

# How robots will change the workforce

December 28 2016, by Gary Robbins, The San Diego Union-Tribune

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Thirty of the world's top scientists are scheduled to meet at the University of California at San Diego in February to discuss the toughest challenges in robotics and automation, including how to make driverless cars safe for a mass audience.

The experts are being brought together by Henrik Christensen, the prominent Georgia Tech engineer who was hired in July to run UC San Diego's young Contextual Robotics Institute.

Christensen said at the time, "I want to build a research institute that, ideally, will be in the top five in the world five years from now. Why not see if we can make San Diego 'Robot Valley.'"

The February forum is being eyed as a step toward raising the university's visibility in robotics, a field defined by grand advances and embarrassing setbacks. Christensen recently sat down with The San Diego Union-Tribune to talk about what's likely to happen in the near term. The following is an edited version of that conversation:

**Q:** Automation and robotics are advancing quickly. What impact will this have on employment in the United States?

**A:** We see two trends. We will use robots and automation to bring manufacturing jobs back from overseas, primarily from Southeast Asia. At the same time, we will see some jobs get displaced by automation. There will be fully automated, driverless transportation in this country by 2020, and that will eliminate some jobs now held by workers like [truck](#)

[drivers](#) and [taxi drivers](#).

Q: Will there be a net increase or decrease in jobs?

A: To be honest with you, we don't know. There was a recent study on this by the National Academies, but there wasn't enough good data to make it clear what the outcome will be. We do see a lot of change occurring. Amazon is printing books at its local distribution centers, then sending them on to customers. They print the book, put a cover on it and off it goes. That cuts down on transportation jobs and costs.

Q: Are you saying that Amazon is just beginning to do this?

A: It's happening today. This program has been in existence for more than a year. The last estimate I heard was that 65 percent of the books Amazon delivers are printed in its local distribution centers. Amazon wants to do (widespread) deliveries of groceries, too.

Q: But doesn't this assume that the technology of driverless vehicles is much further along than it actually is?

A: My own prediction is that kids born today will never get to drive a car. Autonomous, [driverless cars](#) are 10, 15 years out. All the automotive companies - Daimler, GM, Ford - are saying that within five years they will have autonomous, driverless cars on the road.

Q: We're both baby boomers. We've driven all of our lives. How do you feel about kids never having this experience?

A: I love to drive my car, but it's a question of how much time people waste sitting in traffic and not doing something else. The average person in San Diego probably spends an hour commuting every day. If they could become more productive, that would be good.

With autonomous, driverless cars, we can put twice as many vehicles on the road as we have today, and do it without improving the infrastructure.

Q: Does that mean we'll need fewer parking garages?

A: There would be no need to have parking garages in downtown San Diego. In theory, you'd get out of the car and say, 'Pick me up at 4 p.m.' Long-term - we're talking 20 years into the future - you're not even going to own a car. A car becomes a service.

Q: Who is going to orchestrate all of this movement to make sure the interstate isn't some black hole of traffic at 5 p.m. each day?

A: We have to think of this in terms of how can we realize mass transportation. I would like to have trucks that don't drive during rush hour. I'd like McDonald's and others to make deliveries outside of rush hour.

Q: Do you have one central agency orchestrating the movement of these vehicles?

A: My expectation is that the city of San Diego would have taxes based on when you use the transportation system. So if you want to make deliveries at 8 a.m., when everyone else is on the road, it would be more expensive to use the freeway.

We will see significant displacement of taxi drivers, truck drivers, all of these transportation functions. So the question is: What will they do? The unskilled laborers are the ones who are in danger. They have jobs that can easily be done by robots. The question is, "Can we retrain those people fast enough for the new jobs that will be created in areas like manufacturing?"

Q: In the U.S., we currently have about 6 million unfilled jobs. Many of those positions could be filled if people had the right skills. In many cases, people have the opportunity to get those skills but don't go ahead and do it. So ...

A: California is in a relatively good position on this. But I used to live in Georgia, where 34 percent of the population never finishes high school. They're not going to be able to get retrained to do these new jobs. That's why it's very important that we make sure that people's education is high enough that they can get retrained later.

Q: Elon Musk, the president of SpaceX and Tesla, said it may be necessary for the U.S. to have a universal basic income. Should the government pay a certain amount of money to unemployed workers?

A: I think what they're saying is that whether you have a job or you don't have a job, you have a minimum basic income that's guaranteed for life. We are starting to see trends like this. In Sweden, they recently reduced the number of work hours per week from 40 to 30, and they still have seven weeks of vacation every year. That is going toward a socialistic model where you guarantee a basic level of income.

I think that in the U.S., that would be a really hard thing (for lawmakers to approve). It would lead to significantly higher taxes, it would require a departure from the current political system.

Q: Do you see any downside to the evolution of robots? Last year, Google was awarded a patent that involves customizing the personality of robots. There seems to be some disturbing privacy issues there. Or am I reading too much into it?

A: I think we're going to see robots that are going to learn from you. They're going to use potentially all of the data that's available about you.

We would like to build a robot that would help (elderly people) stay in their house another five years. The cost of going to a managed-care facility is somewhere around \$80,000 a year. If you could stay in your home, the cost would only be about \$20,000.

When we build the robot, we would want it to know: What is your personality? When do you get up in the morning? When do you go to bed? Are you a tennis person? A TV person? I think people would want the [robot](#) to be highly customized to them.

The real question is, who else has access to that data? Is it going to be companies like Facebook, Google and Apple? Are we confident that they are not going to abuse that information to try to sell you information, or sell it to somebody else?

Q: You said we have to show that robots can't be hacked. We haven't shown that ability in current society, so is this a solvable problem?

A: I think we have been very ignorant about privacy. But we're getting to a point right where we are starting to pay attention.

Q: Was 2016 a tipping point year in hacking? Major websites were knocked offline. The Democratic National Committee was hacked. Everywhere we turn, we hear a story about hacking. Has the issue really begun to sink in for the general public?

A: I don't think we're there yet. I think all of intellectuals are worried about it. But if you go and talk to everyday people, it's not such a big deal. Unfortunately, I think things have to get a lot worse before they get better.

It has to impact you or a larger number of people who say, "Uh-oh, they've gotten into my bank account." Or a big portion of the grid goes

down and the East Coast is suddenly without electricity for a couple of days. People will go, "Wow, now this has hit me."

When the hack hits their personal lives, people will say we need to stop it. But it's not going to be an easy thing to fix.

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Citation: How robots will change the workforce (2016, December 28) retrieved 28 April 2024  
from <https://phys.org/news/2016-12-robots-workforce.html>

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