



Metalworking

From Blue Collar to New Collar: Training Manufacturing Technologists

Kip Hanson | May 14, 2024

The terms traditionally used to describe different parts of the workforce are pretty basic. Hourly employees such as machinists, fabricators, electricians, plumbers, and other tradespeople have long been lumped together as blue-collar workers, based on the denim shirts that once dominated their wardrobes.

White-collar workers, typically college graduates, got their name the same way. It refers to the white dress shirt, sometimes accompanied by a suit and tie, often worn to offices where they earn a salary commensurate with their degree, job title and experience. There's no overtime, but there's no punching a clock either.

Corporate offshoring in the early 1990s, with help from an education system that prioritized preparation for college, led many to believe that the latter career path was rapidly becoming the only viable choice.

Over the next two decades, vocational education opportunities fell away, the U.S. manufacturing sector shrunk, and companies everywhere are now scrambling to fill the void.

New Collar Job Skills

As a result, yesteryear's job descriptions are changing. Especially in the skilled trades, automation is on the rise. The Industrial Internet of Things is collecting massive amounts of data and enabling faster, better-informed decisions, with the rise of artificial intelligence expected to enhance the technologically driven shift even further.

Computational modeling software and 3D printing are already cranking out parts that were unimaginable a few decades ago. And the machine tools?

They're far faster, much more accurate and significantly more capable than those existing when the term "blue-collar workers" was coined.

These technological developments together are referred to as Industry 4.0, and whether you welcome its arrival or consider it mostly hype, one thing is certain—how we make things is undergoing a massive shift, practically all of it for the better.

Along with that, the skillsets required are evolving, blurring previous boundaries. The “new collar” workers who have mastered the necessary capabilities may not have advanced degrees, but they’re working with state-of-the-art equipment in fields such as CNC operation, automation and robotics.

John Liu and William Bonvillian, lecturers at the Massachusetts Institute of Technology and experts in manufacturing, have a description that fits perfectly.

“We call this new type of worker the ‘technologist,’” they write in a paper titled, not coincidentally, *The Technologist*. “As advanced technological manufacturing progresses, technologists will be essential in the adoption of next-generation factory systems. We believe that training programs for technologists can empower both incumbent and aspiring workers to be knowledgeable, productive, and adaptable contributors to a more robust U.S. manufacturing economy.”

Foundations of Tomorrow’s Workforce

The paper, which Liu and Bonvillian co-wrote, was published in “Issues in Science and Technology,” a quarterly journal from the National Academy of Sciences and Arizona State University.

“Historically, we train people for a specific machine or process,” Bonvillian says. “We train them to be welders, CNC machinists, press brake operators, and so forth. That becomes their career path. But the idea of a technologist is to create an alternative career path—to develop a broad set of foundational skills that will allow them to master these advanced technologies and processes that the industry is currently moving toward.”

Without that, companies won’t have a workforce that can champion the new tools and processes needed for success.

A robot might arrive at the loading door, but nothing will happen unless someone at the company is willing and able to unpack it, plug it in, program it and fit it into the existing production system.

“If we’re to succeed as a country, we have to compete on efficiency and productivity.”

William Bonvillian

Lecturer, Massachusetts Institute of Technology

“It’s especially important to get small and mid-sized firms in a position where they can increase their use of automation and other technologies,” he adds.

Liu agrees.

“Overall, the United States’ manufacturing productivity numbers don’t look very good,” he says. “They have been stagnant for close to two decades, and when you analyze those numbers, you find that the real problems exist not so much at the original equipment manufacturer and tier supplier level but with these smaller companies. And since almost half of the country’s manufacturing output is from firms under 500 employees, it pulls down the whole system.”

Investing in Upskilling

The question then becomes: What to do about it? Companies typically buy new manufacturing technologies and then wrestle with their workforce needs.

Coordinating those decisions is challenging, since educators and large manufacturers alike are still trying to revitalize the pipeline of potential workers.

“We are working with scores of companies—the majority of them small-to-medium enterprises that are struggling with this very problem,” Bonvillian explains. “Many of them are forward-thinking, however. They want to integrate more advanced technologies but realize they might not have the necessary talent and are willing to invest in upskilling their people. This is a big part of the idea behind the technologist—to identify talented folks on the factory floors able to move up a few notches and take advantage of this new career pathway.”

Liu and Bonvillian are helping those companies to identify specific needs as well as the skills and technologies required to succeed. “We’ve interviewed over 40 at this point—around one and a half years of industry mapping—in order to determine what the industry is asking for,” Liu adds.

Competing in Productivity

He admits it will take time to build the educational programs needed for a technologist workforce. Liu created an *MITx Principles of Manufacturing Micromasters degree program* several years ago.

And more recently, he and others at MIT, with funding from the Department of Defense Innovation Capability and Modernization office and its Industrial Base Analysis and Sustainment program, have been working with community colleges in New England to develop blended learning programs intended to produce trained technologists.

“We’ll soon begin disseminating the program and its curriculum to these schools while helping them find funding,” Liu says. “After that, we hope to get this to a national level.”

Although achieving that goal remains a few years away, it’s an important step toward maintaining a healthy national industrial base.

“Going forward, manufacturers in this country are not going to compete on wages,” Bonvillian says. “Nor will we compete by cutting costs. If we’re to succeed as a country, we have to compete on efficiency and productivity. We have to improve the numbers I mentioned earlier, and that means we need to reach out to the small and mid-sized firms and get them up to speed on automation, the Industrial Internet of Things, 3D printing, and all the other advanced technologies needed to succeed in today’s manufacturing environment. It’s something we simply must do, and we can.”

What technological skills do you look for in new hires? Tell us in the comments below.