Life is about to get a lot smarter

Machines are starting to think for themselves and will change the world as we know it, writes Robert Plant

When people think of robots, the image that comes to mind is of machines – sometimes in humanoid form – doing manual labour, and sometimes even behaving in something like a human way. The real changes in the world of work, though, are due to something less visible and more pervasive – the rise of connectivity. Connectivity is the ability to link data and things, which in this case means machines and processes – and people too.

This development is based upon two nascent technologies. The first is 'Big Data' whereby organizations analyze an ever increasing volume and variety of data. This information, often referred to as 'analytics,' is the modern form of business intelligence that drives a lot of decision-making in government and the corporate world. The second is the 'Internet of Things', loosely defined as the ability of machines to communicate – usually through the internet – with other machines. Big Data and the Internet of Things will ultimately combine into a single technological architecture. This will be the source of major change in business, politics and society as a whole.

Largely unnoticed is the fact that machine-to-machine communication already underpins much of what we do. Currently, 61.5 per cent of all web traffic, as reported by the internet security company Incapsula, is actually non-human in origin. Thirty-one per cent of traffic is 'bots' – web robots – created by search engines exploring the web, another 5 per cent comes from 'data scrapers' which trawl the internet for information to analyze and store.

Machine-generated traffic is growing as a percentage of all internet traffic, up 11.5 per cent in 2012-13 alone. So what is driving this? First there is analytics – the crunching of Big Data by businesses. Businesses' need for data and the explosion in machine-to-machine communication create a virtuous cycle. At the same time, the quest for business efficiency promotes more machine-to-machine communication which saves time and cost, given that machines can process information more quickly in the workplace than humans.

Are we as a society heading for a version of *The Matrix* where the machines take over? Probably not. However, the advent of learning systems such as IBM's Watson, a computer which can answer questions put in natural language, may lead to variants of Arthur C Clarke's infamous HAL 9000, the rogue computer of *2001: A Space Odyssey*. In the relatively near future, computers will be exercising control over limited areas of human activity in fields such as medicine, law and stock trading.

The power of data, analytics and the network effect has the potential for far-reaching socio-economic consequences. Should we be afraid? Probably not. Increased connectivity will improve the quality of human life, but not all will be winners and society will have to make some adjustments.

To take one example: the British government intends to install smart meters in all homes and businesses by 2020. These will provide customers with real time information on their energy use and what it is costing them, while giving utilities greater insights into consumer behaviour. While the capital expenditure for installation is estimated to be £10.9 billion, the government estimates that by 2030 the network will provide a £6.2 billion net benefit.

An indication of where this is leading can be seen in IBM's Smarter Planet, Smart Grid initiative, which is already operating in the US. The data from these meters allows utilities to re-route power, for example from wind turbines or other sources of renewable energy, at times of peak use, and thus prevent 'brown outs' or the need to fire up an emergency power station.

A second stage is to link the smart meter to the consumer's thermostat through the internet. Consumers can already access their thermostats remotely via smartphone apps. But now the utility can ask permission from the home-owner at any time to change the thermostat remotely in order to save power. This is useful on summer afternoons where temperatures exceed the forecast. Turning up the thermostat remotely saves energy and cuts the cost of air conditioning, saving the consumer money.

For utilities, the requirement for manual labour to 'read the meter' is removed and power generation is more efficient. For the consumer, the cost of energy is cut. For the labour force, there are no jobs for meter readers and decreased demand for workers at standby power stations.

In the American retail industry automated processes are increasingly used to cut staff costs. In some supermarkets staff are automatically positioned throughout the day, in as little as 15-minute intervals, where they are most likely to be of use to shoppers. Customers are counted by door-mounted devices as they enter and leave and then monitored as they roam the store by camera systems, heat-signature trackers and mobile phone signals.

In warehouses some companies have replaced human workers with technological solutions. The Kiva robotic system – acquired by Amazon in 2012 for $775 million – replaces warehouse workers with dozens of robots that move shelf stacks around. The US retailer Crate & Barrel used to employ one picker taking items from the shelves for every packer. When it switched to the Kiva system, it needed only one picker for every six packers.

Other aspects of the retail operation are being connected together. Employees who work in warehouses or at a check-out are being digitally monitored to improve productivity. In 2013, Tesco was reported to be equipping warehouse employees with Motorola's 'arm-mounted terminals'. These monitor their productivity, and relay hourly time-and-motion feedback scores. At the front of the store retailers are experimenting with cameras and point-of-sale data to monitor checkout rates to ensure staff are hitting scanning targets, such as an item every 1.5 seconds.

Researchers at Goldsmiths, University of London, together with the technology firm Rackspace have concluded that productivity increased 8.5 per cent for employees using wearable technology. More surprisingly, they found that job satisfaction increased by 3.5 per cent. In part this can be attributed to a perceived upgrade in the employee's job function. By giving staff access to the data and connecting them to the network through small PDAs, they feel they have risen in status from being a task-based to a knowledge worker.

In the future, robotic systems will be capable of self-organization and machine-learning to adapt. They will lead to more effective lives for everyone. Our appliances will automatically download fixes and upgrades; our work will depend more on our knowledge and less on completing set tasks. Our free time will be of a higher quality. We will be able, for example, to access a digital physiologist to coach us in our preferred sport, a human skill that was nearly unobtainable by even Olympians a generation ago. Connectivity is something to be embraced not feared; it is not assimilation into a machine-dominated world but, with careful management, potentially the path to human freedom.

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