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# LEADING TRANSFORMATION IN MANUFACTURING

Case studies in technology-driven  
innovation

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## Executive summary

The manufacturing industry has always been shaped by technology. Today, the convergence of digital technologies with physical machinery is the primary driver of technology-led change in the sector, but there are signs that European manufacturers are slow on the uptake.

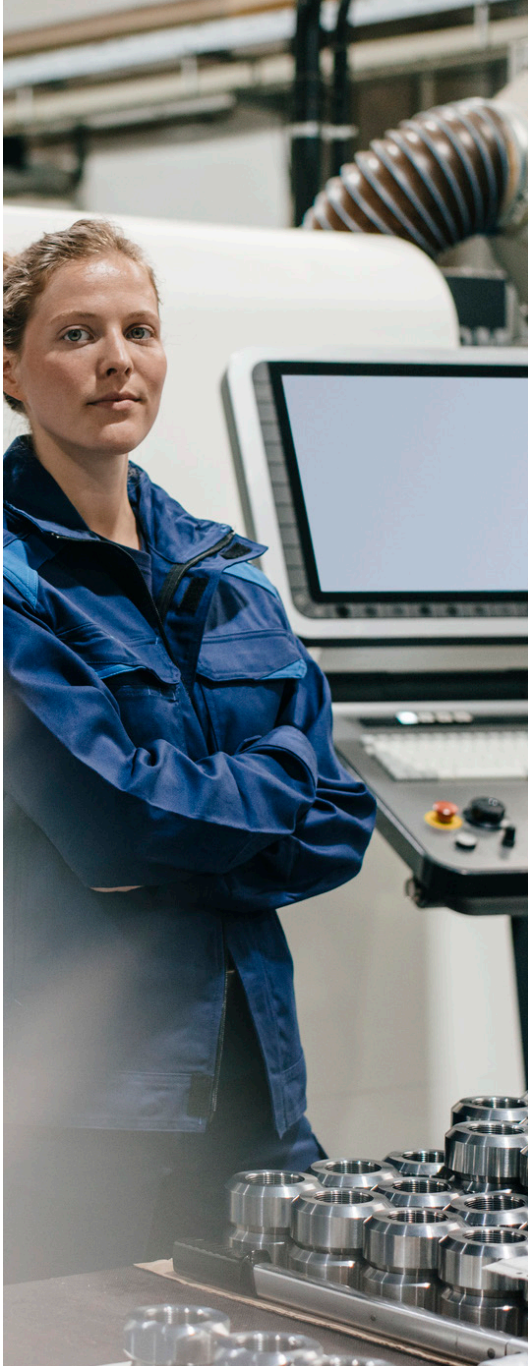
To examine the opportunities and challenges this convergence presents, and to understand the role of technology executives in leading the organisational transformation required to capitalise on it, The Economist Intelligence Unit interviewed executives from three manufacturers pursuing digital transformation:

- Juha Pankakoski, executive vice president of technology, Konecranes
- Andrea Roero, chief information officer, Celli Group
- Michael Johnson, EMEA chief information officer, Bridgestone

We also interviewed Ryan Martin, principal analyst at ABI Research, and thank all our interviewees for their time and contribution.

This report presents insights and findings from the interviews. Key findings include:

- **The merging of operational technology (OT) and information technology (IT) is one of the main roadblocks to transformation.** These two domains have traditionally been managed and led separately, but the opportunities presented by digitisation require concerted effort. Engineering teams may be able to adopt IT without the IT department's involvement but this presents risks, so IT must position itself to offer guidance and input.
- **Advanced analytics capabilities are increasingly pivotal.** All three executives interviewed for this report are bolstering their analytics capabilities in order to extract greater value from the data collected over the course of the manufacturing process. The added value typically derives from improving efficiency and maintenance, but some companies are increasing customer value too.
- **Digital transformation in manufacturing requires IT leaders to play many roles.** These include security advocates, radars for emerging technologies and catalysts for agile innovation. A crucial development is that IT leadership no longer has a monopoly on IT-related decisions. This means their approach to driving change must be more 'collaborate and advise' than 'command and control'.



## Introduction

Manufacturing has a long history of transformation driven by wave after wave of technology innovation. But incorporating today's emerging technologies may prove to be the sector's toughest transition to date.

These technologies, which include advanced analytics, artificial intelligence (AI), additive manufacturing, augmented and virtual reality and digital prototyping, offer opportunities to become more agile, more efficient and to create more value for customers.

But there are signs that manufacturers are dragging their feet. Digitisation across the sector has so far been patchy according to a 2018 report from PwC<sup>1</sup>. In a survey of manufacturers, it found that two-thirds have only just started—or not yet embarked upon—digital transformation.

The study reveals that just 5% of manufacturers in Europe, the Middle East and Africa are “digital champions”; the companies best-placed to benefit from Industry 4.0. This compares to 11% in the Americas and 19% in Asia-Pacific.

One roadblock is the convergence of OT, which controls the machines on the factory floor, with IT, which collects and analyses the data needed for decision-making. Ryan Martin, principal analyst at ABI Research, explains how, until recently, OT and IT co-existed as distinct areas of responsibility. “But with increased collection and analysis of data from previously unconnected plant-floor machinery, and more pervasive use of digital technologies at the operational level, the lines between the two are blurring fast,” he says.

The importance of data in this amalgamation means chief information officers (CIOs) and their teams have an pivotal role to play. In fact, the three executives interviewed for this report describe not one new role for IT leadership but many. Many of these roles depend on the ability of IT executives to steer technology strategy not through direct control but through influence and guidance to peers. Those who adapt to this style of leadership have greater opportunity to elevate IT's contribution to the manufacturing sector.

<sup>1</sup> <https://www.pwc.com/gx/en/industries/industry-4-0.html>

## Manufacturing transformation in action

### **Konecranes raises its data science capabilities**

In March 2019 Konecranes, the €3.2bn Finnish manufacturer of cranes and lifting equipment, announced plans to create a new data science laboratory in Lyon, France.

According to the company's executive vice president of technology, Juha Pankakoski, the move marks the latest step in the firm's ongoing initiative to apply advanced analytics both to data that flows from its own factory floor and from the connected devices sold to its customers.

"It's a significant investment for our company, but we believe it is what is required to take advanced analytics to the next level for Konecranes," he says.

The company currently has 20,000 connected devices across the world and digital lifecycle records from over 600,000 customer assets. These already provide a significant revenue stream for the company, enabling it to monitor its products and provide customers with add-on services for maintenance and repair.



**We believe that with more advanced data science at our disposal, there's a lot of room for us to move forward.**

*Juha Pankakoski, executive vice president of technology, Konecranes*

"But right now, we feel we're only scratching the surface, and we believe that with more

advanced data science at our disposal, there's a lot of room for us to move forward," says Mr Pankakoski. More sophisticated analytic approaches will open the door to closer monitoring, more precise diagnoses and, ultimately, to machines and products "that become increasingly smart at being able to sense their own status and environment, as well as more autonomous in terms of making decisions about their own operations."

At the same time, Konecranes is actively exploring a number of other emerging technologies, such as digital prototyping its own product development process. "This, for us, is a very interesting concept altogether, because if you're able to develop a good, solid digital twin of your planned product, then it does allow you to test and develop that design in a virtual context, without having to build it first," Mr Pankakoski says.

By combining the 3D computer-aided design (CAD) model of a proposed product with simulation software, Konecranes can test a crane's behaviour in different environments and under different workloads to see where it wears out and how it breaks down. Investigations are already well underway in partnership with a number of universities and technology companies, he adds.

### **Celli Group weaves the digital thread**

At Celli Group, an Italian manufacturer of drink dispensing equipment, the product development stage is the start of the so-called 'digital thread' – a continuous pipeline of data that connects each stage of a product's lifecycle, from design through to manufacture and onwards to maintenance and repair. Once a physical machine is built

from a digital prototype, the data used in its creation evolves as a digital twin of that machine. By adding more data, such as its location, configuration and service history, manufacturers end up with a digital construct that knows everything about the design, build and servicing of the physical system.

At Celli Group, the starting point for the application of advanced analytics is in the factory itself, explains CIO Andrea Roero. “If we have a moulding machine that isn’t performing properly, then that could result in quality issues in finished products.”

But the company is now extending its analytical capabilities beyond the factory to

create greater value for its customers. Firstly, Celli Group used connected instrumentation in its products to offer remote repair and maintenance services. More recently, it has started providing customers with business insights, such as trends in customer preferences, based on the data its products produce.

And increasingly, says Mr Roero, the company’s Internet of Things (IoT) platform is home to data that ties augmented reality devices into its operations. These are now being used to provide factory workers and field service employees with instructions for building, installing, maintaining and repairing its products. Wearing a head-mounted display (HMD), they can see those instructions superimposed over their view of the physical machine in front of them. The data behind those instructions, he adds, comes from the digital thread that Celli Group has built which now also informs product development and prototyping at the company.



### **Bridgestone Europe’s smart factory drive**

In June 2019, Bridgestone Europe, the European arm of the world’s largest tyre and rubber company, announced plans to invest €36m into digitising its manufacturing operations. Eight existing European plants across Poland, Hungary, Spain, Italy and France will be transformed into smart factories that use less energy, produce less waste and achieve new levels of productivity. It’s an ambitious undertaking, and one that demands significant support from Michael Johnson, Bridgestone’s EMEA CIO, and his team who are working closely with the company’s heads of manufacturing and R&D department.

As part of this smart factory project, data from tyre production will be analysed by Bridgestone engineers in Rome and Toyko with a view to designing new and improved models. Following advanced analysis, updated designs will be returned to plants in digital format, cutting the production time for the first series of new tyres in half.

AI, meanwhile, will also play a major role in boosting production efficiency. Using data collected from connected sensors on plant-floor machinery, smart maintenance will soon provide the capability to foresee potential faults and suggest maintenance solutions even before outages occur. And smart tracking technologies will be introduced to monitor the progress of prepared materials and semi-finished products within plants, aiding production planning and administrative processes from mixing materials to warehousing.

Cross-functional teams, including representatives from IT, are already at work on delivering the four-year project, Mr Johnson confirms. "There's a large IT element to a project like this, but whereas in the past we

had 'IT projects', that's not the way we work anymore. It would be impossible," he says. "The convergence between engineering and IT, between operational technology and information technology, is ever-growing, and while it might be easy for operational teams to adopt information technology without involving IT, it's widely recognised that this is inefficient and comes with a lot of risk."



### **Our approach in IT has to be one of a partner and a guide.**

*Michael Johnson, EMEA CIO, Bridgestone*

"So our approach in IT has to be one of a partner and a guide, to be very much engaged and involved in distributed, cross-functional teams, working hand-in-hand with others in the business to drive adoption of emerging technologies. It's about working together to find the best ways, the most agile ways of making these things happen."

## The roles of the transformational IT leader

Only companies with a clear digital vision, strategy and culture to support digital transformation can truly hope to take advantage of it—and the technology leaders of Konecranes, Celli Group and Bridgestone Europe all see themselves as playing a leading role in helping their organisations to catalyse the changes required.



**I don't see myself as a typical manufacturing CIO, because I don't think that is what is required any longer.**

*Andrea Roero, CIO, Celli Group*

As Mr Roero of Celli Group puts it, “I don't see myself as a typical manufacturing CIO, because I don't think that is what is required any longer.” What is required, he adds, is a “change agent” who not only understands business requirements through close collaboration with other senior executives, but can also come up with a workable roadmap for applying emerging technologies to those needs.

Indeed, at manufacturing companies that are making progress with technology-led transformation, there are many new roles for the IT function and its leaders. These include:

### **Bridging the OT/IT divide**

This is the role that fits most neatly with the CIO's traditional concerns, but it is still sorely





lacking at many manufacturing organisations. According to a late 2018 report by consultants at strategy firm McKinsey, many Industry 4.0 projects are still delayed or fail to scale because the technical foundation required to collect data from complex, heterogenous manufacturing environments is not in place<sup>2</sup>.

“Fundamentally, delivering Industry 4.0 at scale requires the ability to extract, interpret and harmonise data from disparate systems that were not designed to work together,” the report explains. “Without this step, the best analytic models will not have the data required to deliver the value expected from them.”

When emerging technologies are introduced, with all the associated risk they bring, there is huge value to be had from IT firmly guiding architecture decisions, says Mr Johnson of Bridgestone Europe. “The business and the business objectives need to come first, but we can only build and grow a profitable business if concerns around integration, security and operating technology at scale are addressed first so that new technologies can be added as components of a robust enterprise architecture. So in the face of change, we still feel very accountable for owning and steering the architecture decisions.”

### A radar for emerging technologies

At Konecranes, Mr Pankakoski sees his team as the eyes and ears of the company when it comes to emerging technologies as they tend to have expert contacts updating them on new developments. The trick here is communicating this to other executives in a way that manages expectations, he says. “We don’t just keep an eye on emerging technologies, but also on their development cycles, so that we can communicate to the organisation when those technologies might

reach a sufficient maturity to be worth considering, and that sometimes takes time.”

Mr Roero of Celli Group agrees: “There are a lot of new technologies out there and executives from disciplines across manufacturing companies are aware of them, and excited by them, but even if they understand that the world is changing, they sometimes require a guide who can help them cut through the hype and perhaps take a more realistic view.”

### IT security advocate

When manufacturing operations start implementing emerging technologies without IT’s oversight “bad things can happen,” warns Mr Martin of ABI Research. “It could be the deployment on the factory floor of consumer-grade hardware, such as tablets and VR/AR headsets; it could be network related, when new integrations are introduced,” he says. “There’s a very real risk here that valuable intellectual property gets exposed or falls into the wrong hands in ways that could potentially be extremely damaging to the business. I see that as a very real risk in organisations where the IT function isn’t involved in these decisions.”



**There’s a very real risk here that valuable intellectual property gets exposed or falls into the wrong hands... in organisations where the IT function isn’t involved in these decisions.**

*Ryan Martin, principal analyst, ABI Research*

<sup>2</sup> <https://www.mckinsey.com/business-functions/operations/our-insights/operations-blog/its-the-last-it-ot-mile-that-matters-in-avoiding-industry-40s-pilot-purgatory>

## Catalyst for agile innovation

Pilot projects for emerging technologies call for cross-functional teams comprised of IT, operations and digital and analytics experts. This plays to the IT department's strength, says Mr Martin of ABI Research. Traditionally IT has assembled such teams and adopted 'fail fast' methodologies throughout processes such as software development. The CIO, with their cross-company contacts, is often best-placed to help senior colleagues identify which use cases have most potential value and which might be easier to implement. As such, CIOs are often the driving force behind the adoption of emerging technology, Martin explains.

At Bridgestone Europe, says Mr Johnson, the initial stages of the smart factory project have closely followed agile principles and will continue to do so. "Our goal here was to demonstrate and prove that the smart factory architecture we've devised will generate the results included in the business case. So we're staggering the rollout, starting with this one plant, which is where we'll do a proof of concept and identify a minimum viable product (MVP) approach that works so that other plants and other leaders can see that happening and get on board. Success breeds success."

## Digital skills advisor

As manufacturing becomes more digital, companies need to determine the types of workers and skills that will be required to get the most out of emerging technologies. Many manufacturing organisations already face significant skills shortages, and an influx of emerging technologies will bring that issue to the fore. The World Economic Forum estimates that more than half of

manufacturing employees worldwide will require significant reskilling by 2022<sup>3</sup>; the European Commission estimates that around 37% of workers in Europe don't have even basic digital skills, let alone the more specialised, advanced skills companies will need to successfully adopt new technologies<sup>4</sup>.

The CIO and their team, long-used to recruiting and developing technical skills, have a contribution to make in articulating the human needs of digital transformation. An important element of Bridgestone Europe's smart factory initiative, for example, is the upskilling of EMEA employees to work with new technologies, and here Mr Johnson expects to play a leading role. "We're building our people's skillsets as we're building the technology, so it's introduced to them in a way that is relevant to their day-to-day work. And in some cases, we're looking to bring in new people with the skills to help us accelerate." It's vital that IT advises here, he adds, since it often has the clearest view of the types of digital skills needed.

## Engaging with external innovation

External collaboration with universities and research organisations is a vital part of the innovation picture at Konecranes, says Mr Pankakoski. "We can't be expected to understand every aspect of the 'art of the possible', which is why we work with experts elsewhere." In recent years, this has included tie-ups with researchers at Finland-based Aalto University on digital twin technology and with the University of Lyon on AI and machine learning. The company also has an office at Finland's largest start-up incubator and holds hackathons to collaborate with external developers on concepts for new applications.

<sup>3</sup> <https://www.weforum.org/reports/the-future-of-jobs-report-2018>

<sup>4</sup> <https://ec.europa.eu/digital-single-market/en/digital-skills-jobs-coalition>

## Conclusion: Taking the leap

The digitisation of manufacturing offers companies a number of opportunities to create and extract greater value from their operations, from straightforward benefits such as close and detailed monitoring of system performance to more advanced activities such as digital prototyping.

But while digital transformation may be on the agenda of manufacturing companies around the world, as PwC warns, “most business leaders have still not come to terms with the challenges and opportunities of digital transformation or the conceptual leap it represents”.

The leap for manufacturing IT leaders, our interviewees suggest, is to go from having direct command over a siloed technology estate to becoming one of many influences on a shared technology infrastructure that crosses multiple functions and interest groups.

This should not be seen as a loss of control, however, so much as change in the way in which IT leaders exert their influence. If they can catalyse their organisation’s technology-led transformation, it is a valuable opportunity to increase IT’s strategic contribution.

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