



# ROBOTICS IN THE ENTERPRISE

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# INTRODUCTION

Robots have moved off the assembly line and into warehouses, offices, hospitals, retail shops, and even our homes.

This special feature compilation from ZDNet and TechRepublic explores how the explosive growth in robotics is affecting specific industries, like healthcare and logistics, and the enterprise more broadly on issues like hiring and workplace safety. Read all about it in this free PDF ebook.

## ROBOTICS IN BUSINESS: EVERYTHING HUMANS NEED TO KNOW

An executive guide to the technology and market drivers behind the \$135 billion robotics market.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

### INTRODUCTION

One kind of robot has endured for the last half-century: the hulking one-armed Goliaths that dominate industrial assembly lines.

These industrial robots have been task-specific -- built to spot weld, say, or add threads to the end of a pipe. They aren't sexy, but in the latter half of the 20th century they transformed industrial manufacturing and, with it, the low- and medium-skilled labor landscape in much of the U.S., Asia, and Europe.

You've probably been hearing a lot more about robots and robotics over the last couple years. That's because for the first time since the 1961 debut of GM's [Unimate](#), regarded as the first industrial robot, the field is once again transforming world economies.

Only this time the impact is going to be broader. Much broader. That's [particularly true in light of the COVID-19 pandemic](#), which has helped advance automation adoption across a variety of industries as



IMAGE: YAKOBCHUKOLENA/ISTOCKPHOTO

manufacturers, fulfillment centers, retail, and restaurants seek to create durable, hygienic operations that can withstand evolving disruptions and regulations.

More and more, robots are cropping up in offices, hospitals, and schools -- decidedly non-industrial environments -- as well as in warehouses, fulfillment centers, and small manufacturing centers. More and more, they are on our roads and flying overhead.

And that's just to name a few spheres in which robots are rapidly gaining traction by doing work more efficiently, reliably, with fewer labor disruptions, and for less money than previously possible.

That's got a lot of people excited -- and a lot of others worried. The stunning pace of development in the industry has raised lots of questions.

This guide, written with the enterprise in mind, will address the big questions. And it'll give you the context to make up your mind about others. It'll also give you a handle on an industry that's poised to hit [\\$210 billion by 2025 \(a CAGR of 26 percent\)](#), one whose relevance to commerce and day-to-day life in the coming decades cannot be overstated.

## WHAT IS A ROBOT?

Robotics geeks debate this over beers. No one wins. That's because any definition is bound to be arbitrarily rigid or too general.

Is your washing machine a robot? Is a modern high-end car, which engages in thousands of processes without the driver's knowledge? In truth, it's a little like Justice Potter Stewart's definition of pornography: [You know a robot when you see one.](#)

Need a better definition?

A robot is a programmable machine that physically interacts with the world around it and is capable of carrying out a complex series of actions autonomously or semi-autonomously.

## WHY HAS THE FIELD ADVANCED SO MUCH IN THE LAST FEW YEARS?

There are four reasons:

- falling sensor prices
- open source development

- rapid prototyping
- convergence of disparate technologies

## Sensors

The demand for mobile computing has been a [boon](#) for robotics development, leading to falling prices, rapid advances, and miniaturization of sensor technology.

Accelerometers used to cost hundreds of dollars each.

Now every smartphone can measure acceleration, as well as capture stunning video, fix geographical location and offer guidance, interface with other devices, and transmit

across several bands of spectrum -- functionality robots need to maneuver through our world productively.

The ubiquity of IoT devices is another driver. By 2025 there will be [100 billion Internet of Things](#) connected devices generating revenue of \$10 trillion. For the first time, sensors that capture and send data related to pressure, torque, and position are dirt cheap, [leading to a boom in robotics](#) development.

Similarly, prices for lidar and infrared sensors, previously the most expensive sensing equipment for self-guiding robots, have [plummeted 90 percent](#) thanks in large part to the aggressive development of self-driving cars by Google's Waymo and others. And 3D cameras, which used to be out of reach to all but the most lavishly-funded R&D teams and Hollywood titans, are now available off-the-shelf thanks to [some smart work](#) with algorithms.

## Open Source Development

In 2009, a paper presented at the IEEE International Conference on Robotics and Automation (ICRA) introduced the Robotic Operating System (ROS) to the world. ROS is the first standard OS for robotics development. It also happens to be free, open source, and inherently flexible, freeing robotics developers from the time-prohibitive task of developing an OS from scratch.

There are plenty of open source users in personal computing, but because proprietary operating environments like Windows reached scale first, open source options have always been an alternative to something else. Not so with robotics, where open source is now the norm, resulting in a flurry of crowd-assisted development.

Open Robotics, under whose stewardship ROS falls, has also unveiled a robotics simulator called Gazebo which allows engineers to test robots in virtual reality without risking hardware.

How impactful have ROS and Gazebo been? Of the 23 teams competing in the vaunted DARPA Robotics

The demand for mobile computing has been a boon for robotics development, leading to falling prices, rapid advances, and miniaturization of sensor technology.

Challenge, [18 utilized robots](#) running on ROS and 14 used Gazebo to test their humanoid competitors in virtual environments.

The proof is in the investment. In 2015, more than [\\$150 million](#) in VC funding went to companies developing robots that run on ROS.

But make no mistake, a future awaits in which most cars on the road drive themselves most of the time. When that happens, road accidents should plummet and traffic will improve.

## Rapid Prototyping

Though we're still waiting to see if 3D printers will fundamentally change how (and where) consumer goods are manufactured, the impact of additive manufacturing on robotics development has been enormous. "3D printing enables the creator to go from a mind-bending concept to a solid product in a matter of hours (or days)," according to [Robotics Tomorrow](#), which tracks the industry.

Printers in maker spaces and university engineering departments, some of which allow for multi-material and metal printing, have significantly lowered the barrier to entry for robotics development. Need proof? Just check out the number of robotics projects that are [live on Kickstarter](#) right now.

When engineers can make prototype components at their workbench, innovation follows.

## Technology Convergence

Just as it brought sensor prices plummeting, the enormous success of mobile computing has spurred advances in voice and object recognition, which have clear applications in robotics. 3D gaming sensors are helping robots navigate the clutter of the unstructured human world. And companies like Google, Amazon, and Apple have been hard at work bringing limited Artificial Intelligence platforms online and into homes.

This has all been accompanied by predictable year-over-year increases in computing power, along with the arrival of the cloud and IoT technology. Put it all together and you can see that a lot of technology that roboticians have been waiting for has matured in just the last few years.

## COVID-19

It's impossible to talk about the future of automation without talking about COVID-19 and the massive shutdowns and layoffs that resulted.

If the seeds of a robotic revolution have been sprouting for over a decade, going back to research lab [Willow Garage](#) and the groundbreaking robotics research that began coming out of [DARPA contests in the early-2000s](#), COVID-19 may prove to be an accelerant.

The party line in the industry has been that the robots aren't meant to replace workers but to make work easier for talented professionals. Marketing professionals get oodles of money to sell that premise, and it's a palatable sales pitch, certainly easy enough to swallow in a labor crunch during a strong economy when the creep of automation is tough to quantify in terms of human toll.

The pandemic may change that. Workers are furloughed in all sorts of industries, companies are closing shop or tightening belts, and that deferential tone toward the worker, whom automation was touted as helping, has been replaced by another pitch: Automation can stand in where human workers have to stay home. No one's saying it, but investors might as well be with their wallets.

“Most of the automation equipment in the industry is used to replace manual labor in repetitive and simple processes. However, in the future, we believe collaborative robots will increasingly participate in complex production processes,” says Felix Yang, Accelerated Digitalization Lead, Greater China at SF DHL China, a ForwardX customer and the largest third-party logistics provider in the world.

## ROBOTS TAKE JOBS. ARE THE FEARS JUSTIFIED?

### **Doom and gloom argument**

That sound you hear? A big can of worms opening. Very smart people have staked out diametrically opposed views on this issue, and I advise extreme suspicion of anyone who speaks about these things with unnuanced certainty.

There are certainly some harbingers of bad news. A [recent study](#) by the National Bureau of Economic Research looked at the impact of increased usage of industrial robots on US local labor markets from 1990 to 2007 and found that there were “large and robust negative effects of robots on employment and wages across commuting zones.” According to the historical data, jobs lost to robots have not been adequately replaced by new opportunities brought by robots, an argument technologists often fall back on.

Those findings are not predictive and should be taken in proper context -- the current boom in robotics largely started after 2007, and it's difficult to correlate the impact of robots on employment in industries as disparate as manufacturing and healthcare.

But the fears are real enough that heavy hitters are taking note. Bill Gates has voiced support for a robot tax, for instance -- a levy on the work robots do, which would replace income tax lost by the government when a

robot takes human jobs. South Korea has [come closest](#) to that vision and appears ready to close tax incentives for companies investing in automation. South Korea's president is worried that higher unemployment in the robotic age will necessitate a robust welfare system, which is a huge problem since the government would be collecting less tax revenue to pad such a system during an employment crisis.

A recent [report](#) by Price Waterhouse Cooper suggests that up to 38 percent of US jobs could be lost to automation by the early 2030s. "The risks appear highest in sectors such as transportation and storage (56%), manufacturing (46%) and wholesale and retail (44%), but lower in sectors like health and social work (17%)."

But such findings are necessarily speculative, which accounts for the dramatic range of seemingly credible predictions about the future of employment once machines can do a lot of the stuff currently done by humans.

### It's not that clear cut

On the other side of the debate, there's a credible argument that automation has resulted in regional job losses, but net job increases. One proponent of this view is the trade association A3, which [released a study](#) that found that during non-recessionary periods going back to 1996, both general employment and robot shipments increased. "To us," Jeff Burnstein, president of A3, [told me](#), "that means that robots weren't killing jobs."

A few years ago, the International Federation of Robotics issued [a study](#) that looked at robotics use in China, Japan, Brazil, and India. As robot use accelerated in those countries, unemployment fell.

IDC [found](#) that spending on robotics hit \$135.4 billion in 2019, up from \$71 billion two years earlier. According to the report, services such as training, deployment, integration, and consulting will account for \$32 billion of that, which accounts for a lot of new jobs.

Even the oft-cited PWC report isn't all doom and gloom. Robots increase productivity, and productivity gains tend to generate wealth. Historically, that's led to an increase in service sector jobs, which aren't easy to automate.

There are plenty of holes to poke in the methodology of all these reports. And that's the point: An accurate method for predicting how technologies will change the future is illusive -- and that's especially true when the technologies under consideration will fundamentally alter the economic paradigm. In the broad wake of that uncertainty, you have [Ray Kurzweil](#) predicting utopia and author Martin Ford predicting something [much bleaker](#).

Ultimately, the PWC report comes to what may be the most sensible, albeit frustratingly vague, conclusion. It's not really clear what's going to happen. Average pre-tax incomes should rise with increases in productivity. But the benefits won't be spread evenly across income or education groups.

# WHAT KINDS OF ROBOTS ARE CURRENTLY TRANSFORMING THE WORLD?

There are lots of categories to choose from, but you should know about these:

- collaborative robots
- telepresence robots
- warehousing and logistics automation
- healthcare robots
- self-driving vehicles

## Collaborative robots

A new generation of collaborative robots has emerged in the last few years. Unlike the heavy industrial robots of the 20th century, these collaborative bots, most of which have one or multiple articulated arms, are flexible and easily reprogrammable on the fly. Many models learn by watching humans demonstrate tasks.

The primary feature that makes collaborative robots from companies like Universal Robots, Rethink Robotics, and ABB safe is their ability to avoid unwanted collisions and, using high accuracy torque sensors, to recognize when they've bumped into something or someone they shouldn't have. That capability allows the bots to function outside of safety cages and alongside humans, which opens up new productivity potential for industrial manufacturers. The robots can learn complex tasks and then act as a second pair of dexterous hands to augment the capabilities of skilled workers -- thus the "collaborative" designation.

### *Why is it a game changer?*

Automation is increasing in industries like automotive and electronics manufacturing and making speedy inroads in order fulfillment warehouses. As prices for task versatile platforms fall, small- and mid-sized manufacturers are starting to employ robots. Even so, a plausible future that sees robots replacing industrial workers entirely is far on the horizon, and in the meantime, with the economics favoring a hybrid approach, safety is of primary concern.

The market for collaborative robots could reach [\\$3.3 billion](#) by 2022.

## Telepresence robots

Telepresence robots, which have been something of a novelty, are starting to creep into broader use. There are several different types, from the bare bones [Double](#) models, which are basically iPads on wheels, to iRobot's \$30,000 [Ava 500](#).

### *Why is it a game changer?*

Across most sectors there's a growing segment of contract workers and freelancers who can't be in the office full time, and offices are seeing the value of poaching talent across time zones. Telepresence robots offer a surprisingly adequate alternative to being physically present. I've had a chance to try a few models, and the ability to navigate around the office really does differentiate the experience from a simple Skype call.

The market for telepresence robots could reach **\$8 billion** by 2023.

## **Warehouse & Logistics**

Of all the categories of robots covered here, warehouse and logistics automation is having the most substantial impact on global commerce right now.

Why? One answer is Amazon. In 2012, Amazon bought Kiva Systems, which makes automation systems for warehouses, for \$775 million. Amazon can offer same-day fulfillment of the automation systems at its fulfillment centers. That's left the rest of global retail scrambling to catch up.

Today, you'd be hard pressed to find a retailer with any e-commerce aspirations that isn't revamping its operations with an eye toward automation. The 2012 Kiva purchase left a huge hole. Kiva was the leading supplier of warehouse logistics solutions, and huge companies like Staples, Walgreens, and Gap relied on its technology.

Now, at last, several robotics companies are bringing logistics products to market, filling the hole left by Kiva's acquisition and extending the promise of the automated warehouse to small- and mid-sized retailers.

Some of the solutions are retrofit, such as self-guided carts that can quickly and autonomously move between packing stations. Others are more comprehensive, encompassing miles of conveyor belts and thousands of robotic pickers and grabbers.

### *Why is it a game changer?*

It's a little like asking why was the shipping container a game changer. Because it completely transformed how global commerce functioned. Worldwide sales of warehousing and logistics robots hit a respectable \$1.9 billion in 2016. By 2021, according to a forecast by research firm [Tractica](#), the market will hit a whopping \$22.4 billion.

## **Healthcare**

The burgeoning field of robotic surgery is dominated by [Intuitive Surgical](#), which makes the da Vinci Surgical System. Hundreds of thousands of surgeries are now conducted with da Vinci systems each year -- virtually every prostate patient with a choice opts for it -- and robotic surgery has quickly passed the crucial adoption threshold. Intuitive Surgical now has an \$18.2B market cap.

Surgical robots are going to play a much bigger role in healthcare in the years ahead. Auris Surgical, founded by Intuitive co-founder Fred Moll, has raised [half-a-billion in funding](#), even though the company doesn't have a product to market yet.

But surgery isn't the only way robots are entering healthcare. Personal assistant robots, such as the models developed by [Aldebaran](#), are likely to appear in senior centers soon, particularly in countries with rapidly aging populations, such as Japan.

Toyota unveiled the \$1 billion [Toyota Research Institute](#) a couple years ago, which is currently developing robots that can operate in unstructured and semi-structured environments, such as hospitals and other care facilities.

And robots such as Aethon's [TUG](#) are already moving supplies down linoleum corridors while robotic telepresence solutions are [aiding](#) in teaching and helping connect patients in remote areas with specialists around the world.

### *Why is it a game changer?*

Robot-assisted surgery is less invasive, more precise, and likely to open new horizons for surgical treatments. Auris, for example, is exploring non-invasive surgical tools for lung and throat cancers. More broadly, robots can [reduce healthcare costs](#) by automating operational tasks while potentially reducing mistakes.

The medical robotics market could be worth [\\$12.8 billion](#) by 2021.

## **Self-driving vehicles**

Self-driving vehicles are the flashy technology in robotics right now. But the cars you see Google and Uber testing on California roads are only one application for self-driving technology.

So far, small self-guided vehicles have had far more impact on commerce as they deftly navigate the structured and semi-structured environments of factories and warehouses, spaces that offer less randomness than the open road.

Materials handling in particular has been ripe for automation via self-guided vehicles, in large part because it's such a dangerous sector for human workers. Self-guided robots equipped with lidar, cameras, and a bevy of



A robot assists a surgical team at New York-Presbyterian Hospital

other sensors can safely and quickly navigate loading docks and factory floors while avoiding collisions with workers.

The global market for these vehicles will reach [\\$2.8 billion](#) by 2022.

Back on the roads, self-driving vehicles are showing lots of promise, but the biggest early impact will likely come from semi-autonomous trucks. The idea is that long haul truckers will be able to put their rigs on autopilot while on highways, where they spend most of the time, and then switch back to operator mode on busy city streets.

In 2016, Otto, which Uber has since acquired for \$680 million, orchestrated the first commercial delivery by a self-guided big rig.

### *Why is it a game changer?*

Safety is the biggest advantage. Along with some huge technology players, almost every major car manufacturer is pursuing self-driving technology. We're still a decade or more out from viable fully autonomous cars and trucks, and that's not factoring in potential regulatory holdups. Even when the technology arrives, it will take a while for the existing fleet to turn over. But make no mistake, a future awaits in which most cars on the road drive themselves most of the time. When that happens, road accidents should plummet and traffic will improve.

The market for self-driving and semi-autonomous vehicles could be [\\$77 billion](#) by 2035.

# SURVEY: ROBOTICS USAGE ON THE RISE

Robots don't play a significant role in industries--yet--but respondents expect that to change soon.

**BY: MELANIE WOLKOFF WACHSMAN/TECHREPUBLIC**

The image of robots working on a factory floor is being replaced with the reality of robots working in a myriad of industries ranging from healthcare and logistics to retail and telecommunications.

How are these robotic systems affecting these industries? This past June TechRepublic Premium surveyed 234 professionals to find out.



IMAGE: GETTY IMAGES/ISTOCKPHOTO

## THE ROBOTS ARE COMING

According to the majority of survey respondents (65%), robots and robotic systems do not play a significant role in their industry right now. However, during the next two-to-three years, 66% believe this will increase significantly or slightly. About a quarter of respondents report that their robotic system usage will not change, 9% are unsure, and only 1% report their robotic systems usage will decrease.

The main industries, according to respondents, that will increase their robotics usage in the next few years include: Manufacturing (75%), logistics and delivery (69%), healthcare (58%), agriculture (57%), transportation (49%), mining (47%), telecommunications (47%), and military and public safety (46%).

## TIME COMMITMENT TO ROBOTIC SYSTEMS

Compared to other systems supported by IT, about half of respondents (52%) say that robotic systems will require either slightly more or much more time to support. Eight percent say it will take roughly the same amount of time, and 27% say it will take slightly less or much less time to support. About 14% of respondents are unsure of how much time is needed to support robotic systems.

Regardless of the time commitment, respondents are in agreement (79%) that IT will support whatever robotic systems are deployed in companies. Of that 79%, 62% say IT support will be significant.

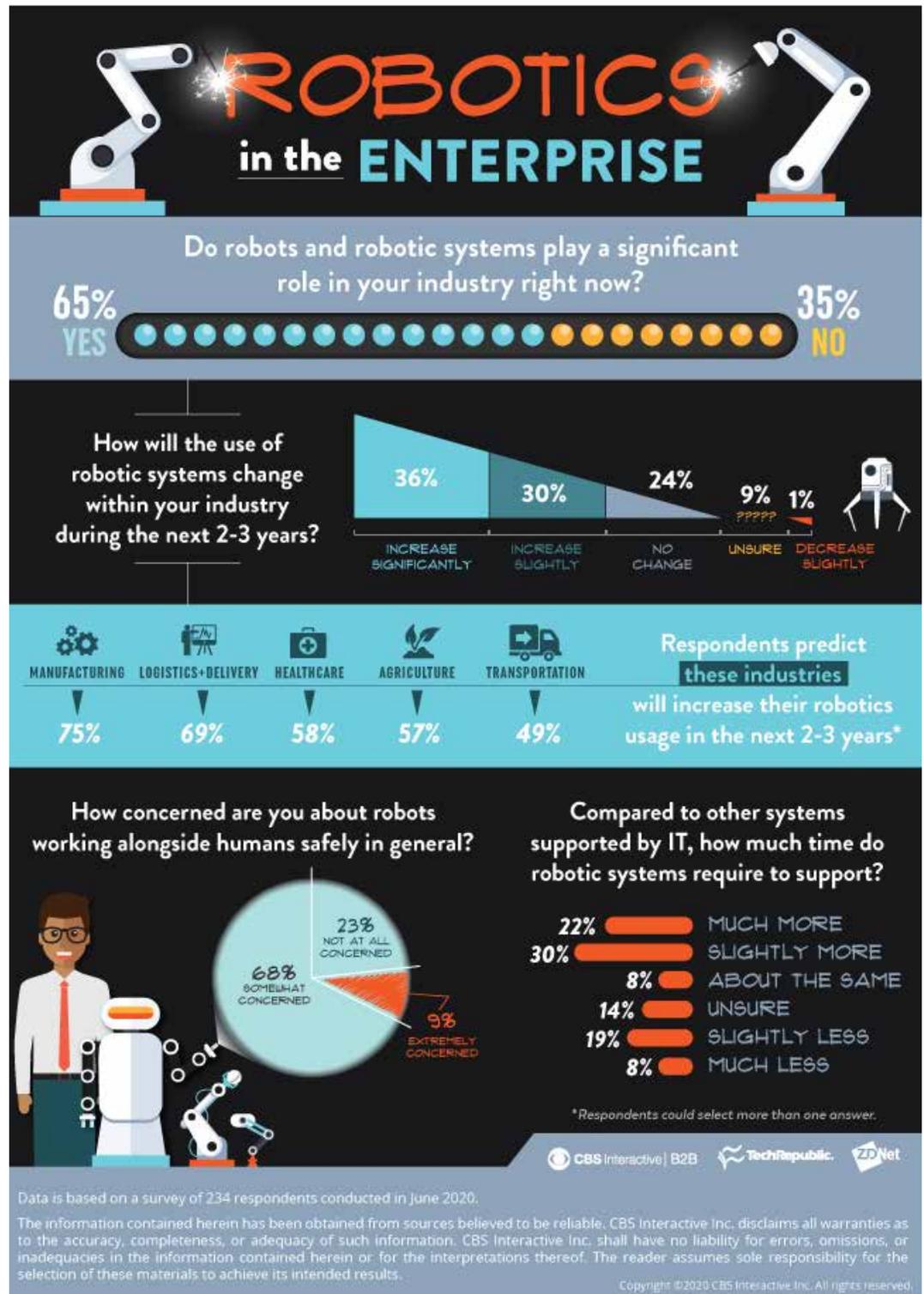
## CONCERN ABOUT ROBOT CO-WORKERS

As far as physically working alongside robots, 57% of respondents have little to no concerns, while 32% have

some safety concerns. Just 11% of respondents are extremely concerned to work side-by-side with robots.

When it comes to robots working alongside humans safely in general, 68% of respondents are somewhat concerned, 9% are extremely concerned, and slightly less than a quarter have no concern.

The infographic below contains selected details from the research. To read more findings, plus analysis, download the full report: [More robot and robotic system deployments expected across industries](#) (available for TechRepublic Premium subscribers).



# THE ROBOTS ARE COMING, AND THIS IS HOW THEY WILL CHANGE THE FUTURE OF WORK

Robotic systems have historically been kept separate from humans, and tucked away deep in factory lines. But as robots start mingling with humans in their workplaces, what is work going to look like?

**BY: DAPHNE LEPRINCE-RINGUET/ZDNET**

If you go to the [Makr Shkr](#) bar in Milan, a top-notch rooftop venue overlooking the city's famous cathedral, you won't be greeted by any bartenders -- that is, of the human kind.

Instead, you'll be able to order your cocktail via an app, playing around with how strong you want the drink to be, or selecting add-ons like bitters or lemon; and your order will be sent straight to the double-armed robot working behind the bar.



Emanuele Rossetti, CEO of Makr Shkr, explains that the robot can be up to four times faster than a real-life bartender in preparing customers' drinks. "But that's not very fun to watch," he argues, and so the robotic arms have been slowed down to match the pace of a human.

The Makr Shkr can prepare two types of drink: easy ones, like a rum and coke, but also the more complex ones, which require the shaking-and-stirring that are the signature moves of bartenders.

That's not to say that the Makr Shkr can do entirely without humans. More delicate and creative tasks, like garnishing a cocktail, still have to be done by flesh-and-bone bartenders.

Rossetti explains that, more than anything else, the technology's speed and precision support the work of humans. At peak hours, a real-life bartender is always at the bar next to the robot; but the technology lets them delegate drinks like a vodka-lemonade, and instead focus on cocktails that require more of a human touch.

More importantly, the robot is utterly incapable of coming up with new cocktails; rather, it repeats the recipes invented by human professionals. "The bartender can invent any recipe and teach the robot how to repeat it," says Rossetti. "The machine has no capacity to decide what goes in a cocktail. It just has the speed and precision to repeat something it was shown by a human."

It remains that in the bar, the robot is the star of the show. Many customers come specifically to see it, film it, talk about it, and Instagram it. With reason: finding a robot at work in a familiar setting like a bar is new and exciting.

As Rossetti says: “Robots are common in a factory, but not in a normal environment.” He certainly has a point: while robotic technologies are nowhere near new, they have until now been kept at a safe distance from humans, mostly tucked away in factory lines and other industrial settings.

Things are changing, and the technology is gradually evolving from industrial, automated factory arms, towards resembling the robots typically found in science fiction: More human-like, and a lot more present in familiar settings.

## ESCAPING THE FACTORY

Humans and robots are even kept away from each other in law, to protect people from injury. The International Standards Organization’s (ISO) safety requirements for industrial robots [typically require that workers be prevented](#) from getting anywhere near a robotic system.

Things are changing, and the technology is gradually evolving from industrial, automated factory arms, towards resembling the robots typically found in science fiction: more human-like, and a lot more present in familiar settings.

Rather than being shoved away in safe spaces, robots are increasingly sharing our workplaces. Amazon’s warehouses are already crowded with 200,000 robotic pickers, who work directly alongside hundreds of thousands of human staff to put together and ship customer orders at speed.

Dussmann, one of Germany’s largest cleaning companies, is deploying robotic cleaners to its offices, which can autonomously detect dirt on the floor, or waste that needs removing. Similarly, Google’s Alphabet X is working on an ‘Everyday Robot Project’, for robots to whizz around the office sorting through waste, [to make sure that items are trashed in the correct recycling bins](#).

In the hospitality industry too, the technology is taking on a new role. The Makr Shkr is by no means the only robot tending to customer requests. From [Zume’s robotic pizzaiolo](#) to Softbank’s [plan to open a cafe run by a handful of ‘Peppers’](#), the company’s humanoid robot, the line separating humans and robotic systems at work is vanishing.

The trend has a name: so-called ‘collaborative robots’, or ‘cobots’, are those designed for direct interaction with

humans. In particular, cobots can come in the form of service robots, which perform tasks that assist humans outside of industrial automation applications, such as customer service, cleaning, delivery or even surgery.

And they are growing. According to the International Federation of Robotics (IFR), global sales for service robots reached almost \$13 billion last year, and have been increasing since 2017. The organization predicts “a strong sales increase” in the coming years, particularly of robotic systems used for logistics, which are expected to more than double by 2022.

This type of collaborative automation has long been anticipated by experts. A recent study by Oxford University showed that by 2035, [up to three-quarters of retail jobs could be automated](#), as well as 86% of restaurant jobs.

## THE COVID EFFECT

And an unexpected boost to automation projects has come with the ongoing COVID-19 crisis, which is generating renewed interest in any technology that can help reduce contact between humans, thus making some workplaces safer.

In the Dutch city of Maastricht, [robotic trio Amy, Aker and James are dishing out food to customers](#) in a newly re-opened restaurant. Meanwhile, [a robot is serving beer in a South Spain bar](#); and Alexia, 1.60-metres tall, and heavy with 80 kilograms of robotic wires, [is helping waiters tend tables in a socially distanced manner](#) in a Pamplona restaurant.

Back in Milan, Makr Shkr’s Rossetti says: “Right now, with COVID-19, we are having huge numbers of requests. In our system, you order and pay through your cellphone, the robot produces a cocktail in a disposable cup that you trash. There is no contact with a human being, and zero risk of infection.”

In fact, a recent report from research firm McKinsey found that the jobs most at risk from the COVID-19 crisis [were also those most likely to be automated in the next few years](#): namely, customer service and sales, food services and building occupations.

## ROBOT REGULATION

Even regulations are keeping up with the robotic takeover of the workplace. In 2016, the ISO realised, while revising its standards for industrial robots, that the rules were becoming obsolete. “If an application will not hurt and injure a human, why not allow contact?” [asked the regulators](#). And so, [ISO/TS 15066](#) was born: a standard to make interaction possible between humans and cobots at work.

The traditional guards and protective devices keeping workers and robots apart were removed, to allow an

“overlapping workspace” between humans and some robotic systems. But while the rules recognise that the nature of robotic work has changed, they still show some uncertainty when it comes to actually deploying the technology.

Risk assessments are required to be carried out regularly to make sure that collaboration is safe for workers -- which is made particularly tricky because cobots tend to be mobile. Roberta Nelson Shea, convener of the ISO group on industrial safety, advises business leaders to identify all the tasks and hazards associated with the technology, and to then go through risk estimation and reduction.

Particular care needs to be taken in the case of customer-facing cobots, such as those found in the hospitality sector. “The concept of service robots is robots that can be used where almost anyone can be exposed to the hazards,” Nelson Shea told ZDNet. “For example, toddlers, babies crawling, kids climbing, adults, or the elderly. The people involved in service robot standardisation need to address that.”

The ISO itself admits that the latest standards are only a first step for a developing industry, and that more work will need to be done as the technology develops.

Jürgen von Hollen is the president of robotics company [Universal Robots](#), which produces cobots for customers interested in automating parts of their workforce’s activities. An early mover in the space of collaborative robots, von Hollen explained that legal issues were initially a direct challenge to the business.

“The regulation that is driving the industry was developed 20 years ago,” he told ZDNet. “When we came in, the concept in front of us was that machines were to be kept away from humans. That was still the case five years ago, but things are changing rapidly. The laws are evolving, and it’s an on-going process even as we speak.”

Now, what von Hollen sees as the biggest obstacle to cobots is awareness of what the technology can do for businesses -- and how easily it can do it. Universal Robots, in fact, promises that the company’s platform and online courses will let anybody program a robot in less than 87 minutes, with or without an engineering degree.

This is because, for those who have never dealt with robotics, the whole concept might seem difficult, complex, and out of their control. Von Hollen remembers one of his customers based in a rural part of the US, whose business sands and polishes metal parts. “It was his son who had called us in,” says von Hollen.

“In that area, not that many automation engineers are available,” he adds. “The shop owner told me from the start that he was very sceptical that the technology would work at all. He was standing in the background when we showed the proof-of-concept. Just 20 minutes in, he said he’d buy it.”

When he went up to the business owner to ask why his son had suddenly seen a case for deploying a robot, von Hollen was surprised to find out that the motive was not financial. Rather than wanting to boost productivity, his customer was concerned with one of his employees, who had been working on the production line for 17 years, doing the same repetitive job.

The employee was developing arthritis in her shoulder and elbow, and her employer felt accountable for it. “We’ve developed many jobs in which humans behave like robots,” says von Hollen, “and which don’t make them happy. They are monotonous, repetitive, tough roles, which most of us don’t want to do. But they still have to be done. Those are the areas we are looking at for cobots.”

## WILL A ROBOT TAKE YOUR JOB OR IMPROVE IT?

Von Hollen’s comments are reflective of an often-heard defence of the rise of robots, in the face of employees scared that automation will take their jobs. In Europe, McKinsey [reports that almost 23% of jobs are at risk of being replaced by robots](#) in the next ten years, as about a fifth of work-related activities become automated.

Despite the ominous numbers, experts don’t expect major job cuts anytime soon. Rather, the nature of work will shift, as robots take on the boring and the mundane, and employees are given more freedom to focus on tasks that require human input, such as creativity, interaction, management or teamwork. McKinsey, in fact, expects that the demand for socio-emotional skills will go up by a third.

In a way, this is only a natural continuation of work. Will Venters, assistant professor of information systems from the London School of Economics’ department of management, argues that humans and technology have always worked together. Robots are being brought into the workplace; but often, this same workplace is already embedded with technology designed to enhance human productivity.

“The difference is, a lot of the existing technology doesn’t look human, and I think that works better for humans to understand their place,” says Venters. “On the other hand, a lot of the automation work seems to be around anthropomorphising the robots. That brings about the fear that these things will replace humans.”

What we call robots, says Venters, is only the most sophisticated technology that we have today, and is no different from the tools of the past. There was never fear that the electric drill could take over the job of a builder, and the same applies to robots, no matter how human-like they are.

In its London headquarters, digital marketing company [Brainlabs](#) has had a robotic receptionist for three years now. The company purchased one of Softbank’s Pepper robots to greet visitors once they reach the office floor’s main entrance, and to notify the relevant person by email that their guest has arrived. Pepper can even

do some entertaining while visitors wait, informing them about the weather forecast or preparing them a coffee via a wi-fi-enabled coffee machine.

The company's CEO, Daniel Gilbert, stresses that the person who used to do Pepper's job is still a Brainlabs employee. But before the robot joined the team, explains Gilbert, the company's (human) receptionist had to split her time between looking after the office and bookkeeping with greeting visitors, which she found disturbed her workflow.

"By automating the basic, repetitive task of welcoming visitors, we freed our office manager's time to focus on more interesting aspects of her job," Gilbert told ZDNet. "In other words, things that robots and AI can't do."

In a way, the decision to purchase the robot is no different to coming up with a code to automate reporting, or with filters to move emails into certain folders in Gmail. Plus, argues Gilbert, automation leads to cost-cutting and business growth -- and that in turn generates job growth. In other words, hiring robots ultimately leads to hiring humans.

And one thing is certain: communicating the right message to employees is key to on-boarding any robot. As humanoid as it can get, a robot is only another workplace tool; and it is vital that human employees know that they are still part of the mix.

"We were always very clear about the fact that we weren't hiring a robot to replace a single employee," says Gilbert. Pepper, as a result, was welcomed by his human colleagues, who have now grown used to the robot's presence, and even created personal reactions for it to say when their name is given by a visitor.

The Brainlabs CEO's top tip for a smooth transition to automation? A renewed focus on the human workforce, which reflects that management cares about employee development.

## ROBOTS AND HR

Research firm Gartner even suggested that [HR departments start thinking of expanding their services](#) to include "robotics resources", too. Gartner predicted that by 2025, at least two of the top ten global retailers will have reshuffled their HR departments to accommodate robotic needs.

Pragmatics like procurement, maintenance and decommissioning are important, but there's more to consider: robotics resources will be responsible for ensuring that the transition towards human-robot collaboration is smooth, and that employees don't feel left behind.

On top of first-class communication, Universal Robots' von Hollen also recommends deploying cobots as strategically as possible. A bottom-up approach is preferable, he says, so that staff can see for themselves how beneficial the technology can be.

“Take one cell and automate it,” von Hollen said. “And then, let others see what happens. We usually see that the person working in the automated cell gets faster and better, and then others start pushing for having access to the same technology.”

“That’s because we don’t make robotics to control humans. We make robotics to provide a tool that humans can use,” he added.

Rossetti makes a similar observation about the Makr Shkr: that bartenders often report that their job has improved as a result of the machine taking on the mundane tasks that they previously had to carry out themselves.

Rossetti is currently getting ready for the Makr Shkr’s next grand opening this month: a 600 square-metre open space in front of the cathedral, operated by both robot and bartender. A few nights a week will see the human competing against the machine in a contest for the best cocktail.

Which one of the two is Rossetti placing his bets on? “The bartender, no doubt,” he answers without hesitating. “Because he is a bartender, and a good one, with that. Only he can know the taste of the cocktail, and how to make the final decision. He’ll make the cocktail much nicer.”

# CIO JURY: 58% OF TECH LEADERS SAY ROBOTICS WILL PLAY A SIGNIFICANT ROLE IN THEIR INDUSTRY WITHIN THE NEXT TWO YEARS

The coronavirus pandemic is playing a role in how fast companies plan to adopt robotics.

**BY: TEENA MADDOX/TECHREPUBLIC**

Robotics is a technology that impacts industries across a range of verticals, not just agriculture and manufacturing where it's been used for decades. Robotics will be playing a greater role in settings from banking and retail, to cloud-solutions providers and healthcare, according to a TechRepublic CIO Jury poll.

When asked, “Will robotics have a significant affect on your industry in the next 1-2 years?” seven out of 12 tech leaders said yes, while five said no. That means 58% of tech leaders in TechRepublic’s informal poll believe robotics will make a difference in their piece of the enterprise.

Those weighing in on the “yes” side include John Gracyalny, vice president of digital member services, Coast Central Credit Union, who said, “I will answer yes, with a big caveat. Financial services does not lend itself to robotics in a typical sense, such as in manufacturing. But what we are seeing, and expect to see increase, is the use of in-branch self-service kiosks generally referred to as ITMs, or Interactive Teller Machines, replacing some human teller stations. They are similar to ATMs, but typically support a wider set of transaction types, and often have the ability to connect remotely to a human representative via chat or video for questions and assistance for more complex transactions.”

Richard Schwartz, president and CEO of Groceryshop, said, “Yes. Robotics is absolutely beginning to have a large impact on the retail tech industry. Robots are a way to deliver a computer vision/AI solution to a \$1T problem—stockouts—by providing an accurate, quick way to check on store shelf inventory. For instance, it helps to ensure your local supermarket doesn’t run out of your favorite mustard. Checking for stockouts is very eyeball intensive today—lots of people walking down the aisle and staring at the shelf, trying to identify what is out of stock or in the wrong place. It’s hard for people to do and takes time away from working with



IMAGE: ISTOCKPHOTO

customers. Robots, both ground-based robots and aerial robots (aka drones), can be faster, safe and more accurate.”

The coronavirus pandemic has changed the mind of some participants on the importance of robotics.

“I would have normally said no. But given the current pandemic, I could see some type of robotics being developed when it comes to person-to-person interactions, trying to eliminate that. This might just fizzle out if a vaccine is made and all goes back to somewhat normal business as usual,” said Steven Page, vice president of IT for marketing and digital banking for Safe America. “Financial institutions are using robotics to audit expense reports, manage incoming vendor invoices and process vendor payments. In saying that, RPA (robotic process automation) could become the norm on the software side faster because of the lower costs and faster speeds it can deliver.”

Schwartz said that in retail, “In the time of COVID, it also increases the safety for store workers, since inventory can be done quickly and automatically.”

Emil Sayegh, CEO, Ntirety, a cloud-solutions provider, said, “Robotics will have a major impact on our industry as we will see more and more automation in factories, healthcare, and agriculture as a consequence of the COVID-19 pandemic. Other than cost, efficiency and accuracy, robotics are also a way to mitigate against the vulnerability of the workforce due to pandemics. With robotics becoming more prevalent, we will see data latency becoming a major factor in how customers are selecting the supporting cloud infrastructure.”

Sean Lane, CEO of Olive, said, “Robotic process automation (RPA) and artificial intelligence (AI) technologies will continue to have a major impact on the healthcare industry in the near future. In fact, nearly two-thirds of healthcare decision-makers plan to implement automation technology at their hospital or health system within the next two years. “

The other five jury members all voted “no” but Timothy Wenhold, CIO, Power Home Remodeling, said he expects to see more robotics in his industry in five to ten years.

Meanwhile, Lawrence Whittle, CEO of Parsable, said he actually saw the pandemic increase the importance of human workers.

“Several months ago, there were plenty of headlines implying that robots were going to obliterate jobs in increasingly automated industries. But then the shutdowns that resulted from COVID-19 shone a spotlight on how important human workers are to industries like manufacturing. Robots and automation may replace repetitive tasks, but they don’t have the flexibility to quickly change and adapt when something unexpected comes up—a key learning from the pandemic. Humans in manufacturing aren’t going away,” Whittle said.

Here are this month's CIO Jury participants:

- John Gracyalny, vice president of digital member services, Coast Central Credit Union
- Richard Schwartz, president and CEO of Groceryshop
- Randy Krzyston, senior manager, IT security and compliance, Brinks Home Security
- Sean Lane, CEO, of Olive
- Madhushan Gokool, IT and data protection manager, Storm Model Management
- Timothy Wenhold, CIO, Power Home Remodeling
- Lawrence Whittle, CEO, Parsable
- Joel Robertson, chief information officer, King University
- Craig Lurey, CTO and co-founder, Keeper Security
- Michael Hanken, vice president of IT, Multiquip
- Dan Gallivan, director of information technology, Payette
- Emil Sayegh, CEO, Ntirety

# HOW ROBOTS ARE REVOLUTIONIZING HEALTHCARE

From automated disinfection and patient video conferencing, to tech-driven surgeries, robots are leading the future of healthcare.

**BY: MACY BAYERN/TECHREPUBLIC**

Laying in a hospital bed waiting for a physician, some patients in Hôpital Pitié Salpêtrière in Paris, France were not greeted by a doctor, but were instead met by [Pepper](#)—the [caring, humanoid robot](#).

[Pepper](#) lent a (robotic) hand “during the COVID-19 pandemic, to allow patients on the intensive care ward to communicate with their family, who were not allowed to visit. The [robot](#) was able to stand next to the bed of the patient and used the tablet on its chest to deliver a video conference,” said Jonathan Davenport, senior research principal analyst at Gartner.



“Though people were often on respirators, and so were unable to speak, hospital staff noticed stress levels of both the patient and family were reduced as a result of the interactions,” Davenport said. “Pepper also reduced hospital staff risk levels by decreasing the need for physical contact with patients.”

Robots in healthcare are not a new idea. However, with the coronavirus pandemic placing pressure on hospitals and healthcare workers to deliver services, the [drive to automate has been expedited](#), said Karen Panetta, an IEEE fellow and dean of graduate engineering at Tufts University.

“The COVID-19 pandemic has accelerated adoption of the hospital-based robotic technology,” said Davenport, echoing Panetta’s analysis. “However, it’s important to understand that these deployments are currently on a trial/proof of concept basis.”

Once the reactionary phase of the pandemic ends, hospitals will reopen for routine treatments, and robots will be further explored at their full capacity, Davenport added.

Telepresence robots like Pepper are a common, but not isolated, application. The healthcare industry is actually exploring five key areas where automation could improve service.

## 5 ROBOT USE CASES IN HEALTHCARE

### Telepresence

While [Pepper](#) is a high-profile example of this application, [telepresence robots](#) can function in a variety of ways and forms.

“Most people call them ‘robots on a stick,’” Panetta said. “They typically look more self-contained, like screens, computers--more like iPad looking types of screen.”

Telepresence robots often monitor the elderly, whether it’s for fall detection or for allowing the patients to communicate on screen with a doctor, said Quanyan Zhu, associate professor, in the Department of Electrical and Computer Engineering at New York University.

This application has been bolstered by social distancing measures put in place with the coronavirus, Panetta added.

“One of the most heartbreaking things about COVID right now is that people are dying alone, and families can’t physically be with them,” Panetta said. “Telepresence robots are something that would be with the patient that the family could control. They could maneuver the device around, talk to the patient, and monitor the patient on their own, without the intervention of a medical personnel.”

### Disinfection

Another [coronavirus-induced application](#) is [robots for disinfection](#).

“The name of the game right now is contactless everything, especially disinfecting,” Panetta said.

One example is the [Xenex robots](#) being used in the Children’s Hospital Los Angeles, Davenport said. The hospital has hundreds of rooms with more than 350 beds, all of which require daily cleaning, and robots step in to minimize infections.

“[The hospital] purchased four robots that use pulsed xenon ultraviolet [UV] light, thousands of times more powerful than sunlight, to quickly destroy harmful bacteria, viruses, fungi, and bacterial spores,” Davenport said.

Telepresence robots like Pepper are a common, but not isolated, application. The healthcare industry is actually exploring five key areas where automation could improve service.

“The portable disinfection system takes about 15 minutes per room — for a total of about an hour when combined with traditional cleaning techniques. The robots complement the cleaning team by performing ‘zapping’ activities on top of the traditional scrubbing, spraying, mopping, and wiping,” Davenport added.

## General assistant tech

Robots can also help with the general assistance of healthcare services, automating mundane processes typically done by staff. This opens caregivers up for more complicated tasks.

“For example, there was one system that was a robot feeder,” said Ayanna Howard, roboticist and chair for the School of Interactive Computing at Georgia Tech. “[The patient] would sit at a desk, and the robot would actually lift up the spoon and it would dip the food and bring it to your mouth.”

These types of robots can also run inventories and fetch certain medicines at programmed times, Zhu added.

Along that same vein, robots can pick up and deliver medications or supplies.

“Stanford Hospital has started to use robots supplied by Swisslog,” Davenport said. “These robots work in the pharmacy and have the capability to pick pills and boxes and put them in bags with barcodes.

“The robots undertake mundane tasks to make the process more efficient and reduce mistakes made by human pickers. The robots undertake the mundane work and enable pharmacy staff resources to be freed up for more complicated tasks,” Davenport continued.

“The boxes are delivered by automated guided vehicle (AGV) to Omnicell dispensing stations. The pick up robots are integrated with the dispensing stations and Epic’s pharmacy management system,” he said.

## Surgery

**Surgery** is an evolving application of robots. With security and safety concerns, these types of robots are not widely used yet, according to Zhu, but they are being developed.

“**Surgical robots** are becoming more prevalent because they have far more accuracy and precision than a human hand,” Panetta said. “They also have sensors that are way better than the human eye. You’re using these sensors that can see right down to the microscopic level where normally you have a doctor looking through some assisted device to do that.”

Panetta said that these robots aren’t left to their own devices, so to speak, but are supervised and assisted by human medical professionals.

## Cancer diagnostics

Robots also provide assistance in cancer diagnosis and treatment, said Tzvia Bader, CEO and co-founder of TrialJectory, a tech platform that uses artificial intelligence (AI) and machine learning to match cancer patients with the right clinical trials for their exact diagnosis.

“The ability of a machine to go over so many data points and identify patterns will always be quicker than any human being; probably also more accurate in identifying some patterns that sometimes we, with the human eye, have a hard time identifying,” Bader said.

“We’re seeing a lot of it in the cancer care right now, looking at monographs, looking at CAT scans...looking even at visual pictures of moles for melanoma...The ability to look over it and fairly quickly identify if there’s anything concerning or not concerning,” Bader noted.

Robots can also help identify paths for treatment, because of its ability to mass volumes of data at a quick pace, she added.

“A machine can read through all this big database of all the thousands of treatment options, and can then take all those medical records of a patient, and in a matter of minutes, match them,” Bader said. “This saves all the work or the question marks, and removes the uncertainty.”

The main benefit of robots, across the board, is efficiency, Davenport said. Whether it’s diagnosing a disease quicker, connecting with a doctor faster, or delivering a medication quicker, robots--literally--take the leg work out.

# ROBOTS ARE CHANGING THE FACE OF RETAIL IN 2020

At NRF 2020, dozens of companies showed off the latest generation that can handle everything from restocking shelves to cleaning floors.

**BY: JONATHAN GREIG/TECHREPUBLIC CONTRIBUTOR**

Robots are now becoming a reality after spending decades as a purely sci-fi concept. Many of the biggest companies, from [Ford](#) to Amazon, use robots to handle manual labor in warehouses.

But at the [National Retail Federation's 2020 Big Show](#) in New York, dozens of companies displayed their latest robots that are designed to work in concert with retail employees and weave around customers.



IMAGE: GETTY IMAGES/ISTOCKPHOTO

The robots at NRF 2020, many of which are either being deployed now or will be this year, are focused mostly on restocking shelves, monitoring price tag accuracy and keeping the store clean.



The Bossa Nova robot on display at NRF 2020.

“Retailers are using robots to do all types of things. Everything from floor cleaning to material handling and now shelf analytics,” said Josh Baylin, who works on strategy with the robotics automation company Brain Corp.

“They’re looking to optimize store performance and drive revenue. We help our partners produce, deploy, scale and support their robotic deployments in all different types of environments, like retail, airports and malls.”

## PRICE TAGS AND RESTOCKING SHELVES

Right now, most robotics companies are focused on building tools that can handle relatively simple tasks in an effort to ease retailers and the public into more widespread use.

The most common tasks for robots center on checking tags so they have the correct prices and sales on them as well as notifying store workers if a shelf needs to be stocked.

“These robots are our workhorse of the future. We put eyes on the shelf and serve as the ground troops of the store, notifying workers of the real-time state of the store,” said Sarjoun Skaff, founder and CTO of Bossa Nova Robotics.

The company has deployed robots in 350 Walmarts in the US and internationally.

“They come with a battery of cameras and sensors that are pointed at a shelf and can capture anything on the shelf in minute detail. Our cloud examines what is on shelf, looks for misplaced items or items that have been mispriced. It helps a store address the most egregious problems in order of importance and it tells people where to go and restock or what labels to replace and more.”

Tim Rowland, CEO of Badger Technologies, said during a panel that his company is working on robots that will soon be able to tap into the entire supply chain, instantaneously notifying the store, and potentially suppliers, when a retailer runs out of a specific product.

## CLEAN FLOORS AND SPILL MANAGEMENT

Rowland spoke in depth about his work providing robots for Woolworths Australia stores, telling an eager audience that the partnership grew out of a need to solve the “grapes on the floor” problem that many retailers face.

Customers, especially ones in supermarkets like Woolworths, routinely slip and fall on dropped food items like grapes, and this problem can sometimes lead to onerous lawsuits for retailers.

Rowland’s Badger robots now work with teams at a handful of Woolworths in Australia to monitor aisles for any fallen food and notify workers of where a cleanup is needed.



The Bossa Nova robot on display at NRF 2020.

Rob McCartney, format development director at Woolworths, said a robot is deployed almost every hour and can cover a 35,000-square-foot store in about 27 minutes.

This specific use case expanded rapidly in ways McCartney and Rowland didn't expect. Employees at each store have now given their robots names and adopted them as part of the community. They've become such a hit that kids routinely come to the store just to take Instagram photos with the robot.

Right now, most robotics companies are focused on building tools that can handle relatively simple tasks in an effort to ease retailers and the public into more widespread use.

The success of the robots at Woolworths Australia locations has prompted Badger to look into how they can expand the capabilities beyond spills and dropped items.

"Can the robot now identify out of stocked items? Can it identify where my displays are not the way I set them up and price inaccuracies? Can I give that data in a way that Rob can take action and start breaking through to fix problems?" Rowland said.

## FUTURE USES

Rowland said there are an endless number of tasks robots could potentially handle and it was only a matter of time before they were deployed in even more retail situations.

"The warehouse environment, to me, is a natural next step. Given enough time, you can train a machine to look at anything. Even in the short term, with some human inspection, I can check bay doors or fire extinguishers or smoke or glass in certain areas. It's a perfect application," Rowland said.

Baylin added that Brain works with many robotics companies that produce tools able to handle a variety of tasks at retailers like Walmart and Kroger.

Brain saw a 500% increase in robot deployments last year and that number is sure to rise as more retailers see the benefits of robots, Baylin added.

His company is working to make robots more approachable and less intimidating so they can be deployed in more situations. While some may question what effect the rapid increase in robots will have on human employment, he was quick to say that the jobs these machines handle are things people shouldn't have to do any longer.

"We're looking at providing a more repeatable, stable process. We want people to have high-value roles. Checking the same things can be monotonous," Baylin said. "We think robots can take those roles and humans can serve in higher-value roles within the store. Think of the robot less as a replacement and more as an augmentation of work."

# THE GROWING ROBOT WORKFORCE MEANS WE'LL NEED A ROBOT HR DEPARTMENT, TOO

Just because they are robots doesn't mean they shouldn't get the resources they need.

**BY: DAPHNE LEPRINCE-RINGUET/ZDNET**

Retailers are increasingly adopting artificial intelligence and robotics, both in brick-and-mortar shops and in warehouses, and with a new robot workforce comes the need for new management methods.

That's right: in the near future, HR departments won't focus only on human employees, but also include a robot resources department to look after non-human workers.

According to research firm Gartner, robot resources could be a thing as early as 2025. In the next five

years, predict Gartner analysts, at least two of the top ten global retailers will have reshuffled their HR departments to accommodate the needs of their new robot workers.

There is no need to start thinking about AI holidays and robot retirement parties. Rather, robot resources organizations will be procuring, maintaining, training, taxing, decommissioning and disposing of obsolete machinery.

With AI-powered robots being particularly suited to the retail industry, Gartner's research predicts that 77% of retailers plan to deploy AI as early as 2021. Automation of tasks such as floor cleaning, data-collection or security could have promising results – and the very first use case identified by the research firm is warehouse picking.

Big retailers have already demonstrated the potential of scaling AI and robotics in the warehouse. Walmart, for example, recently unveiled Alphabot, a robotic fulfillment system implemented in the retailer's 20,000 square-foot warehouse in New Hampshire, and [which combines human labor and robot speed to pick 800 products per hour](#).

Similarly, US giant Kroger signed a deal in 2018 with UK company Ocado to build huge automated robot warehouses, [in which dishwasher-sized robots coordinate in swarm-like behavior to pick orders](#) before handing them over to human employees to pack into bags.



It is largely customer demand for both accuracy and speed that has boosted retailers' interest in robotics. "The retail industry continues to transform through a period of unprecedented change, with customer experience as the new currency," said Gartner's research director Kelsie Marian.

"The adoption of new digital technologies and the ever-changing expectations of customers continues to challenge traditional retailers, forcing them to investigate new human-hybrid operational models."

But just because robot resources are coming of age, that doesn't mean that human resources are going anywhere.

But just because robot resources are coming of age, that doesn't mean that human resources are going anywhere. Quite the opposite, argued Marian: retail workers will have to work alongside new robotic colleagues, and the new paradigm will require careful planning.

She highlighted that choosing the right candidate – human or machine – for a given job will be critical for success. "Retail CIOs must provide ongoing maintenance and performance monitoring for effectiveness," she said. "If not, the team may become counterproductive and lead to a bad customer experience."

In that respect, Amazon may well be an example of success. The retail giant started working with robotics as early as 2012, when it purchased robot manufacturer Kiva Systems. Working in tandem with human employees, Kiva's robots transport pallets of inventory from one location to another in Amazon's warehouses. More recently, [they have started scanning and boxing items to be sent to customers.](#)

Amazon said that if installed in each of its 55 US fulfillment centers, the robots could eventually replace 1,300 employees. The news sound bad, but in parallel the company announced that it would pay workers up to \$10,000 to quit their jobs and set up their own delivery business, in order to tackle [retail's infamous last-mile logistics challenge.](#)

Since the initiative was announced last year, tens of thousands of workers have applied to Amazon's new delivery service program.

According to Gartner's analysts, such examples of human-robot collaboration will become mainstream in future retailers' business models. "This means the robot will have to mesh with the human team – essentially meaning that both sides will need to learn how to collaborate to operate effectively together," she said.

Hence the importance of rethinking HR departments. The good news is that those new robotic teams shouldn't be requiring too much feedback forms and probation paperwork.

# IS THIS THE TIPPING POINT FOR DELIVERY BY ROBOT?

The pandemic has created oddly perfect market conditions for robots to thrive.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

The [pandemic](#) has hurt many industries and many workers. A select few industries, however, are booming.

Streaming VOD services? We caved and bought the kids Disney+ after a week. Online grocery ordering? [Unprecedented market adoption.](#)

Food and grocery delivery robots seem likely to fall into this small list of pandemic booms. [Starship Technologies](#), probably the best known of the delivery robots, has been expanding beyond small

testbeds and is rolling out its robot food delivery service in Fairfax City, VA. Tens of thousands of residents will now be able order contactless delivery from a bunch of area restaurants and grocers. Starship has been [delivering on the campus of George Mason University since early last year.](#)

It makes sense that the sector would be primed for a boom. Last year we saw plenty of successful deployments of robot delivery in limited testbeds. The technology is progressing quickly, but the chokepoint has always

The technology is progressing quickly, but the chokepoint has always been a yarn ball of local regulation and mixed feelings among consumers and city dwellers, who don't always relish sharing sidewalks with roving wheeled robots.



IMAGE: ISTOCKPHOTO/SARAWUTH702

been a yarn ball of local regulation and mixed feelings among consumers and city dwellers, who don't always relish sharing sidewalks with roving wheeled robots.

Starship, for one, has been lobbying aggressively for legislation to allow delivery robots on sidewalks, both in the U.S. and abroad.

But those hurdles have largely collapsed overnight. It's likely the aversion to robots has been outpaced by general fear of transmission, and that counsels rapid adoption of delivery robots in communities that may have otherwise throttled rollouts.

In the US, Starship, which operates fleets of robots that local restaurants and stores can tap into as-a-service, recently launched in Washington, DC, Tempe, AZ, Mountain View, CA and Irvine, CA. In the UK, the company has expanded its service area in Milton Keynes, where the robots have been delivering food and groceries to local residents since 2018. Users access the service via the Starship Food Delivery app, choose from a range of groceries, food and drink items from participating suppliers, and then drop a pin where they want their delivery to be sent. Once the robot arrives, they receive an alert, and can then meet and unlock the robot through the app. Each robot can carry up to 20 pounds, about three shopping bags of goods.

Twenty of Starship's robots are now rolling around Fairfax.

“Fairfax City officials reached out to us as a way to help connect their residents with local businesses in these unprecedented times,” said Ryan Tuohy, SVP Business Development at Starship Technologies. “There is huge demand for contactless delivery now and our robots are an ideal way for residents to get what they want delivered to their door while supporting local businesses. We are really grateful that we can help now and in the future.”

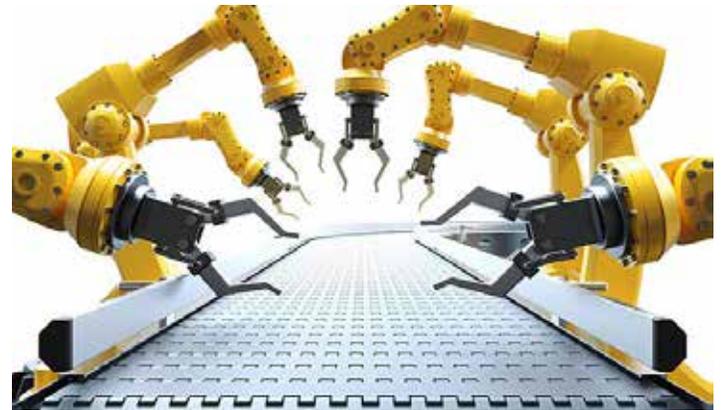
# ROBOTS ARE TAKING OVER DURING COVID-19 (AND THERE'S NO GOING BACK)

Automation can stand in where human workers have to stay home. No one's saying it, but investors might as well be with their wallets.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

Timing is everything. Robots, it seems, are lucky that way.

The [global pandemic](#) has sidelined workers across an unthinkable swath of sectors during a particularly tight labor market. Automation solutions that were unthinkable a twenty years ago have blossomed thanks to the convergence of technologies like machine vision, machine learning & [AI](#), open-source



robotic operating systems, and mobile components and sensors. A global problem, meet futuristic solution.

Even in a turbulent market (and maybe especially in a turbulent employment environment), investors seem willing to back robots. The latest example: ForwardX Robotics, a Beijing-based robotics firm specializing in logistics, just announced a new round of Series B+ funding in the amount of \$15 million, bringing the company's total funding to more than \$40 million.

There are plenty of other examples. SoftBank-backed BrainCorp, which makes robotic scrubbers for, among other applications, healthcare [just raised \\$36 million](#).

“We are seeing huge challenges for supply chain leaders across the logistics and manufacturing industries, from growing labor shortages and consumer expectations to a greater need for flexibility,” explains Nicolas Chee, founder, and CEO of ForwardX Robotics. “Our AI-based automation solutions allow our customers to adapt to a rapidly changing landscape and boost their productivity and efficiency three-fold. With the fallout of COVID-19 already here, enterprises will be looking to futureproof their operations and we’re going to be there with them as they make the transition.”

Overall, the market for autonomous mobile robots (AMRs) and autonomous ground vehicles (AGVs) is forecasted to generate [over \\$10bn by 2023 according to Interact Analysis](#), and that prediction relies on data from before the COVID-19 pandemic.

This certainly didn't happen overnight. The seeds of a robotic revolution have been sprouting for over a decade, going back to research lab [Willow Garage](#) and the groundbreaking robotics research that began coming out of [DARPA contests in the early-2000s](#). Collaborative robots, still a small fraction of the overall automation industry, have [become insanely good at performing repeatable tasks](#) around humans. Mobile robots are whizzing down logistic warehouse aisles and [taking inventory of products at Walmart](#).

All the while the party line in the industry has been that the robots aren't meant to replace workers but to make work easier for talented professionals. Marketing professionals get oodles of money to sell that premise, and it's a palatable sales pitch, certainly easy enough to swallow in a labor crunch during a strong economy when the creep of automation is tough to quantify in terms of human toll.

The pandemic may change that. Workers are furloughed in all sorts of industries, companies are closing shop or tightening belts, and that deferential tone toward the worker, whom automation was touted as helping, has been replaced by another pitch: Automation can stand in where human workers have to stay home. No one's saying it, but investors might as well be with their wallets.

"Most of the automation equipment in the industry is used to replace manual labor in repetitive and simple processes. However, in the future, we believe collaborative robots will increasingly participate in complex production processes," says Felix Yang, Accelerated Digitalization Lead, Greater China at SF DHL China, a ForwardX customer and the largest third-party logistics provider in the world.

That's about the long and short of it. Workers are an uncertain bet in a world where every human might have to stay home for a few months to avoid transmitting an infectious disease. Like it or not, robots are primed to take up the slack.

# SINGAPORE HOSPITAL DISINFECTS PATIENT ROOMS USING XENEX LIGHTSTRIKE ROBOTS

Terumo Singapore says the robots can disinfect a room within 15 minutes.

**BY: AIMEE CHANTHADAVONG/ZDNET**

The Singaporean arm of global medical supplier company [Terumo](#) recently partnered with [Xenex](#) to deploy a fleet of [Lightstrike robots](#) at one of Singapore's general hospitals in a bid to thoroughly disinfect hospital rooms of pathogens.

The deployment follows the hospital's eight-month trial of the robotic technology as part of its infection prevention strategy. During the trial, tests were carried out before and after standard cleaning protocols, and after use of the Lightstrike robots to validate their ability to destroy a variety of pathogens.



Speaking to ZDNet, Terumo Singapore managing director Kevin Seto explained how using the robots has helped hospital cleaning teams to meet cleaning and disinfection protocols.

“We can see with the recent jump in COVID-19 cases, the healthcare system is being stretched and the disinfection robots can help minimise infection risks and avoid human error,” he said.

According to Seto, the cleaning and disinfection process at a hospital typically takes up to four hours for one room, whereas the robots can disinfect each room within 15 minutes.

“It’s fast, safe, and effective,” he said. “Each robot can disinfect a number of rooms in one day. This will significantly reduce the turnaround time for hospitals.”

Seto also assured that the work performed by Lightstrike robots is complementary to the existing work of cleaning staff rather than a replacement as it is deployed into a room after the usual cleaning protocols are carried out.

Each Lightstrike robot is powered by pulsed xenon ultraviolet light that Terumo Singapore says can deliver up to 4,300 times more germicidal UV pathogen killing intensity than mercury UV technologies, as well as penetrate the cell walls of pathogens.

A [recent study](#) by the Texas Biomedical Research Institute found the Lightstrike robot could destroy live SARS-CoV-2, the virus that causes COVID-19, in two minutes.

“Less than half of the surfaces in hospital rooms are disinfected because there just isn’t time to get into the nooks and crannies that are invisible to the human eye, and can remain on tray tables and doorknobs. Lightstrike is able to destroy any pathogen that may have been missed during the manual cleaning process,” Seto said.

He added that given the current environment with the [coronavirus pandemic](#), he expects there will be an increased demand for such technologies to help with reducing healthcare-related infection risks and enhancing existing infection control practices.

“When we can see the superbug that causes the infection becomes resistant to antibiotics, cleaning chemicals, and even hand sanitisers, robotics for disinfection are needed in the battle against superbugs, which is what our LightStrike robots can provide,” he said.

Terumo Singapore is currently in talks with other hospitals in Singapore to roll out the Lightstrike robots, Seto said.

Xenex LightStrike robots are used at over 500 healthcare facilities worldwide, including in Singapore, Thailand, Japan, South Korea, Canada, US, Europe, South America, and Africa.

According to Seto, the cleaning and disinfection process at a hospital typically takes up to four hours for one room, whereas the robots can disinfect each room within 15 minutes.

# ROBOTS ARE LEARNING WORKPLACE ETIQUETTE AT MIT

At a time when social distancing has become the norm, MIT researchers are teaching robots how to work more effectively alongside humans.

**BY: ESTHER SHEIN/TECHREPUBLIC CONTRIBUTOR**

Workplace etiquette is not something normally associated with robots, but a new MIT project aims to teach robots social etiquette to more effectively work alongside humans. In the current [COVID-19](#) landscape where it's not safe for human workers to interact with one another, imbuing robots with this sort of information could speed deployment into workplaces to assist with tasks that people would otherwise need colleagues for, according to MIT.

While humans learn workplace etiquette on the job, it's of course, a much different value proposition for robots. The machines cannot develop these skills by simply asking questions and understanding commands like the AI in Siri or Alexa, according to researchers at MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL). Robots need to know when it's appropriate to communicate, and if they should even be talking at all.

Rather than telling robots exactly when and how to communicate, the researchers have developed a new framework called [CommPlan](#), which gives the machines a few high-level principles for good etiquette, according to CSAIL.

The CommPlan framework “decides if, when, and what to communicate during human-robot collaboration,” the researchers wrote. Then it's up to the robot to make decisions that would allow it to finish the task as efficiently as possible. CommPlan uses learning and planning algorithms to do real-time cost-benefit analyses on its decisions, CSAIL said.

“For example, will asking the human a question save time by making sure the robot doesn't do the wrong thing, or will it slow down the human from doing what they need to do? The robot might weigh a combination of factors, such as whether the human is busy or likely to respond given past behavior.”



IMAGE: MIT

MIT human robot team perform a meal preparation task in a simulated kitchen environment.

The team experimented with approaches in a kitchen scenario involving tasks such as assembling ingredients, wrapping sandwiches and pouring juice. The tests revealed the human-robot teams performed more safely and efficiently using CommPlan, CSAIL said.

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Vaibhav Unhelkar, a CSAIL PhD graduate who co-authored the paper about the framework, said in a statement that he is encouraged by the success of CommPlan, because such policies require significant time, effort, and expertise on the part of programmers. “CommPlan combines the power of human experts and algorithms to create policies that are better, and at the same time, require reduced developer effort,” Unhelkar said.

Additionally, the researchers said that a handcrafted policy relies on ‘cut-and-dried rules’, making it more

likely to suffer from hiccups like over communication.

“Many of these handcrafted policies are kind of like having a coworker who keeps bugging you on Slack, or a micromanaging boss who repeatedly asks you how much progress you’ve made,” said MIT graduate student Shen Li, another of the paper’s authors, in a statement. “If you’re a first responder in an emergency situation, excessive communication from a colleague might distract you from your primary task.”

The researchers said the positive performance results from CommPlan indicate that it is “ripe for applications in other domains, from healthcare and hospital deliveries to aerospace and manufacturing.” While the team has so far only used the framework for spoken language, they say it could also be applied to visual gestures, augmented reality systems, and other approaches, according to CSAIL.

“This work is exciting because it reasons about what the human needs from the robot, and the robot is explicitly trying to communicate just the right amount,” said Brown University professor Stefanie Tellex, in a statement.

Tellex, who was not involved in the research, added that “This will enable robots to be more sensitive and responsive to human needs and hopefully make them more helpful to people.

# THE ROBOTS HANDLING YOUR ONLINE ORDERS

Automation is getting a big boost thanks to consumer behavior changes during the pandemic.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

Fulfillment warehouse robots are having a moment as online shopping continues to [increase during the pandemic](#). The hot market for autonomous fulfillment solutions has helped [Locus Robotics](#), which makes autonomous mobile robots for use in fulfillment warehouses, raise an additional \$40 million during a successful Series D this week.



The new infusion brings total funding for Locus to \$105 million. The company plans to use the money for R&D and expansion into new global markets, including in Europe, where it plans to open a new regional headquarters this year.

“Locus Robotics is thrilled to announce this new round of funding amid our most transformative year yet,” said Rick Faulk, CEO of Locus Robotics. “The new funding allows Locus to accelerate expansion into global markets, enabling us to strengthen our support of retail, industrial, healthcare, and 3PL businesses around the world as they navigate through the COVID-19 pandemic, ensuring that they come out stronger on the other side.”

In general, the pandemic has had a huge influence on consumer behavior, accelerating existing growth of online shopping. That’s been a boon for the automation sector. As I’ve written, technologies such as mobile delivery robots are seeing increased adoption. [Starship Technologies](#), for example, probably the best known of the delivery robot startups, has been expanding beyond small testbeds and is rolling out its robot food delivery service in Fairfax City, VA. Tens of thousands of residents will now be able order contactless delivery from a bunch of area restaurants and grocers. Starship has been [delivering on the campus of George Mason University since early last year](#).

Behind the scenes, robots that help warehouses process and fulfill orders are benefitting from what has become our critical reliance on online shopping.

“Automation has proven to be a critical solution for retail and third-party logistics businesses during this challenging time,” says Tony Palcheck, Senior Director, Zebra Ventures, which led Locus’ Series D. “As the retail industry continues to shift to e-commerce, Locus Robotics’ warehouse automation will help businesses meet the demands of this ‘new normal,’ ensuring that customers can increase operational efficiency to meet requirements for fast, accurate delivery.”

Behind the scenes, robots that help warehouses process and fulfill orders are benefitting from what has become our critical reliance on online shopping.

Locus Robotics makes autonomous mobile robots that operate collaboratively with human workers to improve piece-handling productivity as much as 2X-3X, with less labor compared to traditional picking systems. The robots are aimed at helping 3PLs and specialty warehouses efficiently meet the increasingly complex and demanding requirements of fulfillment environments, which now include social distancing restrictions -- something robots don’t have to worry about.

“We have recently seen a dramatic disruption of retail with e-commerce growth as high as 400% year-over-year in some categories. And others were severely limited as the bulk of their inventory was in stores that they could not get into due to lockdowns. It’s critical that retailers are prepared for direct fulfillment from the warehouse,” said Greg Buzek, President of IHL Group. “This announcement underscores the need for companies to prepare for today’s new labor challenges that will be impacted by the significant volume increases that are already occurring. Companies investing now in warehouse automation, particularly AMRs, will be better positioned for success in the post-pandemic economy as they can support sales from any channel.”

# DELIVERY ROBOTS MANEUVERING TO DEVOUR FOOD DELIVERY MARKET

Next few weeks will set the tone for the sector for years to come.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

No-contact pizza delivery? It's free if you're a healthcare worker in certain areas in the U.S. and U.K. served by Starship Technologies, one of a handful of robotic delivery companies whose business models have been in hyper-drive these last few months.

As restrictions related to COVID-19 gradually ease, developers and service providers in the autonomous delivery space are scrambling to eat as much market share as possible in the still-limited locations where they're authorized. But even robotic delivery, which seems perfectly tailored to the locked-in reality of early 2020, hasn't been spared by the pandemic, and these next few weeks will set the tone for the sector for years to come.



Starship operates fleets of robots that local restaurants and stores can tap into as-a-service.

In general, the food delivery market is walking a fine line, attempting a sensitive response to the upheaval of these last few months while also keenly aware that there's a customer grab underway and the landscape for the market will largely be remapped during the lockdown. [Postmates and Uber Eats have slashed delivery prices](#) and rolled out free delivery programs for certain affected customers, for example, which has the dual advantage of coming off as sensitive and helping the delivery leaders capture new customers.

Autonomous delivery services, which use either autonomous mobile robots or self-driving vehicles to execute deliveries, have been adopting the same strategies, albeit on a scale befitting a much tighter regulatory environment than other delivery services. [Starship Technologies](#), probably the best known of the delivery robots, [recently rolled out its robot food delivery service in Fairfax City, VA](#), for example, touting the access it's given residents to food and grocery delivery during the pandemic. Now the company has announced it's giving free delivery for healthcare workers in the US. The company also offers free delivery to NHS workers in the UK, where its service is available.

“Healthcare workers have been working long hours under stressful conditions and often don’t have the time to get to the grocery store,” explains Ryan Tuohy, Senior Vice President of Business Development at Starship Technologies. “Our contactless robots can help them get what they need and we’re grateful to help so many families during this trying time. We’re honored that we can do something to make life a little easier, especially for the healthcare workers who have been on the front lines of this pandemic.”

Somewhat offsetting the favorable market conditions for autonomous delivery services have been the widespread closures of spaces testbeds in spaces that skirt municipal and state regulatory environments. A company called Flytrex, for example, made headlines by offering [food delivery via drone at a golf course in North Dakota recently](#). The access-limited space permits management to collect waivers from golfers, which allows Flytrex to avoid strict FAA regulation when operating over public spaces.

Starship Technologies has similarly been taking its food delivery model, in which it pairs fleets of its six-wheeled robots with local providers as part of an as-a-service model, [to technology-friendly markets like college campuses](#). But with golf courses and colleges shuttered for the foreseeable future, those early successes have hit the skids. Most robotic delivery companies, including Starship, are in early stages of longer term strategies and are heavily capitalized, so it’s unlikely those lost customers will be any kind of death knell. We’ll find out soon if new market adoption and brand awareness opportunities created by the pandemic have offset those losses.

“Starship has been a lifeline for me over the past few weeks,” says one healthcare worker, Ann, in Mountain View. “Supporting local business and keeping the risk down is a win-win. Working 80+ hours is rough! These robots bring me what I want in minutes. I love them!”

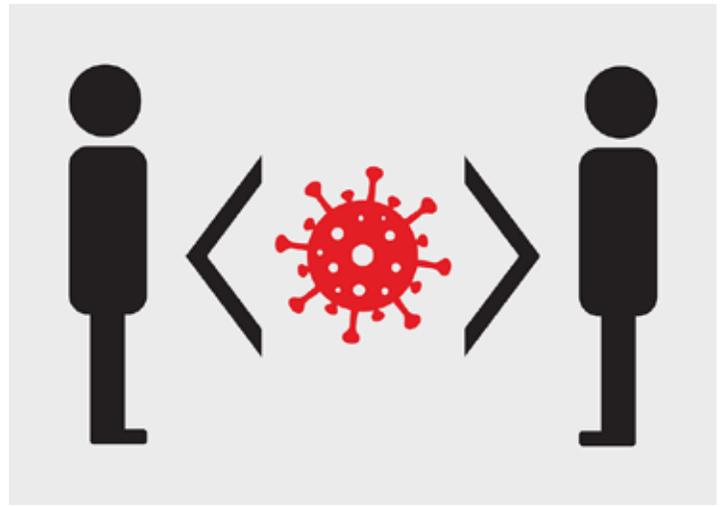
# ROBOTIC WATCHDOGS AND WEARABLES ENFORCE SOCIAL DISTANCING

Developers are rushing COVID-19-related updates to their existing technology stacks in these industries.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

Social distancing is important, and perhaps nowhere more so than at work, where many essential workers have been toiling on site. Now, app updates are permitting technologies used in settings like warehouses and manufacturing floors to monitor [social distancing](#).

In some cases, these high tech police officers are even narking out employees who don't follow guidelines to management. It's part of the growing pains as employers and employees grapple with [retrofitting existing workspaces](#) to maintain safe distancing.



“Our key customers are sharing with us the challenges they’re facing as they rethink and retool to restart operations,” says Andreas Koenig, CEO of [ProGlove](#), creator of industrial wearables, such as a barcode scanning solution. “We faced similar challenges as we reviewed our own processes for safety and efficiency. It is our natural tendency, as humans, to want to go back to doing things the way we did them before, however, it’s not possible. Proper social distancing is now key to a successful return to work.”

ProGlove is one of the technology providers I’ve come across that’s pushing proximity sensing into its existing technologies in response to COVID-19-related changes. The company’s new ProGlove Connect Proximity app provides an additional layer of feedback on an Android device alone or when paired with a ProGlove MARK barcode scanner which rests on the employee’s hand.

When personally equipped with the MARK wearable scanner and paired Android device, workers coming within close proximity of each other are alerted. The alerts come to the workers via a full array of options on the wearable scanner including audio sound, optic LED light, and haptic vibration signals. The company points out this is especially important in a busy or noisy shop floor environment where an Android alert alone in a pocket could be easily overlooked.

“We tested the MARK upgrade in-house and it works beautifully. We’re now rolling it out on our own assembly line,” notes Konstantin Brunnbauer, VP of Production for ProGlove. “For my team it is easy to want to fall back into old patterns of working together but with this extra reminder we can maintain safe distance.”

When personally equipped with the MARK wearable scanner and paired Android device, workers coming within close proximity of each other are alerted.

Another company, [inVia Robotics](#), which makes warehouse automation solutions for e-commerce businesses (many of which have seen [increased ordering during the lockdowns](#)) has added social distancing to features to its existing stack. The new features proactively keep workers at a safe distance from each other and also notify both warehouse workers and warehouse management if that distance is breached.

Essentially, the [robots](#) are now social distancing enforcers capable of informing management when employees slip up.

“We listened to our customers who are concerned about how to keep their e-commerce fulfillment running without disruption but also want to ensure safety for their people,” said Lior Elazary, co-founder and chief executive officer of [inVia Robotics](#). “This solution can be implemented immediately and can easily be adapted to address new workplace concerns as they arise.”

It’s a glimpse of what’s likely to become a new reality across various sectors: Technology enforcing evolving guidelines for our new infection-conscious reality.

# LOOK OUT! A LOW-POWERED SOLUTION TO KEEP ROBOTS FROM CRASHING

A smart neural chip brings power- and-cost-effective radar to drones and robots for the first time.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

One of the big regulatory hurdles to the commercial adoption of [drones](#) -- the kind that fly as well as the kind that roll down sidewalks and may one day deliver you a pizza -- is collision safety. A small handful of safety incidents could have major consequences for adoption, and many regulatory bodies are loath to take chance on automated equipment designed to operate in public spaces without much precedent.



Sensor redundancy certainly helps the case commercial for [autonomous mobile robots](#) and [flying delivery drones](#), and radar is a fantastic sensor for collision avoidance when used in concert with other sensing modalities. But radar is problematic in that it adds payload weight and increases power requirements, upsetting the careful balancing act engineers must perform, particularly when developing flying robots.

A Belgian research and innovation hub focusing on nanotechnology has developed solution that may open the floodgates for radar-based collision avoidance in UAV, ground drones, and robots of various stripes. [Imec](#), headquartered in Leuven, has built what it claims is the world's first spiking neural network-based chip for radar signal processing.

Interestingly, the chip was initially designed to support electrocardiogram (ECG) and speech processing in power-constrained devices.

“Today, we present the world’s first chip that processes radar signals using a recurrent spiking neural network,” says Ilja Ocket, program manager of neuromorphic sensing at imec. “SNNs operate very similarly to biological neural networks, in which neurons fire electrical pulses sparsely over time, and only when the sensory input changes. As such, energy consumption can significantly be reduced. What’s more, the spiking neurons on our chip can be

connected recurrently – turning the SNN into a dynamic system that learns and remembers temporal patterns. The technology we are introducing today is a major leap forward in the development of truly self-learning systems.”

Interestingly, the chip was initially designed to support electrocardiogram (ECG) and speech processing in power-constrained devices. But its generic architecture turned out to be easy to reconfigure to process a variety of other sensory inputs like sonar, radar, and lidar data. The use case of drones seemed to naturally suggest itself from there. The drone industry, after all, is built on a foundation of power-constrained devices. Further, those devices need to react quickly to changes in their environment in order and, crucially, avoid obstacles.

“Hence, a flagship use-case for our new chip includes the creation of a low-latency, low-power anti-collision system for drones. Doing its processing close to the radar sensor, our chip should enable the radar sensing system to distinguish much more quickly – and accurately – between approaching objects. In turn, this will allow drones to nearly instantaneously react to potentially dangerous situations,” says Ilja Ocket. “One scenario we are currently exploring features autonomous drones that depend on their on-board camera and radar sensor systems for in-warehouse navigation, keeping a safe distance from walls and shelves while performing complex tasks. This technology could be used in plenty of other use-cases as well – from robotics scenarios to the deployment of automatic guided vehicles (AGVs) and even health monitoring.”

It’s a great example of the technology and sensor convergence that’s driving much of the automation revolution. It could also be an important step as companies and organizations the world over make their cases to regulatory agencies to open access to skies and public roads for commercial drones.

# BEST TELEPRESENCE ROBOTS FOR BUSINESS IN 2020: DOUBLE ROBOTICS, OHMNILABS, MEETING OWL, AND MORE

The best telepresence hardware to go beyond video conferencing and make remote work truly collaborative.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

How can remote workers make their presence known in their organization? How can enterprises overcome the limitations of video conferencing and enable a level of communication and collaboration that approaches on-site interaction?

Telepresence robots have been on the scene for the better part of a decade, though as global upheavals reshape work and reorient attitudes toward remote participation, the technology may finally be primed to break out of its niche user base and go mainstream. The timing is fortuitous: The [market is now mature](#) enough that consumers have choices when it comes to feature set and price point. As companies downsize physical locations and revamp their policies toward distributed workforces, telepresence offers both technological benefits and collaboration advantages that will appeal to some employers and workers alike.

The current telepresence lineup reflects the range of use cases and intended end-users out there, including a handful of models designed for specific fields and workflows, as well as others that fit organizations of any size.

These are our picks for the best telepresence robots out there right now.

## DOUBLE 2 BY DOUBLE ROBOTICS

### Best telepresence for small businesses already using iPads

Double Robotics has been one among a [few telepresence robotics companies](#) offering lower-priced models focused on core functionality: Mobile video conferencing that's drop-dead simple to use. Affectionately called a Segue with an iPad mount, the Double 2 did something



very important for the technology by giving consumers a palatable entry point to the world of telepresence that required neither a massive capital outlay or a master's degree in robotics.

Though now superseded by its predecessor (see below), the Double 2 is still a tremendous value, particularly if your organization uses iPads already or the IT department has one lying around.

A wide-angle lens, motorized height control to meet your coworkers at eye level, and automatic stabilization and parking make this bare-bones telepresence model drop-dead simple to use.

Double is still selling the Double 2 through Amazon and third-party suppliers for \$2,749.

## OHMNI ROBOT BY OHMNILABS

### Best budget telepresence

In the battle for low-cost, truly robotic telepresence, OhmniLabs has been giving rival Double a major run for its money.

At under \$2200, the Ohmni Robot weighs just 20 pounds and folds up, meaning you can take it anywhere, but still manages all the functionality you need in a telepresence robot. It features wide-angle, low-latency streaming at HD+ resolution and real-time full-resolution zoom to read whiteboards or see fine details at full UHD 4K detail.

A secondary dedicated wide-angle navigation camera lets you see around the base of Ohmni while you're driving, which you can do remotely from just about any standard device. The unit features a bright 10.1-inch screen and integrated Jabra speakerphone for great audio. It doesn't have automatic rising and lowering like Double, but the robot can move its head side to side for natural interactions.

OhmniLabs is also thoughtful about who might use the device, which has dual-band Wi-Fi radio with full 2.4GHz + 5GHz support and optimized background scanning and roaming for large spaces. Full 802.1x support means it should be simple to run on business or school networks.



## DOUBLE 3 BY DOUBLE ROBOTICS

### Best bang for your buck

Where the Double 2 used a tablet display, Double 3 replaces the iPad with a fully-integrated solution using an [Nvidia Jetson TX2 GPU](#), two Intel RealSense depth sensors, two high-resolution cameras, and a beamforming microphone array. In place of the iPad is an integrated screen and new feature sets, including [AR overlays](#), that really step up the functionality and feature set game of the Double.

Some of those features include a new click-to-drive interface, obstacle avoidance, and pan/tilt/zoom video, all of which contribute to a fully-immersive remote experience that's still intuitive to use. Perhaps the biggest functionality upgrade is the addition of mixed reality overlays.

In Double's version of mixed reality, virtual 3D objects are added into the video stream to appear as if they're in the real world. Virtual objects include helpful waypoints to make the video feed more informative during navigation.



The Double 3 with charging dock runs \$3,999. If you already have a Double 2, you can upgrade your current device with a Double 3 head for \$1,999.



## AVA BY AVA ROBOTICS

### Best telepresence for high-end corporate settings and hospitality

With the Ava Telepresence robot, remote users easily and safely navigate through large workspaces, event spaces, and retail spaces with an enterprise-grade video conferencing system designed to make interacting with people on-site feel natural.

Unlike lower-priced models, the robot features intelligent, autonomous navigation. Remote users simply specify a destination, and Ava automatically moves to the desired location while avoiding obstacles. The technology is slick: The robot utilizes advanced mapping to learn the local environment and create a realistic map of the area, which enables it to navigate at the push of a button. Obstacle avoidance we're used to seeing on autonomous mobile robots in fields like logistics and fulfillment enables Ava to navigate around people and avoid tumbles down the stairs.

Perhaps Ava's biggest selling point is its form factor. This is one sleek unit, making it ideal for applications in client-facing offices and sectors like hospitality.

It's also secure. Embedded enterprise-grade security (including encryption, secure HTTPS management, password protection) means Ava is well suited to a corporate IT infrastructure.

## STYLEVIEW TELEPRESENCE CART BY ERGOTRON

### Best telecommunications cart for healthcare

This is a niche product for the healthcare market, albeit one that's extremely flexible and could be a good option for a number of related fields. As doctors increasingly embrace telemedicine to mitigate exposure risks, it's a good time to be selling telecommunications to doctors' offices and hospitals, and Ergotron has been in the game for a while.

Built on an open architecture that allows the cart to integrate most standard communications equipment, this pro-grade telecom console isn't technically a robot but rather a rollable ergonomic cart designed for patient consultations.

Designed with customization in mind, it can be configured with the devices and network-compatible systems a hospital is already using.



### MEETING OWL BY OWL LABS

#### Best desktop video conferencing

Meeting Owl is a 360-degree video and audio conferencing system that automatically focuses on the people speaking in the room. It doesn't move, so it's not a robot by most definitions, but its autonomous functionality makes it an excellent and highly affordable tabletop system for individuals and teams that routinely conference and collaborate remotely.

Eleven-inches tall, Meeting Owl uses an eight microphone array to pick up sound and lock in on the person speaking. Remote viewers on the other end get a panoramic view of all the meeting attendants and a close-up view of the current speaker.

The system comes in original and Pro versions. The Pro version improves on the Meeting Owl's 720p picture and increases audio pickup range from 12 feet to 18 feet, which is especially useful for larger teams or any collaboration utilizing a whiteboard.

The system integrates with all the major video conferencing services so usability is a snap. The original retails at \$799 and the Pro version goes for \$999.

## KUBI CLASSIC BY KUBI

### Best telepresence for education

Kubi is an inexpensive robotic docking cradle for tablets that augments the teleconferencing experience you're used to with the addition of movement.

During video conferencing, the remote participant can steer the cradle to look around a room. "Kubi" means "neck" in Japanese.

That makes it a particularly useful device for team environments where one participant is remote. The remote worker sits at a laptop or desktop but is able to look around the room to engage with speakers, which the device's developers say enhances the interactive experience.

An enhanced audio kit and a secure docking retrofit to keep tablets secured to the base make them good options for educational environments where learners have to beam into larger classroom settings and engage in conversations but won't necessarily have to move around the classroom.



## BEAM BY SUITABLE TECHNOLOGIES

### Best telepresence for conferences and large events

Anyone in tech or a tech-adjacent industry will be familiar with the sight of telepresence robots roving around conference room floors as virtual attendants beam in remotely.

Beam is comfortable in offices and is used by some of the biggest companies in the world, but this

robot from Suitable Technologies really shines in conference settings, where it's nimble enough to bounce from keynotes to breakouts to hallway banter.

Beam has four wheels (the pro version has 5 for increased stability and maneuverability) and wide-angle navigation cameras. The entire ecosystem was built in-house, which means participants must use Beam's app.

The advantage is security, which is best in class. Using industry-standard technology such as TLS/SSL, AES-256, and HMAC-SHA1, Beam encrypts all communication that travels through our system to ensure your calls remain private and secure.

## VGO BY VECNA

### Best telemedicine device for healthcare

VGo's parent, Vecna, knows the healthcare sector, so it makes sense that the company has developed a telepresence robot that enables healthcare providers to deliver lower-cost services and improved quality of care virtually.

Telemedicine is certainly having a moment as providers figure out ways of reducing in-person visits, but the robot has also been used to enable homebound students to go to school virtually.

Using the VGo application on a PC or Mac, an internet-connected person located anywhere connects to a VGo in a distant facility. VGo can be shared by a set of people or dedicated to a single person using standard web accounts and permission settings maintained by the admin.

VGo is lightweight, contributing to its excellent battery life, which is best in class at 12 hours. That makes it ideal for clinical environments and hospitals.



## ADVOCATING FOR TELEPRESENCE

Offices are coming around to telepresence solutions for remote workers, and the recent health crisis has put the transition to distributed workforces into hyperdrive. Teachers and school administrators are now also embracing remote learning, which, in the short term, can quell infection rates -- but, in the longterm, may be a way to maximize limited resources while bringing needed services to students.

Markets and Markets [estimated the overall telepresence market will be over \\$300 million by 2023](#), however that market research doesn't take into account the rapid adoption of remote work due to [COVID-19](#) or the expected longterm effects of the global stay-at-home experiment on attitudes toward remote working. Pivoting out of the pandemic, many companies may embrace a partially distributed workforce, which is a huge opportunity for developers of telepresence and video conferencing systems.

For workers, employers, and IT pros who wish to advocate for telepresence systems, the most important strategy is to tout the collaborative benefits of the technology and to have a plan for implementation. Robots in

the workforce carry a longstanding stigma. Coupled with lingering resistance to remote work situations, existing biases on the part of employers or employees could stop proposed adoption of telepresence dead in its tracks.

But advocating for telepresence as a way of maximizing collaboration and approximating the productive magic that happens in [unstructured interactions in hallways and face-to-face chats](#) can help mitigate concerns. As can explaining that most telepresence systems are ready-to-go out of the box with intuitive user interfaces. The technology is carefully designed not to need extensive training to use. After all, most humans don't need training to have natural interactions in person.

## WHAT TO LOOK FOR IN EVALUATING TELEPRESENCE ROBOTS

The biggest questions to ask are who might use a telepresence solution and in what settings. If you're just looking to enhance video conferencing without spending big bucks or implementing new processes and protocols, solutions like Meeting Owl or Kubi would be the best places to start.

However, for those willing to embrace the dynamic features offered by a mobile robot, consider whether your environment is client-facing. A slick robot like Ava makes a great impression, although it comes at a price.

For most SMBs, models from Double or Ohmni are likely to be smart bets. They're relatively inexpensive and provide a seamless user interface. A company can get by with one shared robot to start and easily scale up to meet needs.

After all, once one remote employee gets a robot doppelgänger, it's likely others will want them as well.

# ROBOTIC DRONES: COMING TO A WAR NEAR YOU

Shifting leadership attitudes and new technology development are leading to more robots in war.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

Autonomous drones may soon be following troops into combat to serve as eyes in the sky and conduct detailed surveillance and reconnaissance missions. To date, drone use by military personnel has largely fallen into the category of “piloted” [UAV deployments](#).

The use of autonomous drones extends the flexibility of drone deployment for on-the-ground operators. It also raises important questions about the use of [autonomous and robotic systems in national defense](#).

“Our aerial robots provide unique capabilities that the Government is seeking to develop and deploy. They are completely self-sufficient and a significantly valuable asset in providing superior situational awareness,” said Nader Elm, CEO of [Exyn Technologies](#), one of the companies pushing the development of autonomous UAV for security and defense applications.



The use of autonomous drones extends the flexibility of drone deployment for on-the-ground operators. It also raises important questions about the use of autonomous and robotic systems in national defense.

Exyn began developing for the enterprise and is active in sectors like oil and gas and infrastructure inspection. The company’s drones are designed to work in complex, GPS-denied environments where unknown terrain and uncertain ground conditions can make life perilous for soldiers.

Those abilities make the drones well-suited to defense applications as well. In contrast to other unmanned aerial vehicles used for ground warfare, which predominantly rely on a pilot, Exyn’s drones are fully autonomous and operate without the need

for a human operator or pre-loaded maps. A new mission behavior called Scoutonomy enables Exyn drones to further collect key data to support military intelligence, surveillance, and reconnaissance, such as mapping terrain and tangible structures and identifying the location of enemy forces and equipment.

It's important to note that Exyn's drones are surveillance tools and are not weaponized. As such, they are not subject to strict limitations under Department of Defense Directive [3000.09](#), which requires a human in the loop in use-of-force situations and prescribes limitations on autonomous weapons to prevent them from firing in case communications are lost. But the increasing prevalence of autonomous systems in defense does point to shifting attitudes within the U.S. Department of Defense and signals a further reliance on robotic tools in war fighting.

Developers like Exyn argue that autonomous systems can help keep soldiers safe and avoid operational mishaps due to inadequate or inaccurate intelligence.

"We're most proud of our robots' ability to identify threats, reduce operational risks and save soldiers' and civilian lives in unknown and volatile situations," says Elm. "Now you can send a drone to perform highly sensitive missions that are far too dangerous for human soldiers, and acquire data that is unprecedented in its level of detail, accuracy and timeliness."

It's also worth pointing out that there are civilian applications for the technology, including supporting disaster response and search-and-rescue efforts. Drones like Exyn's can help keep human responders out of harm's way while accelerating the search for survivors trapped in hard-to-reach areas. Because Exyn's drones can cover more area and relay critical information more quickly than many other systems, they are potentially life saving tools for coordinating ground team response, which is typically the most time-consuming aspect of search-and-rescue.

But the real money is in defense, not in search and rescue. It's a safe bet we're going to see an increasing number of autonomous UAV platforms targeting military applications.

# FUTURE OF FULFILLMENT: ROBOTS, TRIKES, AND VERY SMALL SPACES

The future of fast delivery and easy returns depends on a surprising convergence of technologies and real estate.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

Amazon has built an empire out of speeding up delivery. Companies like Zappos and Warby Parker have carved out major customer bases by streamlining returns. How on earth will smaller ecommerce companies compete?

It's an existential question for those hoping to compete in the 2020s. According to a [recent market report](#) by grocery fulfillment company [Fabric](#), 92% of consumers want same-day delivery or pickup and 65% would switch retailers if this service wasn't offered. Using groceries as one metric of the larger ecommerce fulfillment paradigm, 33% of consumers surveyed in the Fabric market report prefer to have their grocery orders fulfilled within two hours, putting incredible pressures on both digital native and legacy brands.

The solution for companies in search of fast delivery and customer satisfaction may lie in an artful combination of [automation](#), last-mile delivery, and an emerging concept called [micro- or nano-fulfillment](#).

“Last-mile delivery is like satisfaction death valley,” explains Asaf Hachmon, Co-Founder and CEO of [Bond](#), a post-purchase solutions company that allows brands to deliver products and accept returns via neighborhood-level distribution centers. “Online brands spend tons of money on ensuring consumers have the absolute best user experience while on their website, yet are forced to entrust couriers to deliver products with that same level of care and attention -- and all too often they don't.”

The idea behind micro-fulfillment is to leverage adaptable automation and robotics to process orders and returns as close to the customer as possible. Where Amazon relies on massive facilities that economically usually must be located outside city centers, companies like Fabric and Bond are pioneering fulfillment centers that may live just down the street.

Bond, for example, is working with 30 online retailers in New York with six 400- to 500-square-foot distribution centers across Manhattan and Brooklyn. The company also delivers to select locations in Queens and



businesses in New Jersey through partnerships with existing distribution centers. It has plans to open six more centers in the New York metro area by March, as well as dozens more throughout the year as it expands into two additional cities by the third quarter of 2020.

The solution for companies in search of fast delivery and customer satisfaction may lie in an artful combination of automation, last-mile delivery, and an emerging concept called micro- or nano-fulfillment.

Their technology routes the order to the closest distribution center, where a local team delivers the order with environmentally friendly electric trikes, usually that same day. With a focus on creating a better customer experience, the technology allows online shoppers to schedule deliveries in 3 hour windows and communicate directly with their delivery person. They also arrange pick-ups for returns, as well as other innovative solutions.

Fabric has chosen to focus its efforts on savvy automation solutions that can streamline pick-and-place operations across a huge variety of SKUs, something that was unthinkable in the robotics sector until recently due to the task-specific nature of most end effectors. Rapid advances in machine and grasping technologies, combined with savvy logistics, are enabling ultra-fast order fulfillment services like Fabric to extend their reach.

Investors seem to be responding. Bond, for example, just completed a fundraising round worth \$15 million led by Lightspeed Venture Partners, which has also invested in eCommerce startups like Bonobos, Affirm, and Verishop. Fabric, for its part, has raised more than \$130 million to date.

For consumers, all of this spells good news for the customer experience. The future will be on-demand.

# SOFT ROBOTIC HANDS MAY SOON HAVE A FIRM GRIP ON THE INDUSTRY

Variability in packaging is the Achilles heel of industrial automation. These soft hands can help.

**BY: GREG NICHOLS/ZDNET CONTRIBUTOR**

Soft Robotics, a company that develops enterprise level soft robotic grippers for a variety of materials handling and pick and place applications, is on a roll. After securing a high level strategic partnership in 2019, the company has announced an oversubscribed Series B worth \$23M.

Back in December, [Soft Robotics](#) rolled out an innovative adaptable gripper system [designed especially to work with FANUC robots via a new controller](#).

The combined product debuted at IREX in Tokyo in December. Unlike robotic end effectors made of rigid materials that only flex via built-in joints, soft end effectors conform to the objects they pick up, allowing for a wider variety of applications with a single unit.

“Variability is the kryptonite of the robotics industry,” says Carl Vause, CEO of Soft Robotics. “By offering a system that is able to grasp and manipulate items that vary in size, shape, and weight, we are able to solve the problem of high variability in both products and processes.”

When I ran into Vause at a robotics conference a couple years back, he impressed me with a story of his end effectors picking up Peeps, the soft candy birds, directly off the line without deforming them, something unthinkable with rigid end effectors.

As I wrote in 2018 following Soft Robotics’ Series A, building a better gripper is now akin to the age-old quest to build a better mousetrap. As use cases for robots proliferate and the demand for automation explodes thanks to fast fulfillment and grocery delivery, one of the big challenges is confronting variability in packaging. Soft Robotics’ proprietary grasping technology, machine vision, and software solutions address these issues for large and meaningful industries such as food and beverage, consumer goods and cosmetics manufacturing, e-commerce supply chains, and more.



Additional use cases include handling item returns. According to Soft Robotics, UPS alone recently processed nearly two million returns on a single day. According to some sources, holiday returns could add up to as much as \$90 to \$95 billion worth of merchandise this year.

“Creating or accelerating a direct-to-customer channel is a strong cross-sector trend that has moved beyond markets such as food packaging and consumer goods manufacturing and more,” says Remy Glaisner, Research Director WW Robotics at [IDC](#). “At the order management level, it also means establishing highly dynamic ‘reverse supply chains.’ However, the general labor scarcity for use-cases related to order management is a critical roadblock. In that context, the role of nimble gripper solutions adaptable to both the inbound and outbound workflows become of strategic importance.”

The gripper problem is being solved by companies like Soft Robotics and labs specializing in soft systems at research institutions like [Carnegie Mellon University](#) and [UC Berkeley](#).

The venture arms of robotics giants ABB and Yamaha Motor Co., invested in Soft Robotics’ last round. Calibrate Ventures and Material Impact participated in the latest round, along with additional existing investors Honeywell, Hyperplane, Scale, Tekfen Ventures, and Yamaha.

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