

How cutting edge technologies are disrupting manufacturing



Introduction

From 3D printing to robotics and automation to the Internet of Things, digital transformation is sweeping across the industrial and manufacturing sectors. While progress in the UK has sometimes lagged other regions, a number of factors are now coming together to accelerate the sector into the Fourth Industrial Revolution.

“We’re seeing digitisation across every sector and cutting-edge technologies are helping to transform the manufacturing and industrial sector through the use of robotics, artificial intelligence and the Internet of Things,” says Anna O’Brien, Director, UK Technology Sector & Growth Lending at HSBC UK.

The UK’s commitment to achieve net-zero by 2050 is driving manufacturers to adopt technology that helps them to reduce carbon emissions. While at the same time, in a world of rising raw material costs and increasing inflation, there’s an imperative to lower costs and increase productivity and efficiency. In the past, the expense of new technologies was more difficult to weigh against its intended benefits, but efficiencies today can reap significant savings as external costs grow.

“The Fourth Industrial Revolution is centred around integrating technology and digital solutions in the end to end manufacturing processes to improve design, reduce waste, drive efficiencies and enhance the customer proposition and experience.”

Rohit Moudgil,
Head Of Manufacturing Sector Coverage,
HSBC UK

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1 > What's accelerating the Fourth Industrial Revolution?

Many of the technologies that power the Fourth Industrial Revolution, such as 3D printing, robotics and AI, have been around for some time, but the shift in the industry is coming from a number of new drivers.

The COVID-19 pandemic drove digital transformation across all sectors, kickstarting a period of adoption for many companies. But this isn't a one-off change. There are fundamental long-term shifts in the sector that are continuing the trend.

- **People**

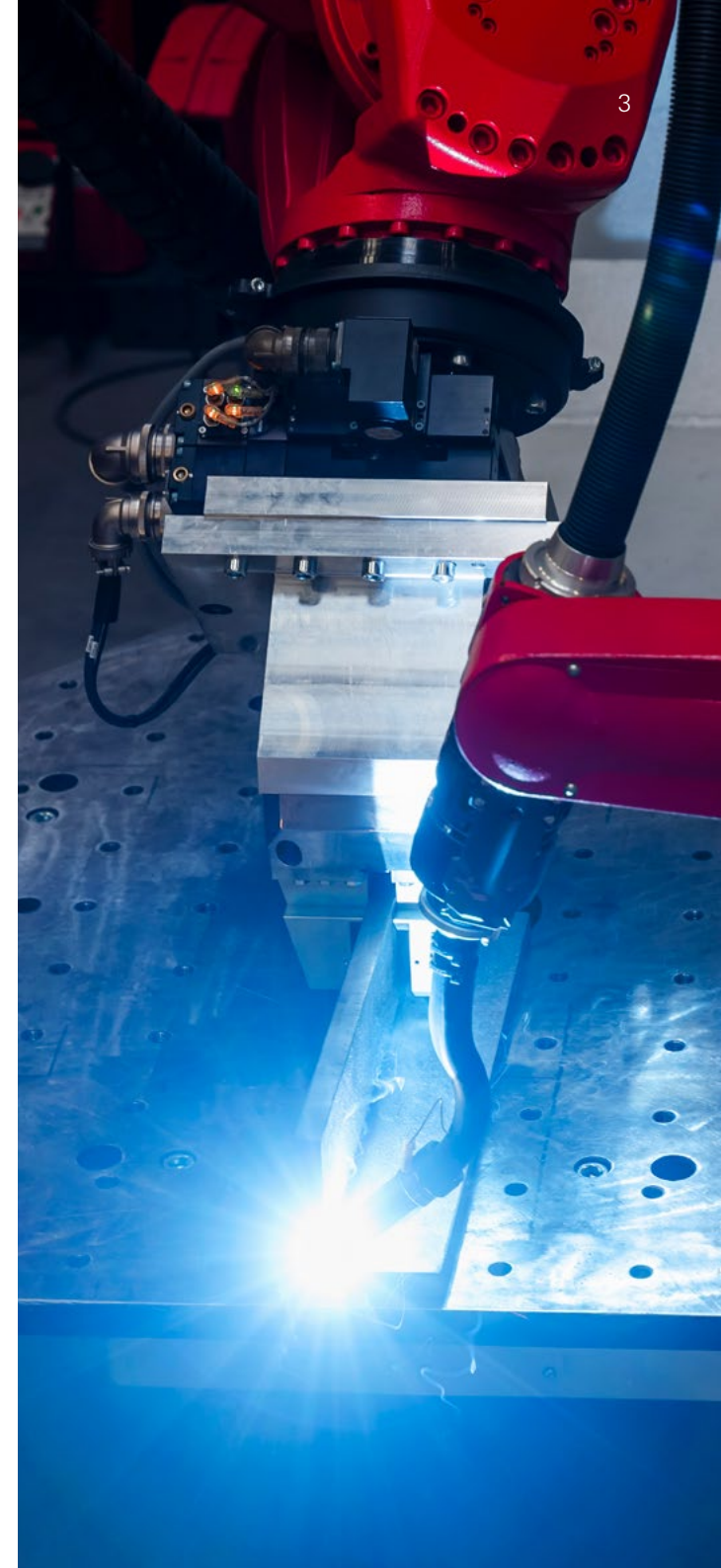
Businesses are struggling to address specific skills gaps and labour shortages in the market. While automated guided vehicles and robotics in warehouses have been trends for a while, for example, adoption is accelerating as the number of people available to work in warehouses has significantly reduced. As another example, robotic welding is a newer solution that is taking off because welding is not a skill that's prevalent in the market right now.

Where the right skills or number of workers aren't available and those roles can be filled by technology solutions, businesses will turn to transformation.

- **Cost**

If companies use the basic cost/benefit analysis that businesses have used for decades, it highlights a unique point of inflection where both sides of this equation are driving transformation. Technology costs are largely following Moore's law, roughly every 18 months, the cost halves and the capability doubles. And in the last two years, the benefits side has really increased. That's because efficiency today reaps significant rewards because inflation is so high.

"Let me use just one example," says Graeme Millar, CEO of Velos IoT. "Imagine you're a farmer, and you are thinking about adopting technology to monitor your crops and make sure that you distribute your fertiliser on your field in a much more efficient way. The cost of fertiliser is about three or four times what it was 12 to 18 months ago. So immediately the benefit that you're going to get from any cost that you spend on the technology, which is lower than it would have been 18 months ago, is three or four times what it was."



- **Sustainability**

Businesses aren't just reducing costs by increasing productivity and efficiency, they're also driving sustainability. The UK aims to reach net-zero carbon emissions by 2050 and many companies have their own internal ambitions to achieve carbon neutrality. The manufacturing sector is also increasingly coming under scrutiny as the source of Scope 3 emissions for other sectors.

Scope 3 emissions are those that come through a company's supply chain to end up in their product, but over which they have no control. An example would be the emissions of the metal ore that was smelted into aluminium that ended up in the door of a car that was eventually sold by that automaker. The question of how much of those emissions should end up on the balance sheet of the automaker is still being weighed. But what is happening is that more and more large corporations are looking at the sustainability of their supply chain. And suppliers that can evidence their own sustainability standards are gaining a competitive edge.

"These technologies help to increase productivity, increase efficiency, lower costs, and help sustainability. And whilst you're lowering costs, you then have more money to reinvest into digital transformation projects, which will hopefully further enhance all of those benefits even further," says O'Brien.

27%

of manufacturers are figuring out what new digital technologies can offer and how they can be applied to their business.

38%

are putting digital tools and technologies in place (e.g., sensors) to create, capture and analyse data to assist in developing projects and changes to their business.

23%

are changing the way they derive value and interact with customers and suppliers.

56%

of manufacturers cite reduced costs and improved productivity as the main benefit of adopting digital technologies.

55%

of manufacturers said Robots, Cobotics and Automation were making some or a lot of difference to increasing sustainability and energy efficiencies in their business,

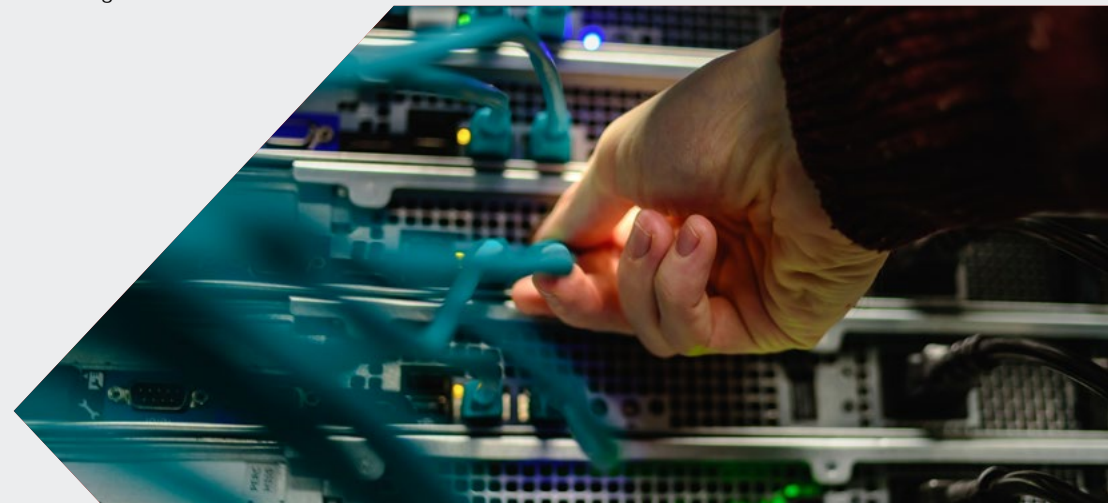
67%

said the Internet of things was making some or a lot of difference,

58%

said 3D printing was making some or a lot of difference.

Source: MAKE UK Industry 4.0 Green manufacturing: an enabler



2 > Technologies powering the Fourth Industrial Revolution: The Internet of Things

One of the biggest trends in the Fourth Industrial Revolution is the Internet of Things, a powerful network of connected devices that is driving efficiencies in logistics and distribution, helping companies to anticipate maintenance needs and making manufacturing smarter.

A customer of Velos IoT, for example, is in the shipping container business and has around 15 million refrigerated containers in operation, says Graeme Millar, CEO of Velos IoT. These refrigerated containers, known as reefers, have had a connectivity device installed that not only tells the company where they are at a given point – to aid logistics and distribution – but also whether they're full or empty.

"In the last year, they've reduced the diesel burn on these refrigerated containers by 6%, just by turning off the refrigeration units on empty containers, nothing else," says Millar. "And when you think about the amount of CO2 emissions that represents, which have simply gone away, not to mention the financial benefits of not burning that diesel – that's a colossal benefit. And frankly, that's just scratching the surface of things we can do."

"Increasingly, we talk about the merging of operational technology and information technology into the Internet of Things. We have new ways of connecting more and more devices and extracting and exploiting more data. And that data helps us understand what's going on in our processes to make them more productive and more sustainable."

Brian Holliday, MD of Siemens Plc

What is the Internet of Things?
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What is the Internet of Things?

A simple definition:

The Internet of Things, or IoT, is a system of connected computing devices, which can be embedded in or carried by objects, animals or people. Each device has a unique identifier and can transfer data over a network.

But what does that mean?

“For decades, actually, we’ve been putting microcontrollers and computers into things, and creating a lot of semi-intelligent, autonomous devices,” explains Graeme Millar, CEO of Velos IoT.

“But what’s happening now with the Internet of Things is increasingly we’re starting to orchestrate all those devices together. And in doing so, we’re getting a lot more efficiency out of them.

“So, for example, for four or five decades, central heating systems had a little microcontroller that turned your heating on at a certain time of the day. What the Internet of Things means is that suddenly your system can know where you are, because it knows where your mobile phone is, and it knows that you’re on the way home. And that’s when it turns the heating on.

“Now you’re just heating the house when it needs to be heated, not a certain time of the day, whether you’ve come home or not.

“For me, that’s what the Internet of Things is, this long-term trend to connect all these autonomous devices. And we’re just going to see more and more of that because it leads to much more efficiency and sustainability in everything you do.”

“The use of sensors and IoT technologies is enabling a much more data-rich environment within the production process that is helping companies get more real-time, very valuable data that they can analyse to anticipate issues, reducing downtime, and improving overall control and quality.”

Rohit Moudgil,
Head of Manufacturing Sector Coverage, HSBC UK



3 > Technologies powering the Fourth Industrial Revolution: Robots, 3D printing and more

While IoT is a crucial component of the Fourth Industrial Revolution, it's by no means the only transformational technology in the sector.

VR and AR

Virtual reality and augmented reality offer digital environments in which to design and test new ideas and are growing in use for industrial R&D and planning. This is linked to digital twins, which in this context are virtual replicas of a real production environment.

"With digital twins, manufacturers are able, in a much more time-efficient manner, to experiment, simulate new solutions and technologies and assess the overall impact on the operating environment and the efficiencies that they can drive out of that," says Rohit Moudgil, Head of Manufacturing Sector Coverage at HSBC UK.

Robots, cobots and automation

Robotics in warehouses and factories have long been a growing trend, particularly as labour shortages in these sectors deepen. Cobots are a newer trend in collaborative robots, essentially robots designed to work with humans rather than alongside them, often augmenting the human workers' skills with speed, strength or precision.

An example would be a robot that simply lifts heavy packages from one end of a production line. The skills needed to create the products are still retained in the human workers along the line, but the physically demanding, brute-strength task is done by the robotic arm at the end, improving health and safety for the workers, and speeding up processing time.

3D printing

3D printing, or additive manufacturing, is another technology that has been in use for some time, but is seeing rapid increase in use as the technology has improved and costs have come down. It's particularly useful at the design stage in prototyping, helping to reduce cost and waste when designing and experimenting with new products and solutions.



4 > Challenges in adopting digital transformation

For many businesses, the key question is, what are the pain points that these technologies are addressing? What will the impact be on their own business?

“One of the challenges is the industry often doesn’t know what to put on the benefit side,” says Brian Holliday, MD of Siemens PLC and co-chair at Made Smarter UK.

“As a manufacturer, we are looking at a range of possible capital budgeting options in a year. And we have to make sure that what we invest in fits the affordability criteria for the business, that we’re looking at it in terms of productivity, and sustainability, as well as investing in the tools that hopefully make us more competitive, like designing better products and bringing those to market faster.

“But if you think about the normal capital budgeting cycle, you’ll be thinking about payback periods. And often, sustainability investments can take a bit longer,” he adds.

For example, installing solar on an industrial site today would likely have a 10-year-plus payback period, even counting the increased cost of energy.

“There’s a role for government to help signpost the importance of continuing to invest in productivity and sustainability-enhancing technologies that will help us,” says Holliday.

Moudgil points out that banks and financial institutions have a role to play too: “It gives me great pleasure to say that we are one of the first banks to really push this initiative. We’ve joined the Made Smarter Northwest Consortium funding platform as one of the first funders to really help SMEs access these digital solutions and accelerate their adoption.”

The talent crunch

Another major challenge for businesses is in the lack of technology-specific talent. As O’Brien points out; “There is a massive war on talent in the market, and there is a skills gap. So how do we get people on board with these advancements in technologies? And how do we address the skill shortages we’re seeing across the market?”

To address it, companies need to be thinking outside the box. Holliday says that the key is for companies to “recruit beyond their own needs”. His own firm has 500 apprentices for a workforce of just over 1000, but he believes that training for the future is of critical importance to the UK workforce.

“It’s one of the reasons that as Siemens has invested in the connected curriculum, working with a number of UK universities, to really introduce an element of digital twinning of industrial data into a variety of undergraduate and Master’s degree courses to help train the next generation as well,” he says.



5 > Top tips from the experts

For companies in the UK, digital transformation is often at the top of the agenda, but awareness around the opportunities, challenges and benefits of different technologies differs. These are some of the tips from the experts:

Brian Holliday, MD of Siemens PLC

“Give an in-house team time to investigate the art of the possible with industrial digital technology and where to prioritise. Start with a simple digital simulation of your process to understand your constraints through machines, materials and people, and seek to optimise first. Engage with experts and peers who might be ahead of you... a technology company, a Made Smarter expert or a High Value Manufacturing Catapult if you’re looking to innovate.”

Graeme Millar, CEO of Velos IoT

“Companies should think about reinvestment and second or third order effects as well. There are firms, for example, using sophisticated software to map the delivery route of a truck, taking into account the weight of the freight, what’s in the container, is it refrigerated, can we optimise the route? Once the data is available, suddenly you get more and more ideas about how you can use that data to enrich the processes you have.”

Rohit Moudgil, Head of Manufacturing Sector Coverage, HSBC UK

“Digital transformation is an iterative process. Every cost saving can be redeployed to accelerate your journey even further, to continuously improve and enhance the benefits that you gained from that initial investment into these technologies.”

Help to get you started

There are a number of government, financial and industry resources that can help you on your digital transformation journey:

High Value Manufacturing Catapult

The HVM Catapult works with thousands of companies each year to boost the UK’s manufacturing performance. It helps to move cutting-edge research from the UK’s world-leading universities into the commercial market, supporting companies to transform the products they sell, the way they make them and the skills of their workforce.

<https://hvm.catapult.org.uk/what-we-do/>

Made Smarter UK

Made Smarter is a national movement backed by world-renowned businesses and the UK government. It unites established and emerging UK technology innovators with the manufacturing community to deliver cutting-edge solutions to the industry’s biggest operational challenges.

The Made Smarter adoption program also offers funding opportunities and advice.

<https://www.madesmarter.uk/>

Industrial Energy Transformation Fund

In 2020, the UK government launched the new Industrial Energy Transformation Fund (IETF) to help businesses install energy and carbon reduction measures including heat pumps within their industrial processes. Delivered by Innovate UK on behalf of the Department of Business, Energy and Industrial Strategy (BEIS), this has pledged up to £315M in funding.

<https://www.gov.uk/government/collections/industrial-energy-transformation-fund>

R&D tax credits

Small or medium-sized enterprise (SME) R&D tax relief allows companies to:

- deduct an extra 130% of their qualifying costs from their yearly profit, as well as the normal 100% deduction, to make a total 230% deduction
- claim a tax credit if the company is loss making, worth up to 14.5% of the surrenderable loss.

If you would like to discuss any of the topics raised here, please contact the team directly:

<https://www.business.hsbc.uk/corporate/technology>

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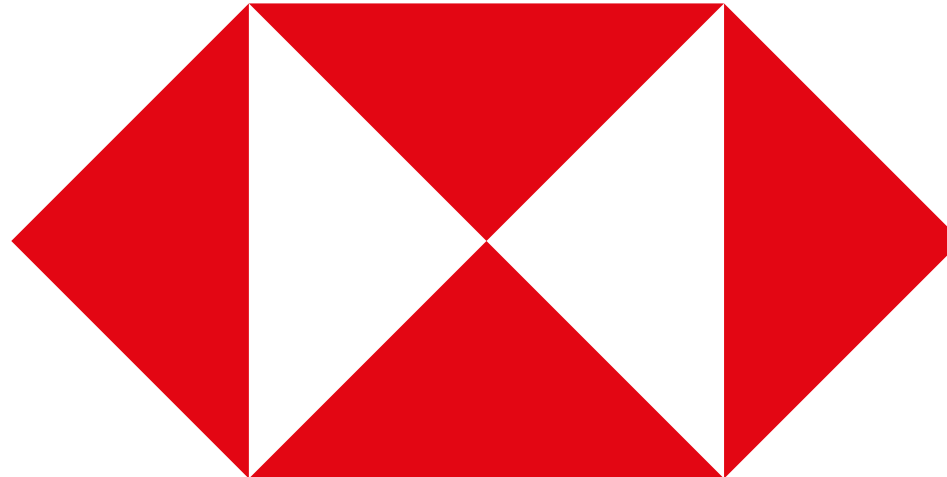
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