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RISK & INNOVATION

How Will Robots Change The World?

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OVERVIEW

The age of the robot has been predicted for decades. First used as a term to mean automated labor back in the 1920s, and popularised in the classic 1927 slient movie Metropolis, they have been a regular feature of science fiction ever since.

The fact that robots and science fiction go hand in hand – and that predictions that we will soon have robot helpers being regular features of future-gazing since the 1930s – has meant that the idea of robots becoming a central part of our lives have become so familiar that we've come to ignore them.

Yet robots have been a reality in manufacturing for decades, having become cost-effective production-line solutions by the 1970s. The Roomba – an automated vacuum cleaner that is perhaps the most famous domestic-helper robot – was launched back in 2002, and has sold more than 10 million units worldwide. And with the rise of the Internet, programmable machines are increasingly on the rise.

Over the coming decade, many are betting that the rise of the robot will lead to just as much disruption as the rise of the web. One recent book has warned that we are at a tipping point where robotics could lead to mass unemployment and economic collapse, while technologists and scientists including Elon Musk, Bill Gates and Stephen Hawking have warned of the related dangers of artificial intelligence. So where are robots making the most headway – and should we be worried?

IN DEPTH

Another term for robot is automaton, and this is perhaps a more useful way to think about the technology. While science fiction has conditioned us to think of robots as humanoid figures like *Star Wars*' C-3PO, most are more like R2-D2 – focused more on function than on form. Robots are designed to perform tasks independently – they can be anything from simple machines to complex systems.

The rise of autonomy

Unmanned military drone aircraft or Unmanned Aerial Vehicles (UAVs) have made the headlines repeatedly over the last decade, having first (officially) seen action during the 1960s in the Vietnam War. Increasingly sophisticated, with sensors enabling independence from on-the-ground operators, many of these flying robots are capable of acting on their own, autopilot systems avoiding collisions as well as detecting and reacting to threats. Humans remain in control of attack systems only.

On the ground, bomb-disposal robots have been in use by the military and police for decades, while new systems like Boston Dynamics' dog-like LS3 are in development to serve as autonomous all-terrain support units, navigating by a combination of sophisticated optical sensors and GPS.

As with so much military technology, the civilian space is beginning to adapt military robotics for more peaceful use. UAV systems are making commercial airliners' autopilots more sophisticated, while drone technology is being tested by Facebook to launch solar-powered UAVs to provide Internet access to remote areas. Meanwhile, Google has been investing heavily in robotics firms, many of which started with military applications, to develop autonomous delivery drones, self-driving cars, and search and rescue robots for disaster response.

This near future of autonomous vehicles that can traverse almost any terrain could revolutionize the last mile of global supply chains. At the same time, almost every major automobile manufacturer is investing heavily in driverless technology, with initial data suggesting that autonomous automobiles are safer than human-controlled ones. Some countries are already introducing legislation to permit driverless vehicles to operate on public roads, potentially rendering the taxi, delivery truck and even the private car out-dated.

The rise of adaptive learning

The rise of the personal digital assistant – the likes of Apple's Siri, Google Now and Microsoft's Cortana – is just one small, early aspect of a related emerging technology. Algorithms are becoming sophisticated enough to learn from data and adapt their responses accordingly – in the case of the digital assistant, personalising their responses to your needs – in a field known as computational or machine learning.

The digital assistant in your pocket is only one small part of this rapidly-developing field, however. Robot learning, where machines learn to adapt to changing environments – to the extent that they can even build new, better versions of themselves to better tackle future challenges – is rising fast. Pack a robot with enough sensors, and with the right algorithms and processing power, a system can be developed that can be self-improving. The same principle can be adopted for manufacturing robots to build improved versions of the end-products they were designed to create.

Though only in the early stages, now that the concept has been proven, expect the pace of progress to rapidly increase. This development could revolutionize almost every manufacturing industry – and combined with the rise of 3D printing and improved big data processing, new, improved models will be able to be designed, prototyped, tested and released to market far faster than previous research and development cycles.

Replacing humans or helping them?

The ability of machines to do work previously done by people has been a concern since the dawn of the Industrial Revolution, the Luddite movement famously smashing machinery in an effort to save jobs.

With machines able to take on almost any predictable task, and increasingly able to combine with computers to analyse data to the extent that they are now able to pass tests previously considered to be signs of self-awareness, some see the rise of the robot as a significant threat to employment. Yet this need not lead to economic collapse, according to some theorists. Instead, the productivity of robots could keep the economy running and even improve output, freeing up humans to focus on other things – assuming that the wealth generated can be effectively redistributed to enable us to continue to buy food and shelter.

With most developed economies suffering from an ageing population, the ability of robots to take on some jobs could even prove a blessing. In Japan – one of the countries likely to be hit hardest by a greying population – the rise of the robot caregiver is already beginning, sponsored by the country's health ministry. In Sweden, the GiraffPlus robotic system involves installing sensors throughout a home to monitor everything from falls to blood pressure.

When combined with robot pharmacy technology – such as that recently rolled out in rural Scotland – autonomous drone delivery of drugs, and even driverless ambulances to ferry people to and from hospital, such systems could combine to provide near total medical analysis and care. Meanwhile, surgical robots are already in widespread use and – although one recent study has linked them to 144 deaths from 1.7 million procedures – increasingly effective, enabling smaller incisions that lead to faster recovery, as well as remote surgery, increasing the number of patients who can receive care.

Bringing it all together

This ability for robots to work together through connected systems is set to be the breakthrough moment for the robotics revolution. The Internet of Things – the popular term for Internet-based machine-to-machine communication – is predicted to be made up of 50 billion connected devices by 2020, according to Aon's 2015 Global Cyber Impact Report.

Add the ability of all these machines – from manufacturing robots in factories to kitchen utensils in homes, fitness monitoring wearables to driverless cars – to communicate with each other to the emerging ability of robot learning to adapt and improve, and we could be on the cusp of a new technological revolution.

TALKING POINTS

''What types of jobs are on some level fundamentally predictable? A lot of different skill levels fall into that category. It's not just about lower-skilled jobs either. People with college degrees, even professional degrees, people like lawyers are doing things that ultimately are predictable. A lot of those jobs are going to be susceptible [to being replaced by robots] over time.'' – Martin Ford, author of Rise of the Robots: Technology and the Threat of a Jobless Future

''Today's innovation will change the model of where, how and why robots are deployed in exponential ways... Like the computer, given to help the engineers do their job better, the robot will become part of the employee's team: there to help them do their job better.'' – Roland Menassa, GE Advanced Manufacturing and Software Technology Center

''The machines are tools, and if their ownership is more widely shared, the majority of people could use them to boost their productivity and increase both their earnings and their leisure. If that happens, an increasingly wealthy society could restore the middle-class dream that has long driven technological ambition and economic growth.'' – MIT Technology Review

FURTHER READING

- More Automation, Fewer Jobs Ahead – Computerworld, September 16, 2015
- 3 Ways Robots Can Transform Manufacturing – World Economic Forum Agenda, September 9, 2015
- 4 Ways Sci-Fi Tech Is Already Revolutionizing Medicine – Fast Company, August 28, 2015
- How Robotics is Transforming 21st Century Farming – Wired, August 14, 2015
- Why Robots are Taking Over China – Fortune, July 26, 2015
- This Unique Approach to Building Robots Could Signal a Better Future – Business Insider, August 12, 2015
- The End is Nigh: Robots are Learning how to Build Better Clones of Themselves – Quartz, August 14, 2015
- The Rise of Industrial Robotics – Engineering.com, July 30, 2015
- Will Robots Care for You in Old Age? – Big Think, July 6, 2015
- The Hierarchy of IoT "Thing" Needs – TechCrunch, September 5, 2015
- 2015 Global Cyber Impact Report – Aon study
- Autonomous Vehicles – The Risks and Rewards of the Future of Personal Transportation – Aon report