5G: blending worlds.

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When Klaus Schwab, founder and executive chairman of the World Economic Forum, introduced the idea of the Fourth Industrial Revolution, he referred to "a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres".[1] 5G will play a major role in achieving this vision; in fact it already is. But it's not just closing the gap between these spheres, it's also changing organisations' whole approach to technology.

Bringing the physical and virtual together

One of the most exciting applications of cyber-physical systems, so far anyway, is digital twins: Virtual replicas of real-world systems. A digital twin can mimic its counterpart in real time, or at least near-real time, using data from sensors in the physical system. That's why 5G is key. Not just for its extremely high-bandwidth, extremely low-latency connectivity, but also because it matches perfectly with multi access edge computing. This is critical for creating detailed and responsive models.

One of the main uses of digital twins is the ability to run 'what if' scenarios: To model what would happen, for example, if you run a production machine for a few more hours per day, or rearrange the layout of a factory floor. This can enable companies to accurately predict the impact of changes much more quickly and cheaply than running a physical test.

Digital twins can also be used to identify issues and opportunities to optimise operations. One manufacturer we worked with was suffering from higher than anticipated outages on some of its production lines. The company's engineers had spent many hours trying to identify the reason for the problem, but couldn't find any issues with the machinery. Looking at the lines as part of a whole system in a digital twin enabled the company to identify the cause: Staff movement at shift changes was causing temporary, but significant, temperature changes. Other companies are using digital twins and artificial intelligence/machine learning (AI/ML) to identify opportunities to reduce waste, speed up processes and reduce energy use.

It's not just manufacturers that are interested in digital twins. Facilities management companies are investing in digital twins to monitor and optimise buildings. And healthcare researchers are exploring digital twins of patients for diagnostics and monitoring – very Star Trek.

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Converging IT and OT

As the gap between physical and digital worlds closes, we're also seeing the lines blur between the teams that traditionally deal with technology in the physical sphere (operations) and the digital sphere (IT).

Gartner first introduced the term 'operational technology' (OT) as recently as 2006[2]. Not because they'd suddenly noticed the use of technology in industrial operations, but because OT was rapidly evolving from historically distinct systems and protocols to complex software portfolios based on technologies managed by the IT department. Traditionally OT relied on protocols such as DNP3, Modbus and LonWorks and predominately used fixed-line connections.

That has changed as technology has evolved and new applications like the Internet of Things (IoT) have emerged. And 5G is going to blur the lines even more. The 5G specification was designed to support the reliability and other characteristics needed in the OT world. And private 5G gives customers connectivity, but also because it matches perfectly with multi access edge computing connectivity that they need.

It's not just that the two spheres are increasingly relying on the same technologies; their goals are increasingly overlapping. Future business success is closely linked to the ability to capture, extract and fuse data coming from both OT and IT systems to create meaningful insight. Consider our example from above, staff movement data is not something OT would have previously had access to, but by merging with IT, these teams can access and use that data to improve operations site-wide. So it's not surprising that OT and IT organisations are getting closer and closer together.

While this can help improve business efficiency and cost control, it poses security challenges. As companies connect more and more systems – including production lines, building control systems and other critical infrastructure – using IT protocols, the risks that these could either be compromised or used to compromise core systems grows.

Overcoming challenges

Security won't be the only challenge. There will be a number of cultural issues to fix as these teams come together – a change of behaviours, processes and mindsets may be required. There will also be competition for key skills, including data analytics and AI/ML, needed to make this work.

Over the next five years, I still expect to see Klaus Schwab's vision come to life and truly mind-blowing applications emerge, enabled by 5G. And I expect to see fewer and fewer companies with separate IT and OT teams. It's just unfortunate that the term IoT is already taken.

1 Klaus Schwab, The Fourth Industrial Revolution: what it means, how to respond, January 2016
2 https://www.gartner.com/en/information-technology/glossary/operational-technology-ot

Next steps

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