Rockwell, Cisco and University of Wisconsin – Milwaukee: Transforming Manufacturing

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Digital transformation is fueling the fourth industrial revolution. Learn how the University of Wisconsin – Milwaukee partnered with Cisco and Rockwell to launch The Connected Systems Institute – a center of excellence in next-generation manufacturing

Executive Summary	
Customer Name: University of Wisconsin– Milwaukee **Industry:** Education **Location:** Milwaukee, Wisconsin **Number of Employees:** 6189	
Challenges	• Prepare the manufacturing workforce for the future • Accelerate industry and academic innovation • Facilitate digital transformation in manufacturing
Solutions	• Cisco wired and wireless networking • Cisco DNA Center • Cisco Identity Services Engine • Cisco Secure Cloud Analytics (Steathwatch Cloud) • Cisco IoT solutions
Results	• Develops manufacturing domain specialists • Addresses the shortage of trained workers • Offers center of excellence in next-generation manufacturing

Business challenge

Digital transformation is fueling what is often called the fourth industrial revolution. To compete effectively, manufacturers must switch from static to dynamic operations by harnessing the power of artificial intelligence, robotics, cloud computing, supply chain technology, and the Industrial Internet of Things (IIoT).

To do so, manufacturers need workers capable of using these technologies—but there is a critical shortage of these skillsets. According to a May 2021 CNN article, industry posted more than half a million job openings.[1] And a study published by Deloitte and The Manufacturing Institute anticipates that as many as 2.1 million manufacturing jobs will remain unfilled through 2030.[2] This report raises a red flag: the worker shortage will negatively impact production and revenue and could cost the U.S. economy up to $1 trillion by 2030. Looking at this shortage in the Milwaukee metro area over the next 10 years, there is a 63 percent projected growth in need for employees with cybersecurity skills and a 34 percent projected growth in need for data analytics and visualization skills[3].

In addition, the technologies themselves—often sourced from multiple vendors—must be integrated. Doing so requires providing an entire ecosystem of providers— compute, networking, sensor, robotics, security, ERP, and artificial intelligence—with venues where it can conduct proofs of concepts that meet the requirements of specific use cases.

Academia needs tools and resources to assist in formulating and testing hypothesizes that will further research into expanding manufacturing capabilities and competitiveness. This research benefits from a facility where testing can be conducted as a precursor to applying for government grants. Finally, academic institutions must teach students modern technologies if they expect to graduate a manufacturing workforce that can immediately make a difference through digital transformation.

"The UWM Connected Systems Institute wouldn't be running today without Cisco. We're just deeply grateful for the contribution that Cisco made, because when you look at the way that the entire project was spec'd out, Cisco components were integral to the design of the project."

-Jennifer Abele, Senior Executive Director of Strategic Partnerships University of Wisconsin-Milwaukee

R&D focus

Research at CSI focuses on a broad range of advanced technologies, including:

- Digital twins: Digital representations of advanced manufacturing systems that enable real-time simulation and analysis of sensor data from production processes.

- Data and sensor networks: The study of data and sensor networks used for cloud-based analytics.

- Data analytics: Platforms that ingest data from sensors and IIoT networks to measure key performance indicators (KPIs).

- Machine learning integration: Creation of machine learning algorithms to improve KPIs in industrial systems.

- OT cybersecurity: Research aimed at developing techniques that identify and address security weaknesses and vulnerabilities in production systems.

- ERP integration: Design of a tri-directional link among the manufacturing lab environment, SAP, and Microsoft Azure data layers—enabling the use of analytics to automate laboratory tests.

Industry partnerships

Industry partnerships are integral to the work at CSI. With the support of its partners, the institute is helping academicians and students become more knowledgeable multidisciplinary collaborators. The institute launched in November 2017 with an initial investment from Rockwell Automation and it has been able to leverage global insights and expertise from Cisco's Country Digital Acceleration Program, which has more than 1000 projects in 40 countries aimed at powering secure and sustainable digitization through cross-vertical solutions. Partnerships and co-innovative environments such as these, in turn, help CSI develop new business processes based on current and emerging technologies. Strategic insights will help Industry partners make their own production environments and processes more effective.

With 75 billion devices expected to be connected to the Internet by 2025, the work at CSI has the potential to transform how products are designed, produced, and sold. The connected systems models that CSI is developing can help manufacturers extract more business insights from the huge volume of data flowing in from IIoT devices and networks. Ultimately, the institute will help its industry partners determine the mix of connected IIoT systems that will yield the best return on investment.

CSI facilities

CSI occupies 11,000 square feet on the UWM campus, with its network isolated from the broader campus systems. CSI research facilities include four on-campus manufacturing labs used for research, testing, and education. These facilities give industry partners a place for experimental analysis and validation, and also provide an environment for students and researchers to experiment with new concepts and solutions. CSI facilities are designed to test IIoT solutions across manufacturing-specific domains.

The labs are built with industrial assets and standards in mind, providing a learning environment where results closely approximate industrial environment. Available resources include:

- **Manufacturing test bed 1**: Features a fully functional production environment where students gain hands-on experience in producing and fulfilling orders. The test bed provides exposure to Industry 4.0 technologies, including robotics and artificial intelligence. The test bed features plant and automation control tools from Rockwell Automation and switching controls from Cisco.

- **Digital twin lab**: Features a digital replica of the manufacturing test bed. Using software simulation for mechatronics and robotics programming, students can simulate processes before executing them in the manufacturing test bed. The lab uses software from Ansys and digital manufacturing solutions from PTC.

- **OT cybersecurity lab**: Focuses on the unique security needs of connected systems in manufacturing production environments.

Business results

In addition to industry partners, CSI brings together UWM's schools of business, information sciences, and engineering to drive adoption of advanced manufacturing methods and technologies. Essentially, CSI is changing how academia works with industry to advance thought leadership and drive desired business outcomes. The intention is that all work done at CSI should be sustainable and repeatable at its core.

UWM is home to internationally recognized faculty who have extensive expertise in IIoT-related disciplines, giving CSI a rich reservoir of talent experienced in using digital tools to accelerate innovation. This capability enables the institute to drive economic growth by supporting the development of innovative production solutions and by filling the pipeline with digital manufacturing specialists.

CSI is a center of excellence for a global practitioner community that is transforming manufacturing processes. The institute brings together the best of industry and academia to deliver education and research opportunities focused on the unique needs of advanced manufacturing and on facilitating the evolution of the IIoT.

Investing in a more connected production environment requires a significant culture change that affects how employees think about their work and how they are rewarded. CSI provides a community forum for learning more about these changes.

Going forward

Built to help drive resilience and competitiveness into supply chains and manufacturing in the United States, the Connected Systems Institute at UWM is truly interdisciplinary, reflecting a convergence of business, IT, and engineering. In fact, the CSI reflects this convergence through an open-concept floor plan that allows participants working in all disciplines–from cybersecurity to robotics–to easily interact with each other.

Clearly, this is not how legacy manufacturing facilities are built. Instead, the founders of the CSI believe that the workforce of the future must have an interdisciplinary mindset to implement digital transformation in a manufacturing setting. And the CSI is designed to deliver just that. Students graduate from the program knowing they need to hit the ground running and knowing what they need to do to meet the needs of their employers quickly.

Learn More

Learn more about how the Cisco and Rockwell partnership may benefit your manufacturing operations at Cisco.com and at Rockwell.com.