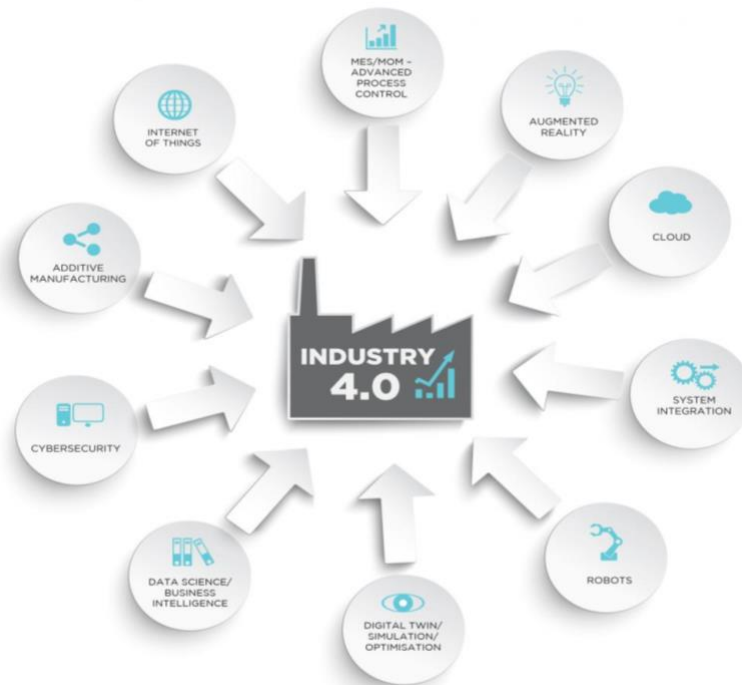


Integrating Industry 4.0 / Smart Automation for Community & Technical Colleges

Executive Toolkit



1

Why Industry 4.0 / Smart Automation and why now?

With the use of computers, automation and cloud technology, factories are becoming increasingly efficient and “smart”. Industry 4.0 is the latest phase for the manufacturing sector which has come about because of the Internet of Things and the accessibility of data. Factories that are known as “Smart Factories” are becoming more prominent, particularly in Europe and the U.S. The terms “Smart Factory,” “Smart Manufacturing,” “Intelligent Factory”, “Factory of the Future” and “Smart Automation” all describe a vision of what more intelligent, flexible and dynamic industrial production will look like in the future. Manufacturing processes will be organized differently, with entire production chains – from suppliers to logistics to the life cycle management of a product – closely connected across corporate boundaries. Individual production steps will be seamlessly connected. These changes to production design will impact almost all aspects of the company such as, factory and production planning, product development and design, logistics, enterprise resource planning (ERP), manufacturing execution systems (MES), control technologies, and parts procurement. In a Smart Factory, machinery and equipment will have the ability to improve processes through self-optimization and autonomous decision-making. This is in stark contrast to running fixed program operations, as is the case today with traditional manufacturing.

¹ <https://www.technord.com/en/expertise/mom-mes-industry-4-0>

Industry 4.0 / Smart Automation and the Future of Work

Until recently, future-of-work discussions revolved around artificial intelligence replacing humans at work. But if that were the case, why are we still seeing a skills gap predicted well into the future? New thinking on this topic now shows that jobs are not necessarily disappearing — but they are being augmented by technology. This thinking is putting a new lens on talent preparation.

Survey data recently published by the World Economic Forum² shows that many job skills will be augmented by technology in the next five years — but to varying degrees. Skills like reasoning and decision-making; coordinating, developing, managing and advising; and communicating and interacting will be augmented by technology — but to a much lower degree than job skills like information and data processing.

What Community & Technical Colleges Need to Do

For community colleges to successfully begin integrating **Industry 4.0 / Smart Automation** into their programs, community college executives will strategically need to address:

1. **Instructor training** – College leadership is often lacking a clear understanding of what requirements are needed for the faculty to move their college’s existing and new programs forward. Colleges may want to partner with industry to “loan” qualified employees to the college to teach courses.
2. **Equipment procurement** – The latest equipment remains expensive, even with discounts offered distributors and industry partners. The ability to identify and secure funding to support the purchase of equipment to train a class of students remains a challenge. In addition to looking for grant opportunities, colleges should look into ways to share equipment amongst local colleges or industry partners.
3. **Interdisciplinary cooperation** – Many colleges have programs that have overlapping components on both the credit and non-credit sides. Industry 4.0 requires overlap amongst multiple specialties, such as IT and manufacturing, which are often housed in different departments at a college. Cross-functional teams must be created to drive these programs.
4. **Curriculum development** – As Industry 4.0 continues to evolve at a rapid pace, the length of time required for colleges to get approval before implementing new curriculum proves challenging to keep up with the pace needed by industry. Some colleges have begun implementing changes in non-credit programs first as the timeline can be implemented more quickly in the interim.

² http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

5. **Where to begin?** – Similar to what we heard from industry partners, community colleges are not sure where to begin to implement Industry 4.0. Many of the cohort colleges began with evaluating their mechatronics program, or adding a capstone course to an existing program.

What Industry Needs to Do

Industry needs to work even more closely with education to address many issues brought forth with **Industry 4.0 / Smart Automation** by:

1. Focusing on regional engagement to better support the business, education, and government fields address the lacking common and clear understanding of what Industry 4.0 means to their respective industries.
2. Working to identify a common nomenclature as terms such as “smart factories”, “smart manufacturing”, and “smart automation” are synonymous with Industry 4.0, but the adoption of those terms creates varied understanding. Term choice typically varies by organizational culture - like it has with the term “mechatronics” for well over two decades. This will need to be addressed.
3. Observations through this work has shown that some industry partners show a lack of awareness of what Industry 4.0 means for their company’s future. The skills gap in advanced manufacturing remains a big issue for manufacturing employers, and these employers are not sure how to regularly engage with their local community colleges to address these issues.
4. Identifying where to begin incorporating Industry 4.0 into their manufacturing facilities remains a challenge. Companies should consider what their biggest threats to production efficiency are and security, narrow in on one area, and begin there. It would be very challenging and costly to change every piece of equipment, job description, and process at the same time. Start small with one area of the company.
5. Investing in workforce training with community and regional partners. Community colleges can address the skills gap needs with the support of industry. They can partner financially, by providing subject matter expertise, equipment, hosting apprentices, and serving in advisory capacities.



Next Steps Education and Industry Need to Take

Next steps for colleges wanting to begin incorporating Industry 4.0 into their curriculum:

1. Reach out to local employers and discuss what Industry 4.0 or smart automation means for their changing workforce needs.
2. Take an audit of what Industry 4.0 components are already being taught across the college and where they are housed at the college.
3. From there, determine which existing curricula can be leveraged or updated across departments and form interdisciplinary teams.
4. Continue to monitor new and emerging certifications from Industry partners such as the **Smart Automation Certification Alliance (SACA)** and/or **Festo Didactic / NC3** certifications that can be cross-walked and integrated into courses, programs, certificates, and degrees.

NOTE: Detailed credential, competency areas, and certification levels of each are found on pages 5-6 of this **Industry 4.0 / Smart Automation Toolkit**.

Industry 4.0 / Smart Automation Certification Checklist – 2019 SACA Framework

The **Smart Automation Certification Alliance (SACA)** - Smart Automation certifications use a modular structure to enable them to fit a wide range of individual needs, industries, and educational environments. SACA offers certifications in three categories: Associate, Specialist, & Professional. Each certification is stackable allowing individuals to start with one certification and add other certifications to customize their documented skills. Certifications are occupationally focused, so they prepare individuals for specific occupations in the world of Industry 4.0.

Basic Operations Associate Level 1	Advanced Operations Associate Level 2	Robot Systems Associate Level 3	IIoT, Networking, Data Associate Level 4
Mechatronics Fundamentals	Drives	Robotics	Barcode
Electricity	Motor Control	Automation	RFID
Fluid Power	Pick & Place Feeding	Inventory Storage	Smart Devices
Relay Control / Ladder Logic	Gauging		Smart Sensors
Power Distribution	Sorting		Smart Output Devices
Mechanical Drives	Torqueing		Internet Protocol
	Electronic Sensors		Foundation Fieldbus
	I/O Link		Computer Networks
	PLC's		Networked Devices
	Safety PLC's		Network Servers
	HMI's		Distributed Servers
	I/O Interfacing		Routers
	Electronic & VF Drives		Switches
	Motor / Motion Control		Gateway Devices
	Power & Control Electronics		Managed Switches
			Unmanaged Switches
			Ethernet
			Profibus
			Wireless
			Linking
			Data Analysis
			Diagnostics
			Analytic Creation
			Algorithms
			Artificial Intelligence (AI)
			Machine Learning
			Predictive Analytics
			Prescriptive Analytics

Source: <https://www.saca.org/smart-automation-certifications/>



Industry 4.0 / Smart Automation Credentials Checklist – 2019 Festo Didactic / NC3 Framework

The **Festo Industry Certification Program (FICP)**, is a new comprehensive industry skills certification, is based on industry and education partnerships to ensure students have the right set of skills to be industry ready. **FICP** evolved from our global industrial automation division and technical education experience over the past six decades.

Fundamentals Level 1	Advanced Mechatronics Level 2	Industry 4.0 Level 3
Electricity Fundamentals	Product ID Fundamentals	Advanced Product ID
Fluid Power Fundamentals	Applied Fluid Power	Human Machine Interface (HMI)
Mechanical Systems	Applied PLC	Advanced PLC
PLC Fundamentals	Applied Mechanical Systems	Smart Maintenance
Robotics Fundamentals	Applied Robotics	Advanced Robotics
Industry 4.0 Fundamentals	Applied Industry 4.0	Cyber-Security

Source: <https://www.festo-didactic.com/us-en/training-and-consulting/festo-industry-4.0-certification-program/?fbid=dXMuZW4uNTc5LjE3LjEwLjgxmZUuMA>

About this document:

This document was compiled as part of the “Creating Connections in Manufacturing Communities with Community Colleges” initiative. This initiative was led by the American Association of Community Colleges (AACCC) and the National Coalition of Advanced Technology Centers (NCATC), sponsored by Arconic Foundation.