

May the Fourth Be With You

The fourth Industrial Revolution is here, and it's changing the way we manufacture goods.

The fourth Industrial Revolution is well underway. As an example, one U.S. manufacturer now has 10,000 robots, loaded with smart sensors and devices, gathering data in real time and sending it through the plant's computer network to a data collector and to the cloud every 15 minutes. Algorithms go to work, and the robots are now to the point at which they can predict their own future failure and order their own replacement parts before the failure occurs.

In this new world of manufacturing interconnectivity and data analysis, manufacturers must build their knowledge and vocabulary of Industry 4.0 terms. Here are 12 to build your parlance:

Industry 4.0: This is the term used to describe the fourth Industrial Revolution, characterized by the collision of operational technology and information technology, as physical equipment becomes interconnected and intelligent.

Smart sensors and smart devices: Driving advancements in Industry 4.0, the sensors and devices utilized on manufacturing equipment now include embedded intelligence, enabling them to be programmed to make decisions without the need for a separate computer or programmable controller. They then scrub data and send only the most pertinent information to plant computer networks. The result is that manufacturing decisions are now made on . . .

The edge: Smart sensors and devices that make their own decisions exist on "the edge" of the plant computer network, saving bandwidth and expediting manufacturing decisions.

Digital twins: These computer models gather information from smart sensors and devices, and simulate a manufacturing process in a fashion identical to the process itself. Digital twins can be used to test changes to a finishing process, and predict future performance and downtime, helping to avoid line-down situations.

Informactionable Data: It's a copyrighted term I own, but I knew when I heard the chancellor of a major polytechnic university use my phrase that I was onto something. IBM released a statistic not long ago that 90 percent of the data that exists today was created in the last two years. With the loads of data being collected by our manufacturing equipment, the problem of the future will not be a lack of data but way too much of it. The key is being able to discern what data helps drive business performance and what doesn't.

Artificial intelligence: Google's artificial intelligence arm, DeepMind, created an AI program known as AlphaZero. AlphaZero trained on the game of chess for a mere nine hours and defeated the winner of the 2016 Top Chess Engine Championship (yes, there is such an animal, and some people clearly have too much spare time) in 25

of the 28 games in which the game didn't end in a draw. We are moving to a time when our finishing processes will gather their own data and optimize themselves.

Predictive analytics: This means using data to predict future events (and avoid the bad ones before they ever take place). See the previous 10,000-robot example.

Augmented reality: Strap on a pair of goggles and maximize productivity. An article at engineering.com touts examples. Complete a complex assembly with the instructions magically appearing before you, analyze an electrical circuit while looking through the schematic, and troubleshoot a paint robot while a remote technician offers expert advice and sees the same view you do. The applications are endless.

Additive manufacturing: It will be a while before 3D printers are used to manufacture end-use parts in volume, but their applications in manufacturing are becoming significant. Companies like Boston's Markforged now offer printers that produce parts made from super-strong carbon reinforced nylon, 17-4 stainless steel, and soon, tool steel, titanium and Inconel. The day that finishers can design paint fixtures and process tooling right in their own plants and print production-ready tooling on a same- or next-day basis is here.

Robophobia: This fear that a robot will take your job is worth worrying about if you have a routine, unskilled job that a robot can perform less expensively, more reliably or more safely than you can. The cure is to commit to lifelong learning and build your skills in a career that leverages technology.

Cloud architect: This is just one of dozens of new careers that will proliferate as a result of Industry 4.0. A six-figure-plus-salaried cloud architect oversees a company's cloud computing process. Not your bag? Other amazing Industry 4.0 careers include automation engineer (the fourth happiest job in America, according to *USA Today*), robot programmer, robot operator, industrial maintenance technician, electromechanical technician, IT systems analyst, IT engineer and data scientist.

IIoT Armageddon: It's another term I came up with on my own. The Industrial Internet of Things, aka Industry 4.0, is upon us. Manufacturing processes and technology will change profoundly in the coming decade. In this exciting era, there will be two types of manufacturers: those who embrace the change, and those who no longer exist. ■■■



MATTHEW KIRCHNER
Managing Director, Profit360
mkirchner@profit-360.com