

# THE FUTURE OF INDUSTRIAL ROBOTICS

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***Thanks to innovations in collaborative robots, sensor technology and high-speed computing power, the industrial robotics market is experiencing a wave of technological advancement. The best part? We are just getting started.***

In the not so distant past, industrial robots were mostly reserved for heavy machinery manufacturers. Installing a robotics solution required an enormous capital investment, many hours of programming and specialized training, and a supersized space for the robots themselves.

But there has been a shift in recent years.

While heavy manufacturing robots have evolved to take on ever bigger loads and weightier tasks (literally), the capabilities and quantity of smaller robots have simultaneously increased as well. Take collaborative robots — or cobots, for short. Cobots are smaller and simpler than their heftier robot cousins and are built to be safe enough for humans to work alongside without safety fences, which also makes them less expensive to install. The cost has dropped from hundreds of thousands of dollars for a single robot to tens of thousands for a cobot.

The absence of safety fences also makes it easier to integrate cobots into established work spaces, even when the footprint is narrow. This has opened industrial robotics and automation solutions to markets that may not have taken advantage of this technology in the past, as well as small- and mid-sized businesses that might not have been able to afford it before.

Given the ongoing labor shortage, the timing could not be better. Indeed the adoption rate and anticipated investment in robotics and automation is expected to climb significantly through the end of the decade.

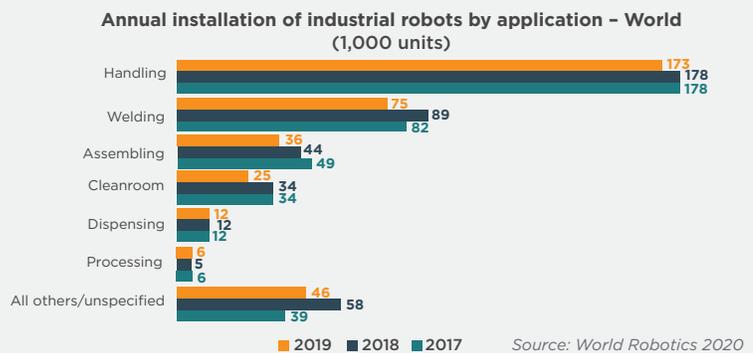
## Simpler, smaller robots make automation more accessible to smaller businesses

Not only was the massive size and cost of a robotic installation a barrier for all but the largest companies, so too was the complex technical competence needed to implement it across a manufacturing line. This has started to change with the development of cobots.

Cobots require less complex programming to operate. Many cobots today can be quickly integrated into a manufacturing process via software in a few days or hours, as opposed to weeks. With that faster ramp-up time, robots can more quickly become full members of the team; making it feasible for smaller companies to bring automation into their operations.

# 88%

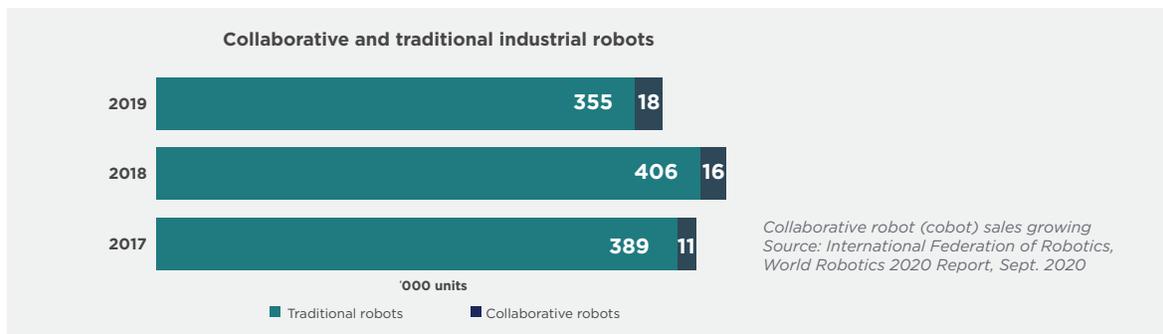
percent of respondents said they anticipate increasing their investments in robotics and automation, according to McKinsey Global Robotics Survey 2018



Admittedly, there is a gap in what can be accomplished with simplified cobot solutions versus complex, heavy automotive robotic applications. But that is actually the perfect entry point for small- and medium-size enterprises to start using robots. Simple applications like pick-and-place or machine-tending can be adopted and integrated much faster than with conventional technology.

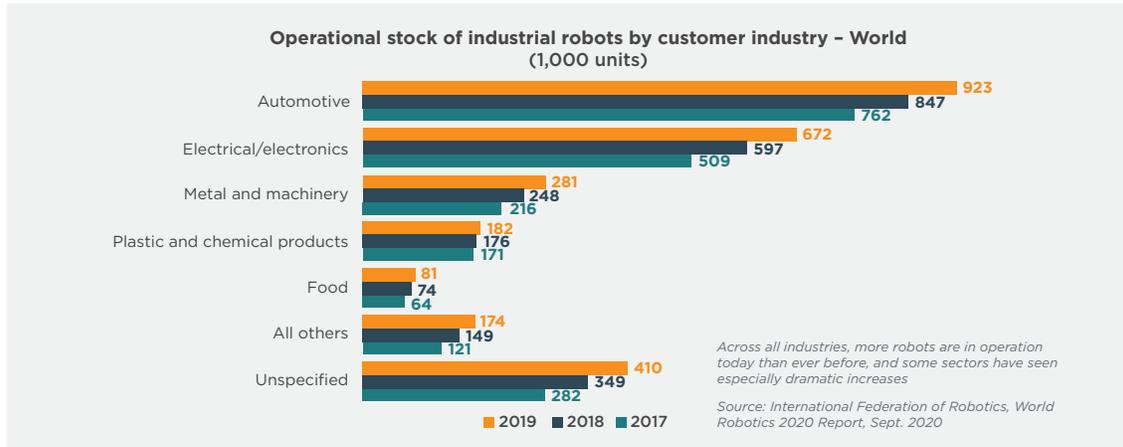
Realistically, a mid-sized company cannot afford to rebuild their entire operation around a robot. To realize the efficiency and productivity gains of automation, smaller enterprises need a robot that fits into the existing environment, where it can be programmed and put to work at the push of a button. Cobots do just that. They fit in where you need them rather than requiring a huge footprint or special, expensive accommodations.

Just a few years ago, it did not seem possible for a mid-sized company to even consider having a robot. Now we are witnessing a 63% increase in cobot installations over a three-year period, much of it driven by smaller companies.



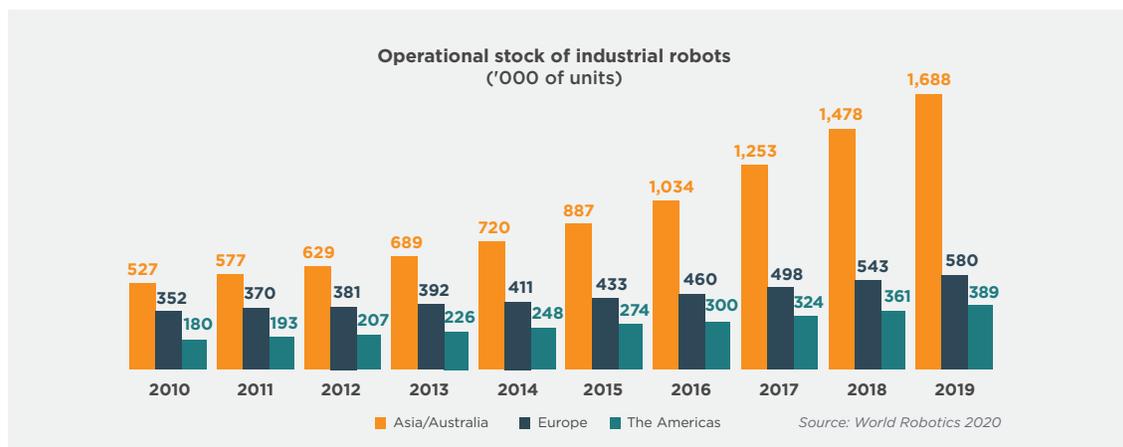
## Broader access to industrial robots will be a game changer for markets across sectors

While the automotive industry still has the lion's share of robots in operation, the increase in accessibility to smaller, less expensive, easier to program and install robots and cobots has opened the robotics market and automation to industries that had either used them in a limited way or not used them at all.



As robots get more affordable, companies' manufacturing investment costs will also drop, especially when you consider the incredible capabilities of 3D printing. In order to set up a production operation in the future, companies will not need to invest millions of dollars of capital; instead even the smallest company could set up a manufacturing facility next door. Cobots give everybody who has an idea for a piece of hardware the chance to launch their own manufacturing company.

This has implications not only in the manufacturing space, but also in geopolitics. More affordable robots will make it possible to inexpensively manufacture where a company's solutions are designed and engineered — or even on-site for the end customer — rather than off-shoring to save costs. Plus these robotics innovations open up capabilities for businesses in the domestic markets of countries that have historically been relied on for outsourced labor. Going forward, a small business in such a country could set up a production line with a cobot and a couple of 3D printers in an hour or less and be in business. The barrier to entry for new manufacturing businesses around the world will be lower.



## The keywords of the future: Flexibility and adaptability

Increased accessibility has been a recurring theme in many technology trends in recent years, so too has been the demand for flexible and adaptable solutions. What is driving that need? The move to smart manufacturing.

Rather than the familiar conveyor belt snaking its way through a plant ferrying goods on a defined, guided path, the factory of the future will be modular. Instead of a literal production “line” spitting out thousands of identical widgets 24/7/365, factories will feature stations or production cells dedicated to creating customizable, small-batch orders.

In the past it was not unusual for a manufacturer to seek automation solutions and robotics that could crank out a consistent product for 20 years. One robot doing one task on an assembly line, day in and day out. Now, a manufacturer could have a cobot on-hand that can be programmed within hours to do one thing (pick-and-place, for example) and then pivot quickly to another task (machine tending maybe). In the factory of the future, robots will need to move and adapt to the tasks they are assigned each day. Manufacturing as a whole is seeing a level of customization that has not been possible before, and it will be driven by the uptick in robotics applications as well as data connectivity and integration.

This evolution matches a transition experienced by other tech-focused industries, particularly personal computing — where innovations shifted from advancements in hardware to new possibilities being made possible by software.

Indeed over the past five to ten years, robot manufacturers have shifted their focus from differentiating themselves via superior hardware, to showcasing their software innovation. (Although it is worth pointing out that there is still a significant chunk of very sophisticated hardware operating within the robotics systems which people tend to underestimate.) As computing power and speed continues to increase, more robotics trends will be driven by the underlying software architecture rather than single programs.



## The rise in connectivity orchestration

The architecture of the robotics network will also be critical. As factories become more modular and increased computing power gives customers access to better intelligence, all the components — from edge sensors to the cloud — need to be seamlessly interconnected. It is a central tenet of Industry 4.0, and it requires reliable, high-speed data and power transmission across the system. It also means designing connectivity solutions as platforms (rather than discrete components) with finely orchestrated communication between touchpoints. This “connectivity orchestration” is an emerging trend for large automation OEMs.

These manufacturers are looking to bring together data from all the different sensors on the factory floor and integrate it in the cloud in order to access the insights they need to make their business successful. Tapping into these insights will also make production more responsive, with robots reacting in real-time as the situation demands.

For example, consider manufacturing applications with continuous touchpoints on a work piece — polishing or welding, for example — where the quality of the end product is determined by how the work piece is processed. In those instances, real-time data is critical so that the robot can respond to the data and adapt to the process in a way that optimizes the manufacturing and does not destroy the work piece.

### INDUSTRIAL ROBOTICS: WHAT CUSTOMERS EXPECT

While each business is unique, there are some common challenges that customers face when it comes to installing robot solutions. Here is a breakdown of the top areas:

#### **Customer needs for industrial robots generally:**

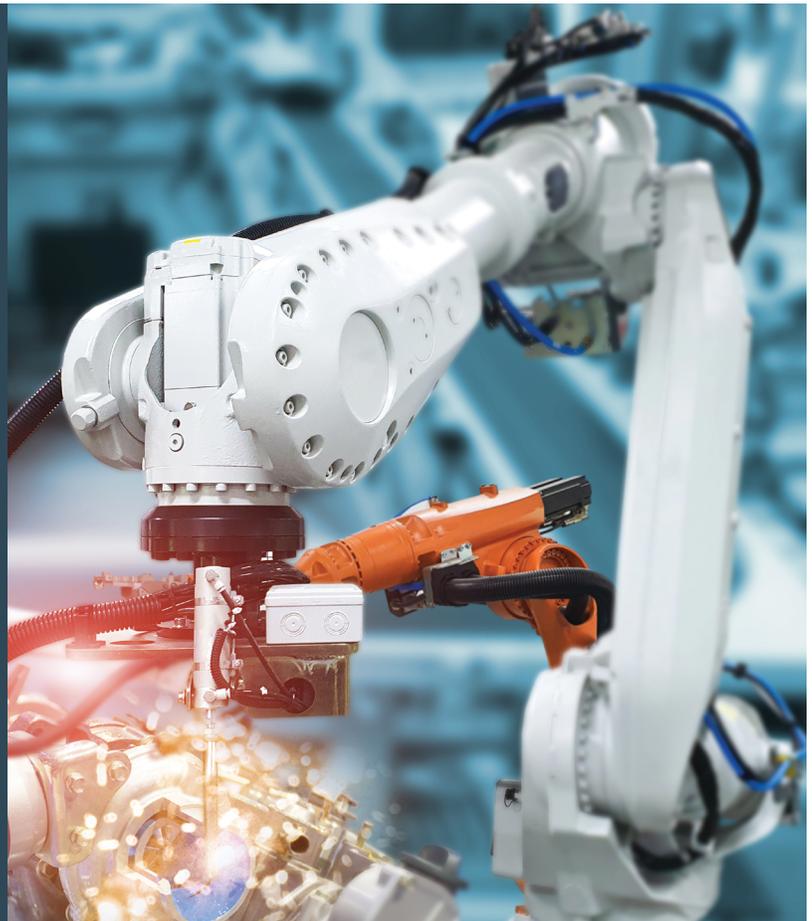
Customization, reliability, quality, long-term design support and product availability.

#### **Customer needs for cobots:**

Easy integration with customers' existing systems/processes, sophisticated capabilities, competitive cost.

#### **Customer needs for autonomous mobile robots:**

Navigation system that is easier to integrate and less costly to implement, integrating safety and guidance systems, charging solutions, interfaces and capabilities.





## INTERCONNECTIVITY INSTEAD OF ISOLATED ISLANDS

Think of all the different components in an industrial setting as islands. Within one robot, for example, there are sensors in the base, the arm joints and the gripper, and there are sensors along the production line as well as in the control units and more. But in order to take advantage of machine-learning, all these islands need to communicate with each other. They all need to be connected so that data can be collected seamlessly, analyzed and used to optimize processes among and between them. Smooth interconnectivity between devices is critical for trends in real-time communication and innovations in artificial intelligence.

## Evolving from programming to machine-learning

The wealth of data required for real-time communication is also critical for another trend in robotics: the growth in machine-learning.

If completely automated, autonomous production is the peak of efficiency for manufacturers, machine-learning is a critical early step required to reach that goal. Rather than programming a robot to tackle a specific task, machine-learning involves “teaching” the robot to do certain tasks by bringing together multiple technologies — including sensors, software and data analysis — to provide insights for the robot to learn from. Through repetition, the robot gains “skills” and “learns” what to do when it sees or feels something in the environment, rather than being programmed for a 1:1 response. Over time, the robot will solve tasks more autonomously. This requires significant orchestration between all the connection points within and outside of the robot to “know” what to do when confronted with a situation or task in the factory.

Short-term, robotics has advanced to a sort of semi-automatic operation; it is going to be longer before a fully autonomous level of operation is possible — at least for large companies. That is because large OEMs — automotive factories, for example — need to change nearly every aspect of their production to move away from dedicated assembly lines to more modularized solutions, and then connect all the dots to draw the necessary insights to power machine learning and autonomous solutions.

However, small- and medium-size enterprises will be able to adopt the technology faster. A smaller company can pivot quickly or hit the ground running with this new approach from the start. In a smaller production setting, there is less concern about connectivity between the downstream and upstream processes, so businesses can bring simple tasks together in a more modular way organically. In fact, in the future, the biggest innovations in robotics may come from small- and medium-size companies rather than larger OEMs simply because smaller companies will be able to embrace autonomous solutions and artificial intelligence faster.

## “ COBOTS: COMING TO A BUSINESS — AND PERHAPS A HOME — NEAR YOU

It is not too far-fetched to start thinking about having a cobot or some helper at your home, at your desk. It is part of the miniaturization trend, but it is also adaptable. We could get to a point where you basically have some kind of a robot or cobot running a standard software and you just download an app that programs your cobot to do the dishes for you. The amount of possibilities is exciting. At TE, especially in the industrial business, our focus is in terms of industrial robots. But if we think about the subject more broadly — this flexibility, the capabilities of having an electromechanical helper with some level of intelligence, that excites me a lot.

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## Reliable, high-speed connectivity is essential to the future of manufacturing

The future of robotics and the future of industry are linked. Any development in one area has deep implications for the other. We cannot look at the future of industrial robotics without also looking at industry itself. The advancements in industrial robotics have been astounding, but so too is the potential for even more growth and innovation when you consider the changing landscape for manufacturing and production.

Throughout all the trends shaping the future of robotics — affordability, accessibility, flexibility, adaptability, miniaturization, easy integration, high-speed data transmission, real-time communication and more — the key component that makes them all possible is connection. Seamless, reliable, durable interconnectivity will be the must-have for manufacturers designing the factories of the future.

## Connect With Us

Are you interested in learning more about TE Connectivity's expertise in industrial robotics connectivity? [Connect with us today.](#)

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