

Logistics Engineering Technology: Collaborative Development of an Interdisciplinary Degree

A WHITE PAPER BY: TARA SHEFFER, SHANE KIRBY, AND LYNA KELLEY

Contributors: Wesley Blyth, Jeremy Banta, Josie Newman

COLUMBUS STATE

COMMUNITY COLLEGE

1.0 Background

In 2014, Columbus State Community College was awarded funding from the National Science Foundation Advanced Technology Education program for the project entitled, Building an Academic Pathway for Industrial Engineering Operations Technicians (1400452). The resulting Logistics Engineering Technology program addresses industry's need for educating qualified technicians by creating an interdisciplinary pathway that supports the increasingly complex technology needs of the supply chain sector.

Columbus State has collaborated with universities, K12, and regional employers to focus to address this skills gap by educating next-generation logistics engineering technicians. The project developed a new multi-disciplinary 2+2+2 career pathway in Logistics Engineering Technology. The core elements of the pathway include, a pre-college initiative targeting prospective high school students, educators, and counselors; the development of a new interdisciplinary Associate of Applied Science degree and certificate; and the establishment of model articulation agreements with four-year colleges and universities.

The curriculum developed by the project is based upon the results of an industry-led job skills analysis and integrates three key components of industry knowledge:

- **Technology Applications:** programming, data mining and simulation modeling
- **Engineering Systems:** automation systems, controls logic, electro-mechanical and industrial engineering
- **Supply Chain Operations:** warehousing, transportation, and inventory management

The Logistics Engineering Technology AAS degree has been designed with both traditional and adult learners in mind. Instruction has been developed for blended delivery combining hands-on experiences in a laboratory environment and distance-based learning. Students hone their critical thinking skills through case studies, simulations and the application of industrial engineering principles. Hands-on learning takes place in a laboratory settings that feature technologies including motors, programmable logic controllers, and network systems. Coursework in networking, programming, and database fundamentals teach advanced computer and data analysis skills. An internship is embedded into the program to increase students' problem solving skills and employment opportunities.

2.0 Growing Workforce Need

Columbus is the nation's fifteenth-largest city, home to the Ohio state capitol, 1,800 manufacturing companies, and 4,000 logistics companies with more than 76,000 employees (Columbus 2020, 2016). In the past decade, the fastest growing sectors have included logistics/transportation and utilities with a +26% growth (Columbus 2020, 2016). Continued investment

in the region's logistics sector as well as the complementary growth in retailing, pharmaceutical and advanced manufacturing sectors indicate a continued demand for college graduates with a strong technical engineering education.

According to the National Center for Supply Chain Technology Education (2013), logistics engineering technicians oversee a variety of software and equipment related to mechanical, applied electronics, manufacturing, automated systems and information technology. The Manufacturing and Logistics Report Card (Ball State University, 2013) reports that Ohio is one of only two states with an "A" grade in the importance of its manufacturing and logistics sector. However, the same report shows that Ohio merits only a "C" in development of human capital. It is this significant gap in the supply of trained Logistics Engineering Technicians that this grant will seek to ameliorate.

In 2016, Columbus was awarded the US Department of Transportation's \$40 million SmartCity Grant. The resulting initiative, SmartColumbus, has since raised more than \$400 million through private-public partnerships with the shared vision of changing the way Columbus does business and competing globally through smart logistics. This initiative requires logistics engineering technicians who are properly educated to work with the new technologies, including street-side mobility kiosks, a new bus-rapid transit system, and smart lighting to increase safety for pedestrians and improve access to healthcare for traditionally underserved areas and neighborhoods.

3.0 Interdisciplinary Approach

The LET degree incorporates a multi-disciplinary academic foundation, which combines information technology, industrial engineering, and supply chain principles. This approach prepares program graduates for meaningful positions in a variety of industries and with several employment-ready exit points.

To prepare program graduates for this versatility, the project team was composed of three faculty members from each of the key disciplines. The interdisciplinary nature of the project team fostered rich discussions and led to a deeper understanding of the results of job skills analysis. Through this analysis process the project team leveraged preexisting courses at the college and identified the need to create two new engineering courses: one focusing on electric motors, controls, and programmable logic controllers and the other focusing industrial and systems engineering.

Key Project Personnel	
J.J. Schultz	Principal Investigator Lead Instructor, Supply Chain Management
Wesley Blyth	Principal Investigator Professor, Supply Chain Management
Jeremy Banta	Co-Principal Investigator Lead Instructor, Supply Chain Management
Jeffery Woodson	Co-Principal Investigator Professor, Engineering Technologies
Peter Carswell	Co-Principal Investigator Assistant Professor, Computer Science

The development and creation of the new coursework was led by engineering faculty with support from supply chain faculty. This partnership allowed for the inclusion of case-studies and site tours from both supply chain and manufacturing perspectives.

CORE COURSEWORK

Supply Chain Operations

- Supply Chain Management Principles
- IT in Logistics
- Warehouse Management
- Inventory Management

Engineering Technology

- Engineering Graphics
- Industrial & Systems Engineering
- Motors, Controls, & PLCs
- Data Acquisition Systems

Information Technology

- Programming Logic
- Industrial Networking
- Database Fundamentals

4.0 Impacts

The logistics sector offers career pathways to family-supporting occupations that employ over 9% of the regions workforce in central Ohio. Labor data projects that this industry in the central Ohio region is experiencing growth that is expected to increase at 12.1% over the next ten years. This project enhances the designed associate-degree level career pathway in this critical sector, one for which national research data and local employer input evidence significant need.

The high school outreach program enables this curriculum to be available at institutions that have historically been unable to afford the faculty and equipment expenses associated with such a program. Additionally, the infusion of engineering and IT in supply chain education has created an attractive alternative career pathway for high school students in STEM and engineering. The project focuses on advancing outreach to underserved populations including minorities, women, and veterans in the region thereby increasing the talent pool for industry and providing these populations opportunities in a high demand, high growth sector. Considering only targeted occupations for Logistics Engineering Technicians, Central Ohio boasts a steady expected growth of 12.1% between 2015 and 2025 with 2,493 more jobs, compared to a state increase of just 8.5% (EMSI, 2016). The median earnings for these occupations are just under \$37.91 per hour.

In addition to preparing program graduates to enter the workforce, the Logistics Engineering Technology degree also seamlessly prepares graduates to continue their studies through an articulation agreement with Ohio University's Bachelor of Science in Technical Operations management. This online degree completion program features a technical operations management curriculum focused on designing, controlling, and managing the process and transformation methods of an organization, while continuously improving operations.

5.0 Lessons Learned

Columbus State Community College is the first community program of its kind to develop a multidisciplinary two-year degree combining information technology, industrial engineering, and supply chain principles. The development of the AAS Logistics Engineering Technology degree program and career pathway was made possible through the active collaboration of faculty from across the college. Without this active collaboration, no one individual at the college would have been able to understand the rapidly changing needs of industry and the various course offerings from across the college that were needed to meet the growing skills gap for Logistics Engineering Technicians.

The AAS Logistics Engineering Technology degree officially launched in autumn 2017. The collaborative interdisciplinary approach of the Logistics Engineering Technology project team will continue to be leveraged through the Logistics Engineering Technology Work Study Grant (1700520). This project seeks to

enhance the existing career pathway for logistics engineering technicians with real-world experiential learning by leveraging the college's proven work study model (1400354). In the future, Columbus State Community College plans to partner with Sinclair College and Oakton College to replicate the LET curriculum and develop additional coursework focusing on data analytics and networking.

6.0 For More Information

- Columbus State Community College, Grants Office:
<http://www.csc.edu/about/grants/>
- Columbus State Community College, Logistics Engineering Technology Grant:
<http://www.csc.edu/about/grants/let/>
- Columbus State Community College, Logistics Engineering Technology AAS Curriculum:
<https://catalog.csc.edu/programs/Logistics%20Engineering%20Technology>
- Ohio University, Bachelor of Science Technical Operations Management:
<https://www.ohio.edu/admissions/online/technical-operations-management.cfm>

7.0 References Cited

- Ball State University. 2013. Conexus Indiana 2013 Manufacturing and Logistics National Report. Muncie, IN. Ball State University, Center for Business and Economic Research. June 14, 2013.
- EMSI. 2016. Central Ohio Employment Projections. Coeur d'Alene, ID. Economic Modeling Specialists International. EMSI (Electronic Modeling Specialists International) proprietary database. <http://www.economicmodeling.com/>
- Columbus 2020 website. 2016. Economic Sectors in the Columbus Region.
<http://columbusregion.com/economic-sectors/>



This material is based upon work supported by the National Science Foundation under Grant No. 1400452. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

For more information, contact:

Tara Sheffer, M.A.
Supervisor, Grant Projects
Columbus State Community College
tsheffer@csc.edu