with the beta test curricula (ten in all), and shared with the consortium partners to be adapted for their specific offering; i.e., date, time, place, cost, etc. When a course could be offered via distance learning delivery (webinar broadcast), the partners would rotate the allocation of cost. In this way, each had a stake in the offering, a vested interest in supporting participant registration, administration and record keeping. Not all 10 courses were offered in each partner region. The manufacturing demographic may not have required that curricula content, so the marketing template was the easiest way to share resources for use where appropriate. This proved to be a most cost effective tool.

Following the close of the Banner Center for Manufacturing Excellence by Workforce Florida, Inc. (upon expiration of grant funding) Polk State College, the ETAM host school, established the Manufacturing Talent Development Institute, Manufacturing TDI, and offered its outreach services to the ETAM consortium members to first, market the ten separate course offerings within the consortium partner regions and elsewhere around the state; and second, to represent to the FLDOE that all ten courses were appropriate for inclusion in the post-secondary course frameworks and available as AS Engineering Technology degree electives.

This outreach effort includes but is not limited to:

- Facilitation of geographic specific focus groups to identify local industry needs
- Access to the Manufacturing TDI's Advisory Council to ensure program delivery is consistent with industry requirements
- Curriculum development and updates of existing curriculum that meet the demands of today's advanced manufacturing industry
- Participation in collaborative grant opportunities to expand efforts to ensure industry has the required incumbent training opportunities, as well as identifying new trends and proactively seeking solutions.
- Partner with regional workforce boards to encourage displaced and unemployed workers toward the field of advanced manufacturing by developing a pipeline of certified new hires that provides confidence to employers that they bring with them the foundational knowledge of specific areas of manufacturing such as: Safety, Quality, Maintenance, Production and Processes.

Sustainability / Replicability

Due to the fluidity and the rapidly changing demands of industry, it is imperative that academia position itself as the conduit to provide relevant, current and cutting edge training solutions to meet this demand. This includes both credit and non-credit offerings that provide a pathway to success for all employees. As industry creates a more entrepreneurial mindset, academia must transform their mindset as well. The evidence of this limitation is evident with the existing skills gap shortages. Even though there are numerous reasons for the skills gap shortages, the disconnection between workforce development and continuing education is one that must be addressed. Knowing that the costs of training are increasing and the margins of our industry partners is shrinking, it is more critical than ever to design, develop and deploy relevant content, with on-ramps and off-ramps to educational degrees, that yields value for both the company and the individual employee. Only then can we begin to impact the skills gap shortages that industry is facing today. The shared model of course deployment can be replicated by any willing colleges. The shared content within the college builds stronger program alignment for our industry stakeholders. The courses developed by ETAM are available for any institution that desires to deploy them. It will require contracting with subject matter experts on the non-credit side for instructional purposes for the ten classes and certified instructors for the CPT. The academic environment can use all or part of the curriculum to enhance any current offering.

The programs are deployed within each institution's corporate college and academic program regular course offerings. The model of shared corporate training course development is being replicated through Manufacturing TDI's CAAM (college alliance for advanced manufacturing) and the "Florida TRADE" consortium. In the Florida TRADE grant, the three college model is being scaled to a twelve college consortium that is providing training and education pathways for three separate constituencies:

- Unemployed individuals

- Veterans
- Incumbent Workers

The basic pathway looks like this:

1. Attain the Ready to Work Certification (the NCRC in other states)
2. Attain the MSSC CPT Certification
3. Attain an advanced level certification
4. Internships
5. Employment

There are multiple on-ramps to the pathway based on where a participant falls within these groupings.

Conclusion

The establishment of a talent development pathway infrastructure that allows for content delivery flexibility, credential transferability and portability and inter-institutional cost sharing is an innovation that has great scaling potential. The scaling of the ETAM innovations provides Florida TRADE, and future adopters, a blueprint for national career pathways, collaborations, and partnerships that can be utilized by other industry sectors and academic institutions.

With ETAM the three partner colleges demonstrated:

- Effective employer partnerships that guided the creation of a unified education/training system for advanced manufacturing talent development.
- Why the development of courses to be deployed for both credit and non-credit is valuable to today's workforce and how regional and statewide institutional partnerships can both facilitate content creation and program deployment.
- The linkages and the development of the courses to national, portable, stacked and latticed industry certifications and demonstrate industry certification-based articulation.
- The creation of employment and academic pathways simultaneously.
- A model where college partners each focus development on their unique/strategic core competencies and deliver one or more component(s) of the model through technology-based learning.
- Partnerships with local workforce boards to provide training grants to assist industry offset their non-credit training costs.
- The value of enhancing the skill sets of incumbent workers via certifications and how articulated college credit provides additional employee growth opportunities.
- The potential of common content adoption and joint delivery to impact portable credentialing with labor market value.

- How partnership connections between industry and academia are forged so a continual talent pipeline can be developed and community economic development efforts are strengthened as incumbent and displaced workers increase their skill sets to advance their careers and utilize articulation pathways to academic degree completion.

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