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Robots mean business: A conversation with Rodney Brooks

Industrial robots revolutionized manufacturing. The chairman and CTO of Rethink Robotics explains why advances in technology mean much more is still to come.

While the ability to automate the manufacturing process—particularly through the use of industrial robots—has proved revolutionary, such technology has traditionally been accessible primarily to large companies. Boston-based Rethink Robotics has sought to make the robotics technology available to smaller organizations with its flagship product, Baxter, a more compact and affordable robot. In this interview, Rodney Brooks, cofounder, president, and chief technology officer of Rethink Robotics, says that the robot revolution has only just begun and predicts that it will spread beyond manufacturing and into other fields such as the service sector. This interview was conducted by McKinsey Global Institute partner Michael Chui. An edited transcript of Brooks's remarks follows.

Sensors and common sense

Over the last 50 years, robots have been identified with industrial robots that have been in factories, mostly automobile factories, where the robots are going through a series of motions again and again, repeatedly, very accurately. But they're really operating the same way they did when they first were introduced in 1961, when computation was incredibly expensive and sensors were very expensive.

In the last 10 years, we've had 50 years of Moore's law, getting the amount of computation we can have in an embedded, lost-cost system so that we can do real-time sensing and real-time 3-D sensing. We also have enough understanding on human–computer interaction and then robot–computer interaction to start building robots that can really interact with people so that an ordinary person—who doesn't have to know how to program—can interact with a robot and get it to do something useful.

The first industrial robots had to be shown a trajectory and follow a trajectory, and that's how the vast majority of industrial robots are still programmed: follow a trajectory accurately. That's your hammer. So now you have to restructure all your nails so that hammer can hit those nails.

In the new robots, in the new style of robots, there's a lot of built-in software, a lot of commonsense knowledge that's just built in. The robot knows—if it doesn't have anything in its hand, it can't put it down. So now you don't have to have error-recovery code put in by the user. We let an ordinary factory worker get the robot to do complex tasks. They don't have to know anything about programming, they don't have to know about quaternions or six-dimensional vectors; doesn't come into it. They're showing it the objects and what to do with the objects, and the robot is making the inferences.

When a factory worker wants the robot to do something new, they come up to the robot, they grab its arm. They move its arm over an object. There's a camera there. They show it the object. The robot learns what the object looks like by moving around. They may bring it down, they may press the button to close the fingers. The robot infers, "Oh, I'm supposed to pick something up here." And if, by the way, the object was moving when it went down, the robot would infer, "Oh, this is a conveyer belt. I know about conveyer belts. I need to match my arm speed to that."

So they just show the robot the things that it's got to deal with, where to pick them up, where to put them, when to hold them in front of a scanner, say. And the robot patches everything together and then is able to do the task by itself.

Changing the face of manufacturing

I think the face of manufacturing is going to change over time. We'll have systems where manufacturing can be done much closer to where the goods are consumed—not halfway around the world—because all the CAD[1] systems, all the understanding of what needs to be manufactured, will be able to be transported around on the network. And then people locally can decide they're going to manufacture where they are, cut down costs, have much shorter supply chains matched to demand much more quickly.

And so we will see a change in manufacturing into more local, smaller-scale operations, but manufacturing very complex things. Now, a company in the US might design a product, figure out how to manufacture it in China, and then, with contract manufacturers, ship it to the retailers in the US.

In the future, that model may change. The companies that design stuff may just sell the CAD package, and then local suppliers all around would buy that and produce on demand. And so there will be many, many different sorts of businesses come up, just as we've seen in the computer industry. The old, main players dissolved; a new set of companies continuously reinvented as the models changed. I think that's going to happen in physical stuff and physical distribution.

[1] Computer-aided design.

Robots in the service economy

With changing demographics, it becomes harder and harder to get labor to do the service things. We talk about being a service economy, but even that's going to get harder. And it's going to be robotic elements that enable that service economy to continue to grow. So how do you bring in an intelligent system—which does sensing, computation, and mechanical actuation in the world—to achieve some task that used to take a person?

I think we're going to see a lot more assistance in getting things into cars, out of cars, getting things up stairs, getting things into your house. We already have cleaning robots. So we're going to see more and more things like that, the robots doing simple tasks. ☐

Rodney Brooks is cofounder, chairman, and chief technology officer of Rethink Robotics. This interview was conducted by **Michael Chui,** a partner at the McKinsey Global Institute.