

Supply Chain Research Report

Risk and Resilience

Researched and Produced by:

THE MANUFACTURER

**MADE
SMARTER**
INNOVATION

DIGITAL SUPPLY
CHAIN HUB

Our mission

Inspire the new industrial revolution, turning the UK into a world leader in digital tools and technologies.

**MADE
SMARTER**

Executive Summary

Tim Lawrence

Director

The increasing globalisation of supply chains in the 21st century has led to more cost effective supply of goods and services, especially through low cost sourcing policies businesses have employed into Asia and Eastern Europe, but this approach has also increased the vulnerability of UK supply chains to global trade.

The COVID-19 pandemic brought those vulnerabilities of supply chains to life in February 2020. China suddenly shut its borders and the flow of goods from Asia immediately reduced, leading to shortages for UK manufacturers.

£422 MILLION LOSSES

COVID-19 also impacted demand and supply patterns in areas like semiconductors where, post-pandemic, supply was constrained leading to shortages in key UK industries such as automotive and aerospace. Revenues from key companies dropped dramatically, including Jaguar Land Rover posting a £422 million loss due to this challenge.

Following on from COVID-19, we have seen increasing geopolitical tensions through the Ukraine war, war in the Gaza strip, and with China. There has also been an impact on global shipping routes including via the South China Sea, Red Sea, Suez and even the Panama canal. These factors have shown vulnerabilities in current supply arrangements.

75% ARE WILLING TO PAY MORE FOR SUSTAINABLE PRODUCTS

Alongside this, supply chains are also being required to change due to increasing consumer pressure and legislation, both in sustainability and human rights. A recent survey by YouGov found that 82% of UK consumers believe that businesses have a responsibility to protect the environment, and 75% are willing to pay more for sustainable products. Supply chains need to know not just where their materials come from, but also the CO2 footprint of the products they sell right down to raw materials.

So, how should UK manufacturers respond to this rapidly changing supply chain landscape?

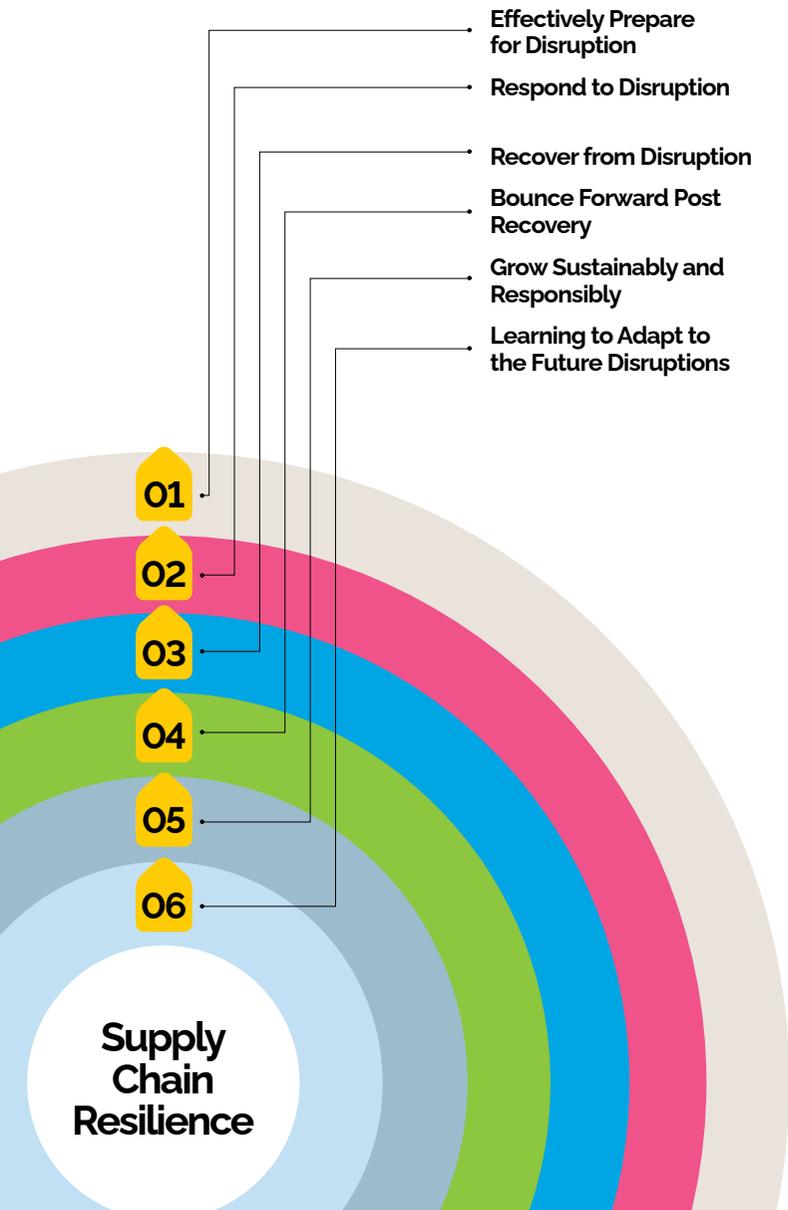
Through this report we share real case studies of the approaches organisations are taking to address these supply chain risks using digital technologies.

Through our work at the Digital Supply Chain Hub in developing a resilience framework with the University of Warwick, we have defined six key areas of action industry should undertake to address the risks in their supply chains.

Executive Summary

Tim Lawrence

Director
Digital Supply Chain Hub



This model highlights a number of effective strategies businesses are deploying to increase resilience:

In terms of effectively preparing for disruption, it is clear organisations are looking at better intelligence tools and capabilities. Digital technologies are playing a key part in enabling this, whether it be through AI-based risk analysis tools or mapping of supply chains using available data and natural language processing. Inventory strategies are also changing with companies like Yunex traffic looking to hold strategic inventory in areas like semiconductors and electronics.

In responding to disruptions the focus has been on having supply chains that are agile and responsive. For example, companies are increasing supply chain visibility through tracking and tracing technologies so disruptions can be seen early and can then be reprioritised for customers, a key part of Domino Printing services case study in this report.

Getting supply chain back up to speed after a risk event requires continuous monitoring and improvement as highlighted

by Ricardo and how they have set up their supply chain to respond to disruption.

In terms of proactive responses, a clear strategy that is emerging is to consider whether to source more locally through reshoring some of the supply chain. This strategy is being considered by over 90% of manufacturers as an approach to managing the geopolitical risks. There is a trade off between lower cost and lower risk but when businesses also factor in inventory holding and the CO₂ impact of global vs local supply chains then the opportunity for near shore supply chains is significantly growing.

Adoption of digital technology is also going to be an increasingly effective approach to managing supply chain risks and increasing resilience, whether that be adopting solutions like the resilience tool on the Digital Supply Chain Hub, using AI to increase visibility and early warning of risks or better planning supply chains through both supply and demand sensing.

However, these technologies will require better ways of working across supply chains. Data and information sharing on risks, CO₂ emissions and capacity data will be critical to the smooth flow of goods through the physical supply chains. This need to work together across supply chains will require supply chains to be more open and trustful than they have in the past. Again new technologies can support this data sharing as demonstrated by projects such as Connected MBEE, the ultra secure defence testbed exploring supply chain collaboration as part of the Digital Supply Chain Hub. Building trust to support collaboration and sharing will be key.

The digital supply chain ecosystems being built through the Digital Supply Chain Hub are a great initiative to both learn what others are doing to manage risk but also to collaborate across the supply chain to deliver increased resilience for all UK supply chains.

Introduction

During the last decade, few elements of industrial or business processes have had to endure as much upheaval, turmoil and disruption as manufacturing supply chains. No one could have predicted the sheer scale and volume of the challenges that have been thrown at the sector in recent times, to the extent that in trying to predict the future and strategise a roadmap going forward, the only prediction manufacturers universally agree on is that the only certainty is uncertainty.

There has never been a time when supply chain or product availability issues have caused so many problems for manufacturers and engineering businesses of all types. The 'perfect storm' of the myriad challenges impacting the sector mean that it's one of the highest priorities on boardroom agendas across the country.

The reality of manufacturing is that to ensure production, processes and operations are successful, supply chains need to be relied upon, and any challenges or disruption can have a huge impact on inventory, flow of deliveries, availability of components, trust among suppliers and partners, time to market and, ultimately, brand reputation.

A vital part of industrial businesses, supply chains account for 50-70% of a manufacturing company's costs; over 80% of most industrial companies' CO₂ emissions are created through the supply chain; and one in five job roles within the sector are directly involved with supply chain.

In this report we'll look at the challenges the sector has faced in recent times, and their relative impact; how to build successful supply chain strategies; best practice from those that know; help currently available and recommendations for the future.

The Challenges

**MADE
SMARTER**



COVID-19

When talking about challenges to manufacturing supply chains there is a clear and obvious place to start. As the pandemic took hold and lockdowns were enforced, the flow of global trade was hit hard – particularly if any process involved goods coming from the Far East (semiconductors for the automotive sector being a well-known example).

Not only was the disruption widespread, its very nature was also unprecedented and impacted the modern global supply chain like never before. In previous generations, supply chain resilience conventionally focused on protecting largely against single point failures – for instance, identifying a key component and dual sourcing to ensure continuous supply.

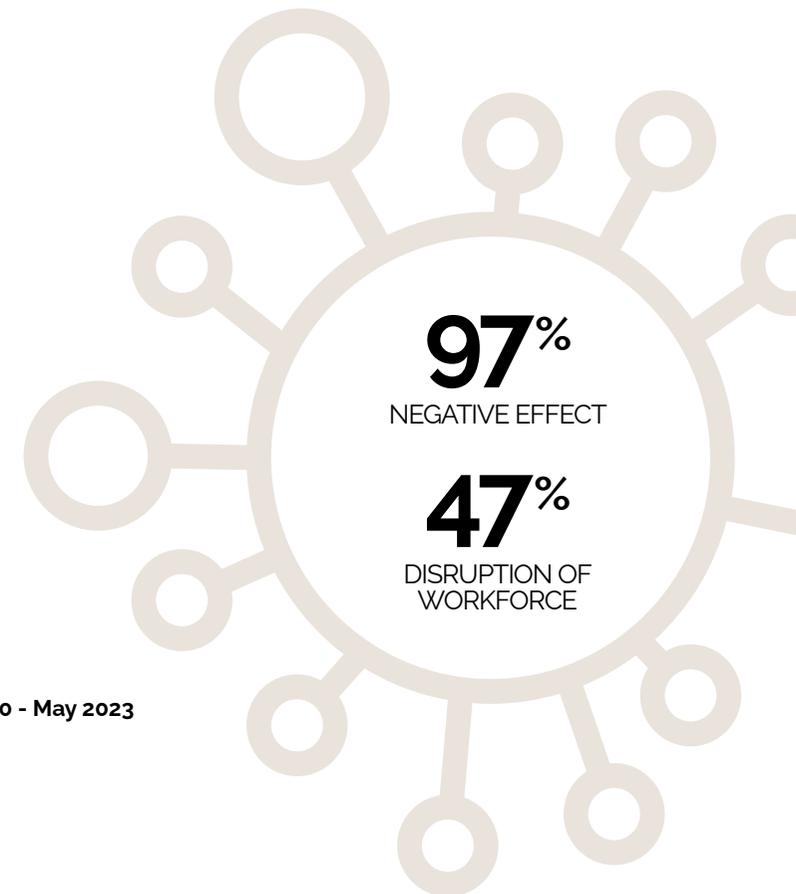
However, the global impact of COVID-19 saw many supply chains face multiple fractures – at component suppliers, manufacturing sites and in the 'last mile' to the customer. Therefore, it proved difficult, if not impossible, for firms to have redundancy across all those operations and still maintain efficient supply chains.

This could also be seen within the COVID-19 crisis itself; when COVID-19 hit in earnest, hospitals desperately needed ventilators – but countries like the US and UK didn't have the capacity or ability to make them quickly and efficiently. Only a massive global mobilisation effort – involving procurement from thousands of suppliers – scrambled together what was required, at vast expense, and not quite on time.

Lead times across the sector rocketed in some cases as demand for certain components far outstripped supply. In turn, this saw many manufacturers' inventory increase significantly as many shifted from a 'just in time' business model to 'just in case', with a huge drive to increase warehousing capacity.

A survey conducted by Ernst & Young in 2020 and again in 2022 showed that only two per cent of businesses said they were fully prepared for the pandemic, highlighting the unprecedented nature of the COVID-19 challenge and how many organisations were caught unawares.

The survey also revealed that all automotive and nearly all (97%) industrial product companies said the pandemic had a negative effect on them. In addition, 47% of all companies reported the pandemic disrupted their workforce – even if factories were allowed to remain open, they did so amid a whole raft of safety measures such as physical spacing, contact-tracing and increased personal protective equipment (PPE) requirements.



Pandemic Years, January 2020 - May 2023

The Challenges

Brexit

Alongside the COVID-19 pandemic, UK trade and industry was simultaneously grappling with the impact from the UK leaving the European Union and the subsequent disruption caused. Who could forget the delivery driver shortage and the warnings of a turkey-free Christmas in 2021?

Unlike COVID-19, firms had time to prepare for Brexit. However, such a seismic event proved no less tumultuous. Office for National Statistics (ONS) figures at the time showed that nearly a third of firms across Britain's manufacturing, wholesale and retail trade sectors suffered supply chain challenges due to Brexit. The departure from the EU created uncertainty and confusion for many businesses, which was accentuated by outdated, legacy and paper-based systems.

According to The Manufacturing Advisory Directorate (MAD) Yorkshire, January 2021 saw the biggest drop in manufacturing exports from the UK to the EU since 1997, with a drop of over 40%. Of course, a drop was expected due to natural teething problems and trepidation, however, the industry was experiencing issues of the same magnitude over a year later. This suggests that the extra paperwork, red tape and checks at ports following Brexit created significant and ongoing disruption.

New processes and regulations added complexity, particularly for SMEs which do not have the time, money or resources to deal with heightened levels of administration. With many smaller manufacturers often exporting low stock, one lorry would be used for multiple items, creating a logistical nightmare amid new customs and tariffs.

The Manufacturing Barometer, produced in early 2021 by the South West Manufacturing Advisory Service (SWMAS) and the Manufacturing Growth Programme (MGP), revealed that almost two-thirds (65%) of companies saw negative price changes within their supply chain due to Brexit, with the availability of raw materials an issue for 56% of firms. More than half cited complications with exporting (54%) and importing goods (56%), causing short and long-term hits on volumes and new opportunities.

With reference to the aforementioned driver shortage, data from ONS also revealed that EU born workers accounted for 13% of all employees in the manufacturing industry and this was impacted with the cessation of freedom of movement between the UK and EU. In addition, research from the Confederation of British Industry (CBI) showed that access to skilled labour was a major contributing factor to the limited output from the manufacturing sector over this period.

The abundance of new rules, be it immigration or trading laws, left manufacturers unsure of what to prioritise to keep their business afloat and remain competitive.

Many manufacturers, particularly in the automobile and aerospace sectors, relied on well-oiled, yet complex and interconnected supply chains. These snaked across Europe to move materials, components and finished systems between locations and suppliers. Brexit hit these highly tuned 'just in time' operations hard and the suspension of production at Honda's Swindon plant in early 2021 shows what can happen when these supply chains unravel.





Red Sea/Ever Given

The current conflict in Gaza and the subsequent disruption caused by Houthi rebel attacks on ships in the Red Sea, has led to significant shipping delays and severe price hikes. Such consequential supply chain disruption has caused many manufacturers to reconsider their inventory strategies, look at alternative shipping routes and consider reshoring strategies.

On 19 November 2023, Iranian-backed Houthi rebels in Yemen hijacked the ship *Galaxy Leader* in the Bab al-Mandab Strait, a strategic link between the Mediterranean Sea and the Indian Ocean via the Red Sea and the Suez Canal. Since then, dozens of vessels have been targeted by Houthi drones, missiles and boats in the area.

Over 80% of international trade in goods is transported by sea, and 30% of global container trade passes through the Suez Canal. However, in December 2023, shipping giants AP Moller-Maersk and Hapag-Lloyd paused their activity in the Bab al-Mandab Strait, with MSC and CMA CGM soon following suit.

Indeed, at the turn of the year, Suez Canal traffic reached its lowest level since the 2021 blockage, when the 400 metre long *Ever Given* container ship ran aground, blocking the waterway for six days and

holding up £7bn of goods per day. As an alternative to the Red Sea route, the world's major shipping companies ordered their vessels to traverse the Cape of Good Hope, a lengthy detour that adds around 4,000 miles and a 30% increase in transit times to every journey, extending supplier lead times while simultaneously increasing prices and container rates.

In turn, this saw ships burning more fuel and taking longer to reach their destinations, a situation that created larger carbon footprints in the process. Indeed, Maersk stated in May that the diversions and higher sailing speeds arising from the Red Sea situation have led to the burning of 13.6 million tonnes of additional fuel since mid-December – equivalent to the emissions of nine million cars over the same period. For the shipping industry – which is already one of the most polluting in the world – this is less than ideal.

According to figures from London-based shipping services provider, Clarksons, container ship arrivals in the Gulf of Aden – which connects the Red Sea to the Indian Ocean via the Bab al-Mandab Strait – were down 92% in the first week of February compared to the average for the first half of December. Furthermore, the Red Sea crisis coincided with the Panama Canal's worst drought in its history. Another key shipping channel, the Panama Canal normally allows 38 ships a day to pass through. At the start of 2024 that number dropped to around 24, meaning more delays and further cost increases.

Data from the S&P Global UK Manufacturing Purchasing Managers' Index (PMI) at the start of the year showed that attacks on ships in the Red Sea had the greatest impact in Europe, as re-routing resulted in two-week delays in some instances being added to average lead times for European producers.

During this time some European-based manufacturers paused some of their operations in Europe in the face of component shortages. Tesla temporarily closed its factory near Berlin between 29 January and 12 February, citing a lack of components. Meanwhile, Volvo Car paused operations at its Belgium facility for three days due to a delayed delivery of gearboxes.

Despite a US-led coalition which has seen naval vessels deployed in the area to protect merchant shipping, Maersk has stated that the situation has intensified in recent months and while the Danish shipper will continue to reroute cargo for the foreseeable future, the risk zone has expanded, and attacks are reaching further offshore. This has forced vessels to lengthen their journeys still further, resulting in additional time and costs to get cargo to its destination. Therefore, the company is estimating a capacity loss of 15-20% on the Far East to North Europe and Mediterranean market during Q2 2024.

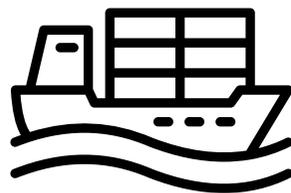
The Challenges

Red Sea/Ever Given - Continued

Furthermore, on 23 March 2021, while travelling from Tanjung Pelepas in Malaysia to Rotterdam in the Netherlands, the vessel Ever Given, one of the world's largest container ships, ran aground in the Suez Canal, blocking the channel. The ship remained in place for six days before it was freed by salvage crews, but the supply chain disruption was so great that its impact was still being felt months later.

One of the world's major strategic arteries for world trade and navigation suddenly became a chokepoint. Every day that the Ever Given blocked the canal, dozens of ships carrying billions of dollars' worth of cargo were blocked from crossing the waterway.

As many as 400 ships were blocked in total, costing the global economy an eye-watering \$416m per hour. Again, many shipping companies sought an alternative route around the Cape of Good Hope despite the clear cost implications involved. It served as a stark reminder of the fragility of logistics and brought to light the vulnerabilities of a system most people take for granted.



While an isolated incident, the more recent collapse of the Francis Scott Key Bridge in Baltimore served as a reminder that severe supply chain disruption can occur at any moment. The incident not only affected immediate transportation and logistics but also posed long-term challenges for Baltimore's role as a critical port node in US and international trade. As the city braces for a decade of construction in the aftermath of the collapse, experts and stakeholders are keenly observing how these changes will ripple through local businesses and the broader logistics network.

OVER
80%

of international trade in goods is transported by sea.

30%

of global container trade passes through the Suez Canal.

400 ships

Were blocked in total, costing the global economy an eye-watering \$416m per hour.

92% Down

Arrivals in the Gulf of Aden

Connects the Red Sea to the Indian Ocean via the Bab al-Mandab Strait.

15-20% Losses

On the Far East to North Europe and Mediterranean market.



Ukraine

The horrific events currently taking place in Gaza have overshadowed, somewhat, the situation taking place a few thousand miles to the North where another conflict continues to rage. It's been over two years since Russian tanks rolled across the Ukrainian border, a geopolitical event that proved no less disruptive to global supply chains and caused shortages of raw materials and energy price increases.

The conflict in the region has proved particularly challenging for the food and beverage sector as Ukraine - known as Europe's breadbasket - was among the world's top agricultural exporters prior to Russia's invasion. The country accounted for 50% of the planet's sunflower seed oil, 18% of its barley, 16% of global maize production and 12% of wheat. In 2021, Ukrainian farmers sowed almost 17 million hectares of spring crops, which is more than the combined area of Austria and Czechia. In 2022, this was down by nearly a quarter (22%).

In addition to the food sector, there was further disruption in other commodities and industrial inputs that originate from that part of the world. Russia is the third-largest producer of nickel - with ten per cent of the market - which is used in lithium-ion and electric vehicle batteries. In turn, Ukraine provides 70 per cent

of the world's neon, much of which supports the US microchip industry. Futures prices for precious metals such as gold and silver also surged after the invasion.

And it wasn't simply an issue of lowered output on the ground. Getting the produce out of the country to eager international markets was hampered by Russian military vessels blocking Black Sea ports, while domestic transport lines to export points were often stopped.

With the war disrupting supply lines and making exports less reliable and harder to secure, the price of foodstuffs increased - at a time when they were already at their highest levels in a decade. A 2022 Dun & Bradstreet report, 'Global Business Impacts: Russia-Ukraine Crisis', cited that approximately 600,000 businesses worldwide rely on Russian and Ukraine suppliers, with over 90% based in the US. So, finding new avenues for these products became an urgent discussion almost overnight.

**Gold
Silver** 

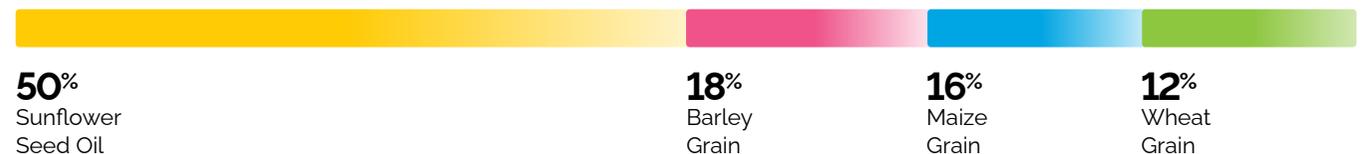
AFTER INVASION

70% PROVIDING THE
WORLD'S NEON

22% 

17 MILLION
HECTARES SOWN

The country accounted for...



The Challenges

Sustainability

Of course, against the backdrop of these challenges, manufacturers are also under increasing pressure to get their houses in order with regards to the environment and emissions. Tighter legislation and regulation are putting the journey towards net zero front and centre for industrial businesses, many of which utilise significantly energy intensive processes.

The emissions associated with the entire supply chain, including raw material extraction, transportation and distribution, can be significant. Common terminology when speaking about supply chain emissions is Scope 1, 2 and 3 – a method of categorising the different kinds of carbon emissions a company creates in its own operations, and in its wider value chain.

Scope 1: Covers the Green House Gas (GHG) emissions that a company makes directly, for example while running its boilers and vehicles.

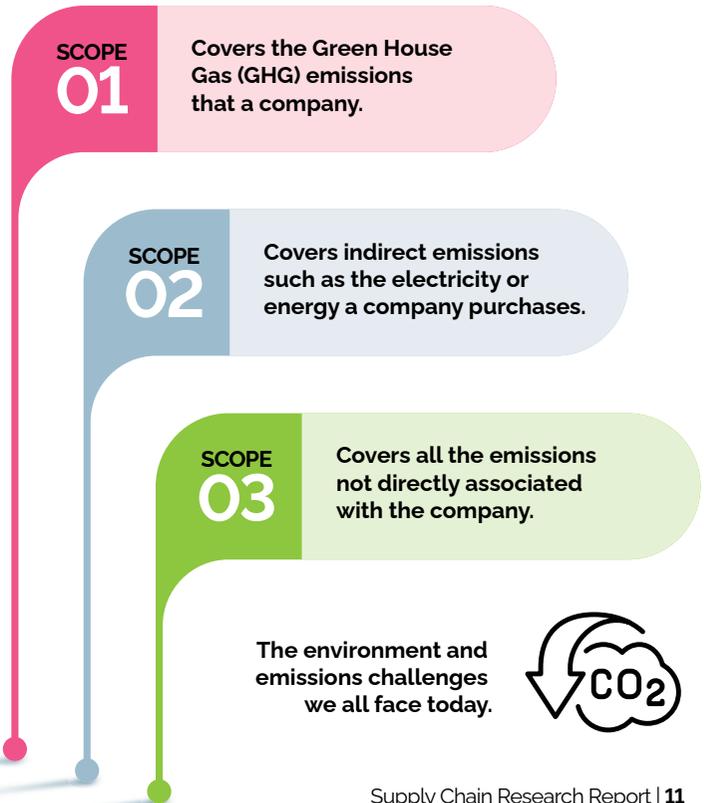
Scope 2: Emissions cover indirect emissions such as the electricity or energy a company purchases for heating and cooling buildings which is being produced on its behalf.

Scope 3: (the tricky part) covers all the emissions associated, not with the company itself, but those the organisation is indirectly responsible for, up and down its value chain. For example, from buying products from its suppliers, and from its products when customers use them. Scope 3 represents the greatest challenge for

most organisations as they are numerically often several times larger than the easier to measure and manage Scope 1 and 2 emissions. This is due to the significance of the carbon, both in the underlying supply chain, but also the future use of the manufactured products.

Until now, most EU companies have only reported on Scope 1 and 2 – with only a third measuring their Scope 3 emissions. However, under the Corporate Sustainability Reporting Directive, companies will also be required to report on Scope 3, their net zero reduction targets and progress.

This means manufacturers will have to be able to exchange data with partners to track and document the carbon footprint of raw materials brought in, the final product for sale – and everything in between.





Technology

A plus point of the COVID-19 pandemic was that it hit the accelerator on the need for digital adoption and switched people on to the possibilities of what could be achieved. The vast majority of manufacturers are on some kind of digital transformation journey which is offering the opportunity for business leaders to redesign and future-proof their value chains in response to global challenges. However, despite the clear benefits around embedding visibility and resilience within manufacturing supply chains, digital transformation strategies do come with their own challenges.

The wide variety of solutions and vendors available to manufacturers means that many businesses are unable to see the wood for the trees, have become bogged down by jargon, terminology and buzzwords, and still have a general lack of understanding around the potential return from a digital technology investment, which is in turn, delaying adoption in some quarters.

The pressure is on for manufacturers to optimise their supply chains, but many are still at the early implementation stage of their digital investments, and complex workflows and processes, security concerns and a growing compliance burden are magnifying the pressure. Therefore, many manufacturers' supply chain visibility is not all that it could be.

In addition, legacy environments, lack of IT/OT convergence, reluctance to trust AI and resistance to change at a factory level are all barriers to digital

adoption and, as a consequence, supply chain optimisation. This supply chain issue is not helped by the fact that many manufacturing operations operate within certain silos. A legacy issue in many ways, and while these silos may not have caused an issue historically, in today's fast-moving, demand-driven landscape they are holding businesses back.

There are many reasons why such silos exist, but they frequently arise due to organic growth, internal restructuring, failed efficiency improvements, disconnected processes and acquisitions. Silos can occur between different business structures, merged as part of global acquisition, between different business departments operating out of the same site or even different teams working within the same office.

They significantly impact collaboration and the speed of decision-making across a business, reducing competitiveness and responsiveness, and increase the vulnerability to disruption. The time and complexity involved in successfully uniting previously separate business systems, processes, data structures, plans, targets, KPIs, reports and organisational silos should not be underestimated.



Introduction

Against the backdrop of these myriad and varied challenges it should be remembered that there are manufacturers who are facing these down and thriving. Here, we look at just a few who are winning the supply chain battle.

Successful Businesses Strategies

Industry Case Studies

**MADE
SMARTER**



SIMON MARTIN
Global Manufacturing Director
Yunex Traffic

Based in Poole, Dorset, Yunex Traffic develops intelligent traffic management systems, simulation, tunnel management, AI powered digital solutions and infrastructure for autonomous driving, with the goal of making mobility safer, more efficient and sustainable. The company won the Supply Chain Excellence category at The Manufacturer MX Awards 2023 (TMMX).

01

How have supply chain challenges impacted the company?

How have supply chain challenges impacted the company?

The most significant challenges we've had to face have been Brexit, COVID-19 and disruption within the global electronics supply chain - a secondary impact of COVID-19 but one we still had to address in its own right.

However, the biggest challenge for us has been the global electronics crisis. At its worst, lead times shot up to two years for some electronics components, that's if we could get them at all. Therefore, we've had to implement a variety of changes in order to mitigate that which relate to the foundations we're putting in place for future digitalisation.

02

How have the supply chain challenges changed company operations?

These made us change the way we approach business operations, look at how agile we are and made us sharpen our processes.

Job one whenever you have any supply base disruption is to build a buffer. For us this effectively meant increasing inventory. We wanted to make sure we weren't disrupting our customers and, during the whole period, we never once stopped production and we're really proud of that.

03

What role do digital technologies play in increasing supply chain visibility and resilience?

During COVID-19 we had to be ready to adapt to whatever occurred. Sometimes shipments would be affected or suppliers would be shut down. If that happened, we had to pivot and react, make decisions quicker and make sure we had the right people in front of the right problem at the right time - that's something we got pretty used to.

Even so, we had to be careful. We've got a wide portfolio of products and each one has high levels of configurability. For example, a European traffic light has around 20,000 possible permutations or combinations. We can't keep all of that, so the sales inventory and operations planning process (SIOP) becomes really important.

04

What were the key attributes to Yunex winning the supply chain category at TMMX?

Brexit has been impacting us for a number of years. How we adapted post the UK's exit from the EU was extremely important as approximately 40% of what we produce goes into Europe. So, we had to make sure that we stay competitive, keep costs down, react quickly and didn't have delays at customs. And that meant improving our processes.

We don't know exactly how much our customers are going to use - we can perform run rates, projections and use all the statistical tools available, but we can never be 100% sure. So how do we manage that?

05

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

We now have an export control and customs (ECC) team that's based both in the UK and in Europe that we integrate into any conversations around European logistics. And we recently changed how we're distributing in the EU which has included a project that will see us with a larger European hub.

We had to look at new processes and be really agile. The finance team was pivotal in how we manage this and came up with real-time cost projections and how those were changing over certain periods. This was brilliant and a real enabler for rapid and informed decision making.

Our products go out onto the streets across Europe, so we have a lot of depots where we keep spares and materials in order to serve and service that market. Therefore, we've come up with a new way of servicing our biggest market in Europe, which is Germany, and that means less effort in terms of customs compliance and a stabilising of our production due to a Europe-wide Kanban process where we're consolidating all our logistics sites.

We also had to get extremely proficient at inventory management. During the component crisis our buffer was to increase inventory, but of course the expectation of any organisation is to minimise that so you can continue to support customers and not tie up too much cash. Therefore, since the peak of the electronics shortage, our inventory has been coming down and we have a weekly deep-dive to see where we are on each of the product lines, where we are versus the plan, where the gaps are and how we align them.

The most significant challenges we've had to face have been Brexit, COVID-19 and disruption within the global electronics supply chain.



One of the best methods of optimising inventory is to reduce overall end-to-end cycle time, which means that product is spending less time within your four walls. The flip side of facing large challenges is that it makes you better. We're always looking at cost optimisation and some of the lessons learned during these challenges have definitely made us sharper.

How have the supply chain challenges changed company operations?

We're now really open about how we're performing in front of our customers. We look at true on time to request and we are laser focused on quality. We always try to give a manufacturing advantage to our customer facing team and as such, manufacturing has been made one of our four strategic pillars of the organisation.

Focusing on manufacturing as a competitive advantage means our organisation backs us and invests in us to bring additional value to our business.

We're also a more proactive organisation - we don't just accept an order and quote a lead time and price. We'll ask what the customer needs, how we can get ahead, what the price point needs to be, how can we best optimise that for the organisation, what batches make sense, what are the delivery frequencies, and how are we focusing on ESG targets?

What role do digital technologies play in increasing supply chain visibility and resilience?

We have a future factories strategy and a five-year roadmap of how we use digitalisation to transform what we do. In terms of our supply chain, one of our key areas in this regard is how we Poka-Yoke our customs compliance documentation, how we feed data into that and how we automate the process.

We make sure that the master data on SAP gets translated effectively to whatever combination a customer is ordering so that what we've got on a pallet matches exactly with the paperwork.

We're also looking closely at real-time cost management. We have variations in input and product costs, because we're not necessarily always buying at the list price. And if our customers want to bring orders forward or make changes, we can show them what options are available.

The SIOP process and our inventory management is key. I can look at what the inventory is going to be across all product lines and consolidate that in an overall plan. Having the visual management through our dashboards enables us to manage our business and having the right data at the right time means we can make the right decisions.

In any digitalisation project, the key is not necessarily the actual digitalisation or the coding of any given solution; most of the effort is focused on the provenance of the data.

What were the key attributes to Yunex winning the supply chain category at TMMX?

Firstly, we've got a great team here, and that's key. Everyone is really committed and they not only have a great mindset and approach, there's also some key experts. We're open to how we challenge ourselves to make things better and there have been some significant changes over the last few years, with more to come.

There's been a great learning process from previous awards where we haven't been so successful. We've learned from some of the best in UK industry and we've seen what others are doing. We've then asked ourselves how we can adapt and continuously improve.

Continuous improvement is so important; establish a baseline, improve, reset and repeat. Our MD and CFO are also fantastic, and they've given us great support by making manufacturing one of the strategic pillars of the business. Everyone's bought into that and it underpins our overall strategy deployment as an organisation.

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

Reasonable standardisation is good at a macro level, as it still allows flexibility to some of the smaller players, who need to do something a bit special to still have a competitive advantage. In the UK especially, we've got to be really flexible and have a real solutions-based approach to everything we do, particularly post-Brexit.

If some of the overall improvements in logistics, transport and customs compliance could be led at a larger level and pull people together, that would make sure the overall supply chain framework is as optimised as it can be, while leaving that flexibility for different industries and businesses to come up with a way of offering the best value for their customers.

And if there is lobbying with government around that, it will create a single message coming through from the UK manufacturing industry.





CARL HAYCOCK

UK Operations Director
Domino Printing Sciences

Domino Printing Sciences is a developer of industrial and commercial inkjet printing, thermal transfer printing, print and apply machines, digital printing presses and laser printing products. The company won the Supply Chain Excellence category at The Manufacturer MX Awards 2019.



01

How have supply chain challenges impacted the company?

02

How has the company responded?

03

What role do digital technologies play in increasing supply chain visibility and resilience?

04

What were the key attributes to the company winning the supply chain category at TMMX?

05

What are the top tips for unlocking the potential of technology?

06

How can companies unite disparate systems in order to enhance their supply chain?

07

What importance does cyber security play?

08

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

We have seen significant increases in component prices and higher freight costs.

How have supply chain challenges impacted the company?

As a global company, Domino serves customers worldwide with a complex supply network; like many other international businesses, we have seen significant increases in component prices, higher freight costs, extended lead times and scarcity of certain critical raw materials.

The last few years have also proven challenging due to significant regulatory changes related to trade compliance, as well as geopolitical tensions and conflicts that have created the perfect storm for supply chains.

How has the company responded?

All these factors have proved challenging for Domino as a business, but we have worked hard to minimise customer disruption. Our primary focus has been ensuring that customers can be kept supplied so that they can continue doing business as usual in essential sectors, including food, beverage, pharma and industrial markets.

In the main, we have been able to keep up supply to our customers through a robust supply chain strategy based on ensuring resilience and business continuity and serving the customer in short lead times – not to mention a professional and dedicated team of buyers and material planners, of course.

Material input costs, freight and wage inflation have been substantial additional costs. Still, we have worked to absorb cost increases where possible to limit the costs passed onto our customers.

What role do digital technologies play in increasing supply chain visibility and resilience?

End-to-end supply chain visibility is the ultimate panacea, allowing for the most warning of where issues may arise and, by extension, the capability to make strategic decisions with regard to inventory distribution. This level of visibility is not possible without digital technologies, including our ERP system, which helps provide greater visibility of our supply chain networks and solutions that help identify items within the supply chain, such as scannable 2D codes.

At Domino, we run a single, connected ERP system that provides end-to-end visibility of our supply network, and we have dual capability on critical products to ensure we can react quickly and efficiently in a crisis situation.

We are also investing heavily in a next-generation cloud-based ERP system that will provide additional capabilities in global trade management and allow us to connect directly to suppliers' systems to improve visibility further. The system should also be ready to take advantage of advancements in machine learning and artificial intelligence so we can further optimise decision making with regard to supply chain management.

In addition, we are heavily invested in exploring the capability of QR codes powered by GS1 to individually identify products and record their movements through logistics and supply chains. We are currently implementing QR codes powered by GS1 on all our consumables packaging (including inks, ribbons and filters) to provide additional value and services to our customers.

Including scannable 2D codes can enable easy booking into warehouse systems and facilitate many additional value opportunities in the future, for example, accessing reordering information, safety and install data, and environmental credentials, all of which make it easier for the customer to do business with us.



What were the key attributes to the company winning the supply chain category at TMMX?

Our approach to building a robust and resilient supply chain directly contributed to our winning the Supply Chain Excellence category at TMMX. We won this award in 2019, and shortly after the pandemic hit, and we were able to clearly demonstrate the benefits of our design and investment in the ongoing training and development of our supply chain professionals. You could say The Manufacturer was ahead of its time in recognising it!

What are the top tips for unlocking the potential of technology?

It is important to think about a technology's impact on a business when selecting or designing new systems, and not just to implement technology for technology's sake. Think about data strategies and the governance surrounding them to maximise the potential of digital automation and ensure that processes are designed from end-to-end.

Behavioural change management training is also a significant enabler in gaining the engagement of teams that need to bring the benefits to life – it's always helpful to demonstrate the impact of a technology in terms of how it will affect the end customer experience and the benefits it will bring.

Our implementation of QR codes powered by GS1 on consumables is a good example of our approach to this – scannable 2D codes are an immensely powerful technology that can give everyone more access to information in a secure way.

They will bring huge benefits to Domino as a business in terms of improving our supply chain visibility and operations, but we are also helping customers access our systems directly through the use of these technologies. By scanning the code, customers can not only book a product into their warehouse system but also access key information about the product.

How can companies unite disparate systems in order to enhance their supply chain?

In an ideal world, everything would be available via a single connected system – however, the reality is quite different.

In our experience, it is inevitable for companies to have to manage many interfacing tools, sharing data between different ERP, CRM, PLM and MES systems, both within the company itself or when dealing with suppliers and customers. Companies may be tempted to try and integrate as much as possible into one system – but this can be detrimental and lead to businesses making trade-offs in performance.

A market-leading system with the flexibility to integrate easily with others is a must, as disparate systems are often a practical reality. Benefits can still be gained by having a data lake where end-to-end processes and whole business performance can be aggregated and viewed with a customer-facing lens. This can also shortcut some of the time spent waiting for the long-term architectural changes that might be needed to move to strategic global platforms.

What importance does cyber security play?

Digital supply chain systems interconnect with multiple nodes within wider supply chain networks, including warehouse hubs, freight providers, suppliers and customers. It is incredibly important to ensure that data is secure and cannot be disrupted by those with ill intentions.

Cyber security remains as important as ever, as cyber threats can be more disruptive than many traditional supply chain issues. Businesses should ensure they have a mature end-point phishing strategy and protection programmes like multi-factor authentication. To develop resilience, it is necessary to invest in continual testing for vulnerability in all systems and have a supporting IT-led cyber strategy focused on protecting key assets.

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

At present, there are many evolving standards for connectivity – including OPC UA, Ethernet IP, Unified Namespace, EDI, and XML – that are all working towards making it easier to build digital supply chains. Having one set of standards may help to unite the industry and ensure interoperability between different technological systems, and having support from big industry players would certainly help expedite the adoption and assist with wider buy-in.

The new Digital Link standard for QR codes powered by GS1 is a great example of a harmonised system for 2D codes led by a single entity, GS1, that will make it much easier for all supply chain systems to interact and use data. We are still in the early days of the power of this code format and the benefit it can bring in supply chain unification and consumer engagement, but we are expecting this to have a very significant impact.





IAN MORRIS

Head of Procurement
Ricardo

Working across eight key market sectors including aerospace and defence, automotive and energy utilities and waste, Ricardo deliver technologically advanced solutions that ensure access to clean air and water; cross-sector engineering solutions to accelerate decarbonised transportation; innovation to support global net zero and industry agendas; comprehensive expertise in safety, assurance and certification. The company won the Supply Chain Excellence category at The Manufacturer MX Awards 2022.



01

How has supply chain challenges over the last few years impacted the company?

02

How has the company responded?

03

What role do digital technologies play in increasing supply chain visibility and resilience?

04

What were the key attributes to the company winning the supply chain category at TMMX?

05

What are the top tips for unlocking the potential of technology?

06

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

Businesses dealing with the complexities of managing a global supply chain have been impacted by challenging external factors in recent years.

How has supply chain challenges over the last few years impacted the company?

Most businesses dealing with the complexities of managing a global supply chain have been impacted by challenging external factors in recent years. For a company like Ricardo, which operates in low volume manufacturing for high-performance and specialised vehicle applications, these challenges have been particularly pronounced.

Disruptions in the availability of critical components and increased costs have all been part of the landscape we've had to navigate. The nature of our business means that we are managing a complex global supply chain in a low volume environment. We deal with big corporates, new technologies and extremely complex components, with very little leverage from a revenue potential and attractiveness perspective for a supplier.

Balancing the relationships we have with over 600 suppliers against a backdrop of global uncertainty and disruption has meant that we have needed to be highly adaptive to maintain the high standards our clients expect.

How has the company responded?

We manage a global supply chain and many of these challenges vary across regions. We've had to rethink and enhance our strategies to maintain resilience in our supply chain, and our relationships with our suppliers are paramount to building that.

There is a huge focus on continuous improvement, both in terms of our own processes and the support that we offer to our suppliers. Initiatives like scorecards, risk assessments and on-site support give our suppliers the opportunity to improve their efficiency and reduce waste across the entire value stream on the way to our clients, ultimately improving the quality of the services that we can provide.

We've also invested heavily in the sustainability of our operations, establishing a dedicated supply chain sustainability function. This investment aims to reduce our carbon footprint and enhance efficiencies throughout the entire value stream. By emphasising transparency, adaptability and sustainability, we have been able to mitigate some of the adverse impacts and continue delivering high-quality products and services to our clients.



What role do digital technologies play in increasing supply chain visibility and resilience?

Digital technologies have a big role to play at Ricardo. The impact that real-time data has on our ability to make improvements to our systems cannot be understated.

Technologies like advanced analytics and system integration tools enable us to monitor our supply chain operations closely and respond proactively to any disruptions and to mitigate risk. Our rigorous system utilisation, from SOP processes through MRP, is bolstered by digital tools that help to facilitate continuous improvement and efficiency across the value stream.

This technological integration ensures that we can maintain the high standards demanded by our clients and adapt swiftly to any challenges that arise, thereby enhancing the resilience and reliability of our supply chain.

What were the key attributes to the company winning the supply chain category at TMMX?

In my opinion, it was due to our demonstration of how we approach the difficulties associated with managing a complex global supply chain, in a low volume environment. While also taking the ESG impact of our supply chain into consideration.

The bottom line is that, because of the prestige and complex requirements of our clients, we demand the absolute best from our supply chain. However, a supply chain is only as strong as the relationships you build. And I think for me, perhaps the best demonstration of Ricardo's supply chain excellence is how we manage those relationships to ensure that we always support our clients appropriately.

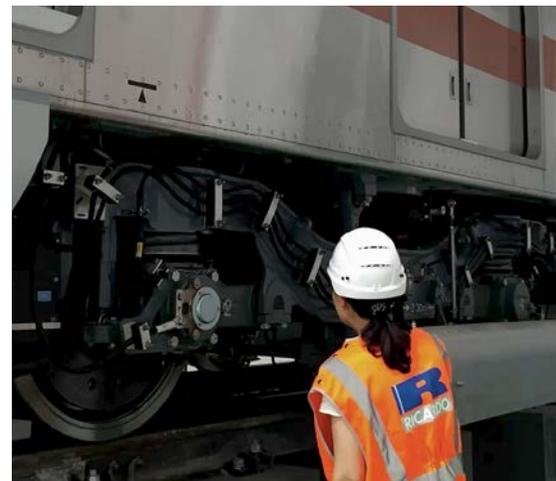
What are the top tips for unlocking the potential of technology?

Technology has a role to play in the supply chain in so much as it improves visibility and provides the data required to help us make the right decisions for our business. However, it is easy to focus on the data and not on the relationships and human factors in your supply chain.

Use the data as a tool for improvement but don't underplay the value of interpersonal relationships with your suppliers and the insights that come from those. Use these insights in tangent with the insights from your data to give context to what is really going on in the supply chain. You need both to get the full picture.

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

One set of industry standards could potentially help to enhance supply chain efficiency and interoperability at some level. It's important to acknowledge that some industries will have standards specific to regulations in their market, aerospace for example, and so any universal standardisation of supply chain practices would need to take this into account.





CLAIRE AITCHISON

Executive Operations Leader
Druck

Druck, a Baker Hughes business, delivers world-class piezo-resistive pressure sensors, pressure transducers, pressure test and calibration instruments, providing its customers with high performance, stability, quality, accuracy and quick response – in any environment. The company were Runners-up in the Manufacturer of the Year category at The Manufacturer MX Awards 2023.

01

How has supply chain challenges over the last few years impacted the company?

02

How has the company responded?

03

What role do digital technologies play in increasing supply chain visibility and resilience?

04

What role is AI/blockchain playing here?

05

What are the top tips for unlocking the potential of technology?

06

How can companies unite disparate systems in order to enhance their supply chain?

07

What importance does cyber security play?

08

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

Increased costs on energy, materials and labour which has challenged every aspect of profitability.

How has supply chain challenges over the last few years impacted the company?

We have seen increased costs on energy, materials and labour which has challenged every aspect of profitability. We have also seen unusual order book levels, both over inflated after COVID-19 and now below expected levels as many customers reduce their inventory; this coupled with initially extended lead times on purchased components, now reducing, has meant operations have not felt stable for over four years now.

How has the company responded?

We have increased the urgency on implementation of automation to try to avoid adding headcount when we grow. We have driven our sustainability agenda to reduce our power consumption, and have increased our Technology team around key new product introductions to improve our portfolio. We have also pushed our commercial activity into new market spaces to try and generate more orders.

What role do digital technologies play in increasing supply chain visibility and resilience?

It's essential that we understand our data and use it to drive continuous improvement; as a business we are gathering ever more product and process data and using it to deepen our understanding. Driving to root cause on yield issues, tightening process specifications and visualising real-time process performance to detect changes and prevent spec creep are vital for supply chain resilience.

What role is AI/blockchain playing here?

Our parent corporate business is restricting the use of AI until greater security of IP can be assured. We are using AI tools to optimise inventory using a partner agreement with an AI provider, and we have AI learning on some automated equipment beyond a production network firewall, but overall uptake of AI is limited at the moment.

What are the top tips for unlocking the potential of technology?

Understand your roadblocks in your processes and work to reduce waste and optimise flow with automation and data. Once the roadblocks are in line with TAKT times, work to join up the processes and continue to understand your data wing to wing.



How can companies unite disparate systems in order to enhance their supply chain?

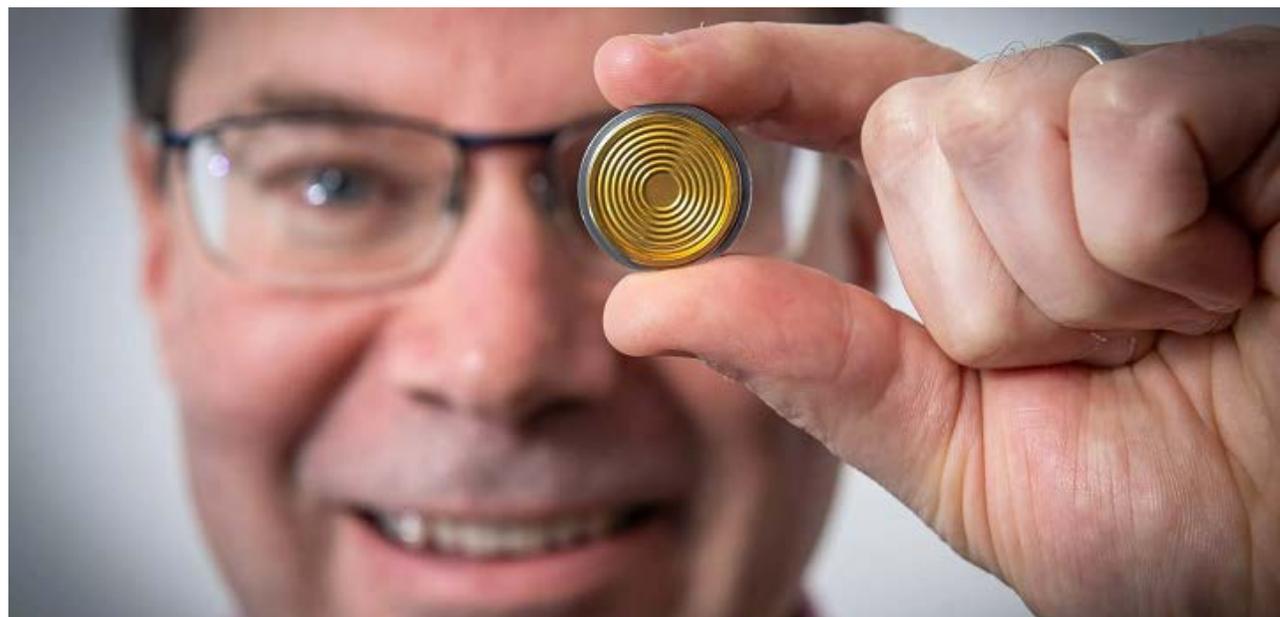
We work to understand what data we need and what systems are available to provide that data. Any data that can be pulled into an SQL database can be visualised out to enhance performance through tools such as Power BI, Tableau or bespoke MES systems. Where historically installed systems have been left in place, we work to understand if that data is available any other way and try to simplify and rationalise any unnecessary systems.

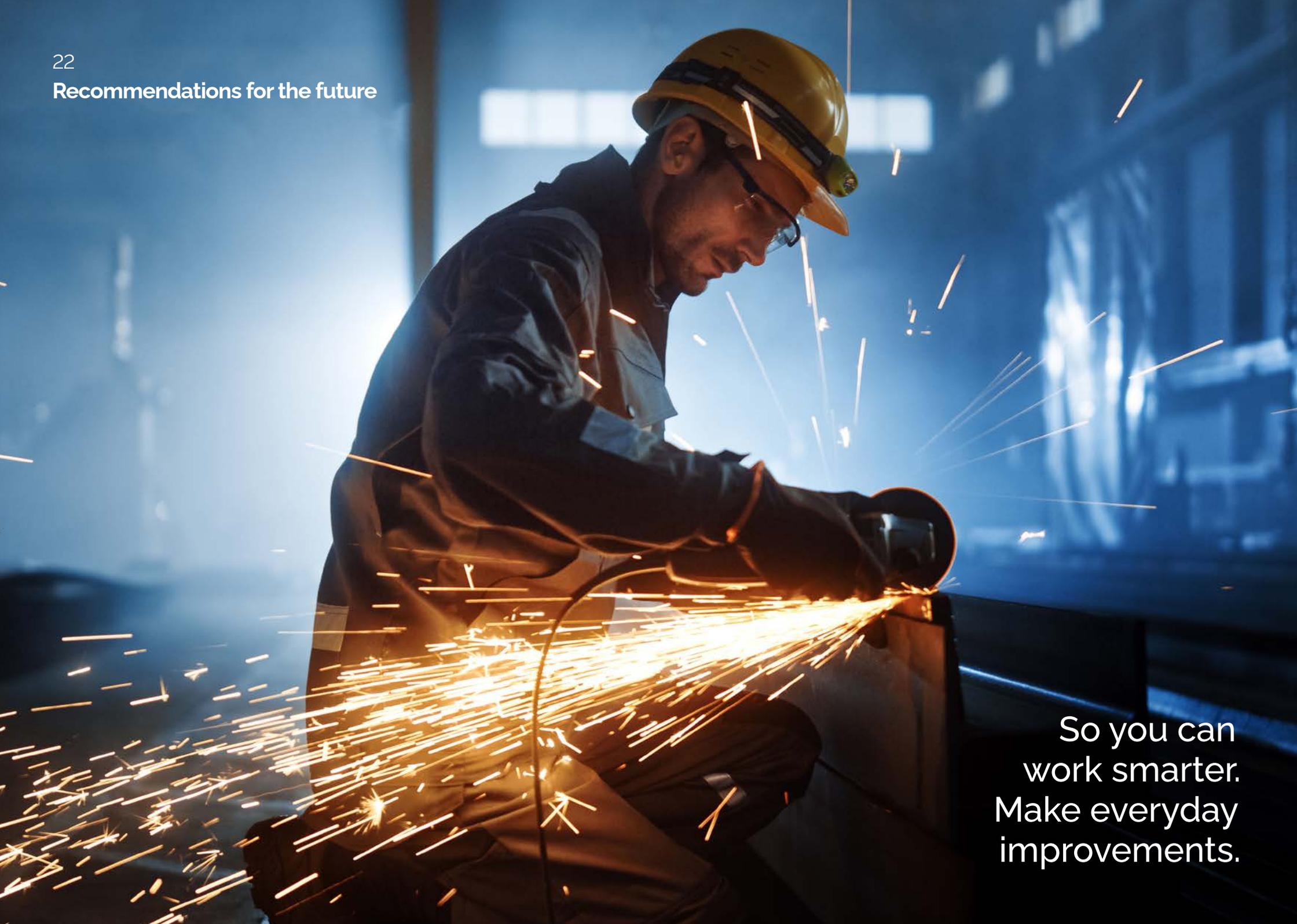
What importance does cyber security play?

It's huge to have cyber security that protects your assets in production networks and data in general corporate networks. There are so many possible ways for IP thieves to find a way into company systems or indeed for employees to share data inappropriately in error. Systems to protect the company and training to keep employees current on their part in protecting the company is imperative.

Does there need to be one set of standards in order to unite the industry and does this need to be led by the big players?

AI and data security is an opportunity and a risk to us all. To have one set of standards and have implemented controls would likely reduce those risks for all manufacturing businesses. Developing standards will cost money, something that the big players would have more capacity to achieve than smaller businesses.





So you can
work smarter.
Make everyday
improvements.

Recommendations for the future

**Now, forward thinkers
have a chance to
stand out.**

**MADE
SMARTER**

Recommendations for the future

It should be remembered that necessity is the mother of invention, and while the plethora of disruptions mentioned in these pages have caused challenges for manufacturing supply chains, they also present opportunities.

It's only when the tide goes out that you can see who's been swimming naked' and this has been true over the last five years as the disruption and challenges within the sector has shone a spotlight on any embedded shortcomings within industrial business processes. It has also highlighted the need for some manufacturers to increase their agility, investment and adaptability in the face of change and market volatility.

It is worth noting that investment in technology within manufacturing businesses has increased in recent years as the value of digital transformation and a digitalised supply chain has been laid bare - helping enterprises navigate disruptive forces and respond faster to volatile supply and demand.

The likelihood of further disruption in the future is extremely high and there's no doubting that events of recent years have forced manufactures to act; to the extent they are now far better placed to manage and mitigate future challenges.

For the supply chain challenges mentioned in the earlier section, some obviously have clearer warning signs than others - it would have been far easier for manufacturers to make preparations ahead of Brexit, for example, than the unknown of COVID-19 or any natural disasters.

The four key indicators to consider for potential disruption include:



01

DEMAND FLUCTUATIONS

When there are unexpected and fast changes in demands from consumers, clients or partners for a product or service, it can massively impact stock and delivery schedules throughout the supply chain. This can result from a particular seasonal demand or an emerging trend encouraging more investment.



02

UNSTABLE SUPPLIERS

Supplier stability can be a massive issue throughout supply chains, with financial concerns such as missed payments. Another indicator can be breakdowns in communication with said suppliers.



03

TRANSPORT DELAYS

Whether it's traffic and route issues that are key to logistics, or lead times increasing, there are plenty of red flags that you can catch early. These disruptions can have a huge impact later down the supply chain.



04

GEOPOLITICS

These can have a significant impact on supply chains, with relationships between countries and their trading and regulations massively affecting transport across borders and markets.

As mentioned previously, regardless of whether manufacturers can get a heads up on any potential disruption or not, they can be sure that further shakeups are coming down the track – it's a case of when rather than if.

So, what are manufacturers to do?

Of course, the safeguarding of critical supplies received a boost at the start of the year with the announcement of the then government's new Critical Imports and Supply Chains Strategy.

In response to increased geopolitical disruption, and the unprecedented challenges of recent years, the strategy highlighted the need to manage supply chain shocks and equip UK businesses to deal with global supply chain problems and access the essential imports they need.

More than 100 top UK firms, including pharmaceutical and manufacturing leaders like The Association of the British Pharmaceutical Industry (ABPI), the Society of Motor Manufacturers and Traders (SMMT) and Green Lithium contributed to the strategy to ensure it helps develop resilient and secure supply chains that protect both their business and the consumers who rely on them.

The aim of the Critical Imports and Supply Chains Strategy was to enable government to share vital information and guidance with businesses on the risks to key supply chains and the practical steps they can take to protect themselves from disruption, including regular updates on emerging supply chain risks, such as new export bans on critical everyday goods imposed by other countries.

As part of the strategy, it was planned that the UK would set up a new online portal to allow businesses to quickly report red tape or disruption affecting their critical imports. It was thought that the government would then be able to remove these barriers wherever possible, saving business time and money.

The strategy set out how the UK will use cutting edge research to understand the impacts of shocks on supply chains and how critical goods required in the future can be secured. This included researching how climate change will impact key supply chains, and how to mitigate the impact of environmental disasters.

The establishment of a new Critical Imports Council would have also allowed businesses and government to work together to identify risks to critical imports and develop a plan of action – ensuring that businesses have a central voice in shaping government's work to build supply chain resilience.

This albeit positive news, of course all came before the result of the recent general election which saw an end to the Conservative government. It is now vital that incoming Prime Minister Sir Keir Starmer picks up the mantle to ensure that industry receives the clarity, coherency and consistency to follow through on this promising news. Consistent messaging is key to any industrial strategy, and ongoing support for the sector is vital to mitigate against any disruption coming our way further along the road.

Recommendations for the future

To this end, speaking less than a week after the election result, the new Chancellor of the Exchequer, Rachel Reeves has already promised to take immediate action to fix the foundations of the economy, rebuild Britain and make every part of the country better off, a statement which has been described as a "bold statement of intent" from the industry.

So, while there is a certain amount of uncertainty from Westminster, what can manufacturers on the ground do to help their supply chain cause?

Any disruption, regardless of its location, can have a huge impact on international markets and quickly. Rising costs caused by this disruption mean less disposable income for customers and lengthening lead times can spell bad news for brand reputation.

Therefore, the security of raw material supply chains is something manufacturers must be vigilant about. A secure logistics management system is one of the biggest assets a manufacturer can have and can help an organisation understand how to meet the demands of the market amidst the disruption.

While recent supply chain events have forced manufacturers to reprioritise different operational functions, it's important to remember that many, if not most of the businesses within a company's supply chain will have been in the same boat. Therefore, it is important to interrogate the reliability of supply lines.

Reshoring, nearshoring, friendshoring

Fleet-footed and adaptable manufacturers have realised that shortening and reducing complexity in their supply chains would future-proof their organisations against any ongoing damage. A very effective way of doing this is by increasing local sourcing – taking more from suppliers nearby, regionally and across the UK, as well as increasing the number of domestic UK merchants.

All the recent supply chain headaches have encouraged many UK companies to rethink procurement and recognise the benefits of local partners for reliable delivery. Reducing dependence on foreign suppliers and partners increases the adaptability and agility of British manufacturers.

Of course, there is a growing clamour in the sector for manufacturers to bring their operations closer to home, commonly known as nearshoring or reshoring. The economies of scale that once made shifting manufacturing to the Far East are now outweighed by increased labour costs, logistical and administrative headaches and a lack of supply chain control.

A survey conducted by the Boston Consulting Group at the end of 2023 showed that over 90% of manufacturing businesses now see nearshoring and reshoring as key ways of safeguarding their supply chains, with the relocation of orders to neighbouring countries seen as the most suitable restructuring option to increase efficiency, improve flexibility and shorten delivery times.

Two-thirds of the companies surveyed plan to restructure their supply chains in the next five years. Notably, 67% of industrial companies intend to increase regionalisation, with plans to relocate procurement capacities to more politically stable areas. 42% of all companies surveyed rate regionalisation as the primary approach to restructuring their supply chain.

Eastern European countries are seen as the most common option. 57% of businesses already source goods from the region, while 32% plan to relocate their activities to Eastern Europe in the coming years.

While geopolitical tensions remain a major motivation for nearshoring, production costs were also rated as a strong or very strong influence for 82% of companies restructuring their supply chains.

Nearshoring or reshoring has the ability to increase resilience, accelerate lead times and enhance sustainability. But to do this, companies should first create transparency throughout their entire supply chain. This foundational step enables a comprehensive 'total cost of ownership' analysis, identifying primary products suitable for nearshoring and reshoring, as well as determining the most viable supply regions.

Additionally, by strengthening relationships with providers, manufacturers can also tap into knowledge and tips on market dynamics which can help businesses to anticipate and avoid problems or take advantage of predicted opportunities. Therefore, collaboration, relationship building and a willingness to help colleagues, including competitors, is crucial.

90%
See nearshoring and reshoring as key ways to safeguard supply chains.

82%
Companies restructuring their supply chains.

67%
Plans to relocate procurement capacities to more politically stable areas.

42%
Rate regionalisation as the primary approach to restructuring their supply chain.

57%
Source goods from Eastern Europe.

32%
plan to relocate to Eastern Europe.

Recommendations for the future

Technology

Emerging technologies like artificial intelligence and machine learning hold the key to supporting UK manufacturers in solving supply chain challenges. An AI-powered supplier directory is in development through Digital Catapult's Digital Supply Chain Hub programme (DSCH) and the High Value Manufacturing Catapult, to help British businesses find relevant local manufacturing contacts, allowing businesses to diversify their supplier base. By connecting UK companies to regional suppliers, collaboration and supply chain resilience can be strengthened for manufacturers across the country.

DSCH has invested in the development of digital tools as part of the programme. This includes working with Versed AI, who are solving the problem of multi-tier supply chain visibility by creating a vast knowledge graph of supply chain relationships extracted and aggregated from thousands of different sources. This knowledge graph can be queried to map a company's supply chain down to tier n. This reduces risk, helps companies meet regulatory responsibilities and addresses sustainability goals.

Another example from DSCH includes the supply and demand sensing tool from Singular Intelligence. Working with Sainsbury's, where demand uncertainty and supply shocks disrupted the fresh pork supply chain resulting in revenue loss, food wastage, and downgrades. Through the development of an AI-driven intelligent supply and demand sensing solution which can provide more accurate and timely demand signals and supply risk. Following the use of this tool, it was estimated there was a 2%-5% improvement in product availability and a 50%-70% reduction in food waste.

Emerging technologies are also making regional cooperation simpler. The Digital Supply Chain Hub provides regional test beds, enabling the development of solutions using real supply chain data from UK companies.

This demonstrates the capabilities of British manufacturing clusters and creates more tailored solutions for members. As collaboration is fuelled by AI and data analytics, UK businesses can better localise suppliers for greater coordination and resilience.

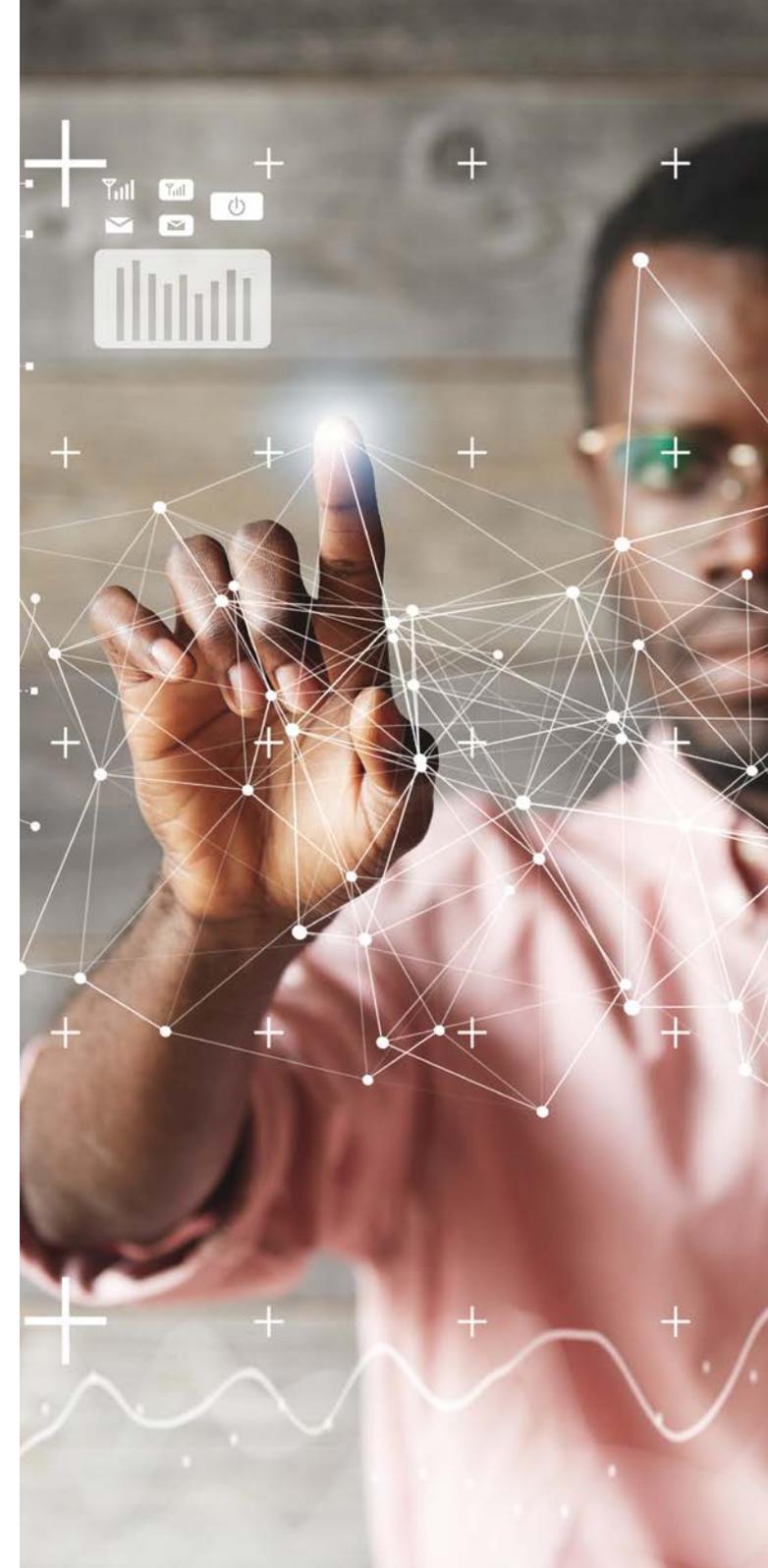
In addition, advanced data sharing and planning tools provide enhanced visibility for proactive decision making, allowing manufacturers to anticipate potential disruptions, optimise production and increase competitiveness.

Companies could also look at using advanced algorithms and manufacturing equipment data to optimise production yield from sourced material and reduce the volume of raw material procured.

They could use contract negotiation levers, like shorter payment terms in exchange for tempered commodity pricing or volume discounts, to help incentivise suppliers. Material disruption can also be anticipated and headed off by achieving better visibility of market signals and using scenario models to target sources of supply that may require higher just-in-case inventory.

Recent research conducted by the Institute for Manufacturing (IfM) at the University of Cambridge (supported by the UKRI Made Smarter Innovation Challenge and funded via the Economic and Social Science Research Council (ESRC)-led InterAct Network) revealed how extended reality technologies can support UK manufacturing by demonstrating production provenance in the Industrial Metaverse.

The Metaverse is a term used to describe the merging of the physical and digital worlds. The Industrial Metaverse comprises a series of 'snapshots of realities' around the data on sourcing, production, and delivery of components, which can be explored in augmented reality. This allows manufacturers to identify risks and take corrective action to comply with upcoming regulations.



Best Practice and Solutions

The case examples highlighted earlier show that disruption and challenge can present opportunities. If any manufacturers are looking to digitally evolve their supply chains, Digital Catapult offer The Made Smarter Innovation | Digital Supply Chain Hub, a digital innovation ecosystem that empowers individuals and organisations to work together to make supply chains smarter.

The hub can help transform UK manufacturers by accelerating digital innovation – making supply chains more efficient, resilient and sustainable. It is helping to harness the power that is inherent in UK manufacturing, bringing businesses and researchers together to develop new solutions, tackle sector specific and industry wide challenges, and build a powerful UK supply chain community.

The hub is led by Digital Catapult, and funded by UKRI through the Industrial Strategy Challenge Fund, as part of the national Made Smarter innovation activities. It is delivered in collaboration with the High Value Manufacturing (HVM) Catapult, National Physical Laboratory (NPL) and TWI.

Best Practice and Solutions

With the aim of accelerating commercial integration of advanced and emerging digital technologies across manufacturing supply chains, over the next four years, programme partners will work with technology providers, research organisations and academics up and down the country to develop globally competitive, resilient and sustainable digitally enabled manufacturing supply chains.

The project aims to help manufacturers integrate advanced digital technologies, leading to improved data sharing and more informed analysis, meaning manufacturers are able to spot bottlenecks in supply chains, reduce waste and boost efficiencies. The hub has partnered with manufacturers and universities to deliver a number of flagship projects to boost existing expertise, create regional centres of excellence and ongoing efforts across the sector to accelerate commercial integration of industrial digital technologies.

These flagship projects include NICE, the critical minerals project enabling UK manufacturers to improve the sustainability and resilience of their supply chains with better informed sourcing decisions through the development of a digital toolkit to govern and incentivise data pooling in the critical minerals supply chain; and CMBEE led by the High Value Manufacturing Catapult and supported by NPL, to create a collaborative and ultra-secure digital testbed that maximises innovation across multiple tiers of supply-chain networks in the Tempest defence programme.

The programme also aims to develop a virtual and inclusive platform that coordinates the integration and adoption of industrial digital technologies by establishing a virtual digital supply chain hub, and exemplar projects addressing key challenges within the supply chain through the development, standardisation and sharing of knowledge.

Recognising that managing supply chains has never been easy and that disruptions will always be unavoidable risks, the Made Smarter Innovation | Digital Supply Chain Hub programme also commissioned WMG, University of Warwick, to critically analyse the existing research and practices in supply chain resilience.



This project has four key aims:

The development of a new definition of supply chain resilience in the new normal.

Identification of practices and risk mitigation strategies to improve the end-to-end supply chain resilience in the manufacturing sector.

The development of a practical supply chain resilience framework for evaluating and measuring supply chain resilience.

Developing the foundation and working method of a digital tool for the assessment of supply chain resilience within the manufacturing sector.

The project explores research through:

- > **A systematic literature review of state-of-the-art publications**
- > **An industry practitioners' report**
- > **Framework and tools developed by leading consulting firms**

Two industry focused workshops were organised to engage the UK's leading manufacturing companies and seek their input in developing strategies and frameworks. The developed framework was validated through feedback and sessions with senior supply chain executives from three manufacturing industries.

The project activities involved 50 experts from 42 organisations, including 34 manufacturing and services organisations, and eight universities from across the UK. The organised activities included one online workshop, one face-to-face workshop, and three one-to-one feedback and validation sessions with relevant stakeholders from the industry. The outcome of the project can be seen here at: <https://digitalsupplychainhub.uk/wmg-supply-chain-resilience-framework/>

The project activities involved:

50 EXPERTS
+
42 ORGANISATIONS
+
34 MANUFACTURING SERVICE ORGANISATIONS
+
08 UNIVERSITIES



Being competitive
means keeping
your edge.

Summary

Summary

**MADE
SMARTER**

To stay competitive in the global economy, UK businesses must continue to embrace digitalisation and innovation as supply chains demand greater speed, resilience and sustainability. Strengthening domestic manufacturing capabilities will be critical for the UK, especially helping British SME manufacturers integrate advanced digital tools like AI and predictive analytics into future supply chain planning and operations, something which will be vital for the UK economy. Digital supply chains hold strategic value for key sectors, including manufacturing, and play a vital role in managing risk and meeting global demand for UK output.

Ongoing collaboration between regional British businesses and local suppliers is essential for building resilience. Providing support and funding initiatives to help British SME manufacturers upgrade technology and build advanced digital capabilities through local partnerships can further solidify the UK's reputation as a global leader in agile and resilient supply chains.

Recent disruptions have proven the immense value of flexible, robust supply chains enabled by close regional teamwork and emerging technologies. By combining local collaboration and digital advancement, British manufacturing can turn supply chain obstacles into new opportunities. Any company interested in joining Digital Catapult's Digital Supply Chain Hub programme should visit: <https://hub.digitalsupplychainhub.uk/>

Sources of information:

IfM University of Cambridge
Ernst & Young
MAD Yorkshire
Wincanton
KMPG
Forbes
SCOR
LMA Consulting
Sedamyl
INVERTO – Boston Consulting Group



Summary

About Digital Catapult

Digital Catapult is a deep tech innovation organisation driving business value by accelerating the application of advanced technologies.

Partnering with government, industry and academia, we focus on significant challenges and opportunities facing the UK's economy and society, where technology can play a major role in providing solutions. We break down barriers, de-risk innovation, open up markets and responsibly shape the products, services and experiences of the future.

Digital Catapult is part of the Catapult Network that supports businesses in transforming great ideas into valuable products and services. We are a network of world-leading technology and innovation centres established by Innovate UK.

About Made Smarter Innovation | Digital Supply Chain Hub

The Made Smarter Innovation | Digital Supply Chain Hub is a digital innovation ecosystem that empowers individuals and organisations to work together to make supply chains smarter.

Developed by Digital Catapult and funded by the Made Smarter Innovation challenge at UKRI, the hub will transform UK manufacturing by accelerating digital innovation – making supply chains more efficient, resilient and sustainable.

The hub is harnessing the power of UK manufacturing, bringing businesses of all sizes together, alongside innovative technology companies and leading researchers to develop new digital solutions, tackling sector specific and industry wide challenges, building a powerful UK supply chain community.

To facilitate connections and knowledge sharing, the hub is currently free for all users to sign up to, from manufacturers of all sizes to technology solution providers. Businesses can be matched based on their requirements, upskill their workforce through training modules and join in discussions on critical supply chain issues such as resilience.

About *The Manufacturer*

We know manufacturing.

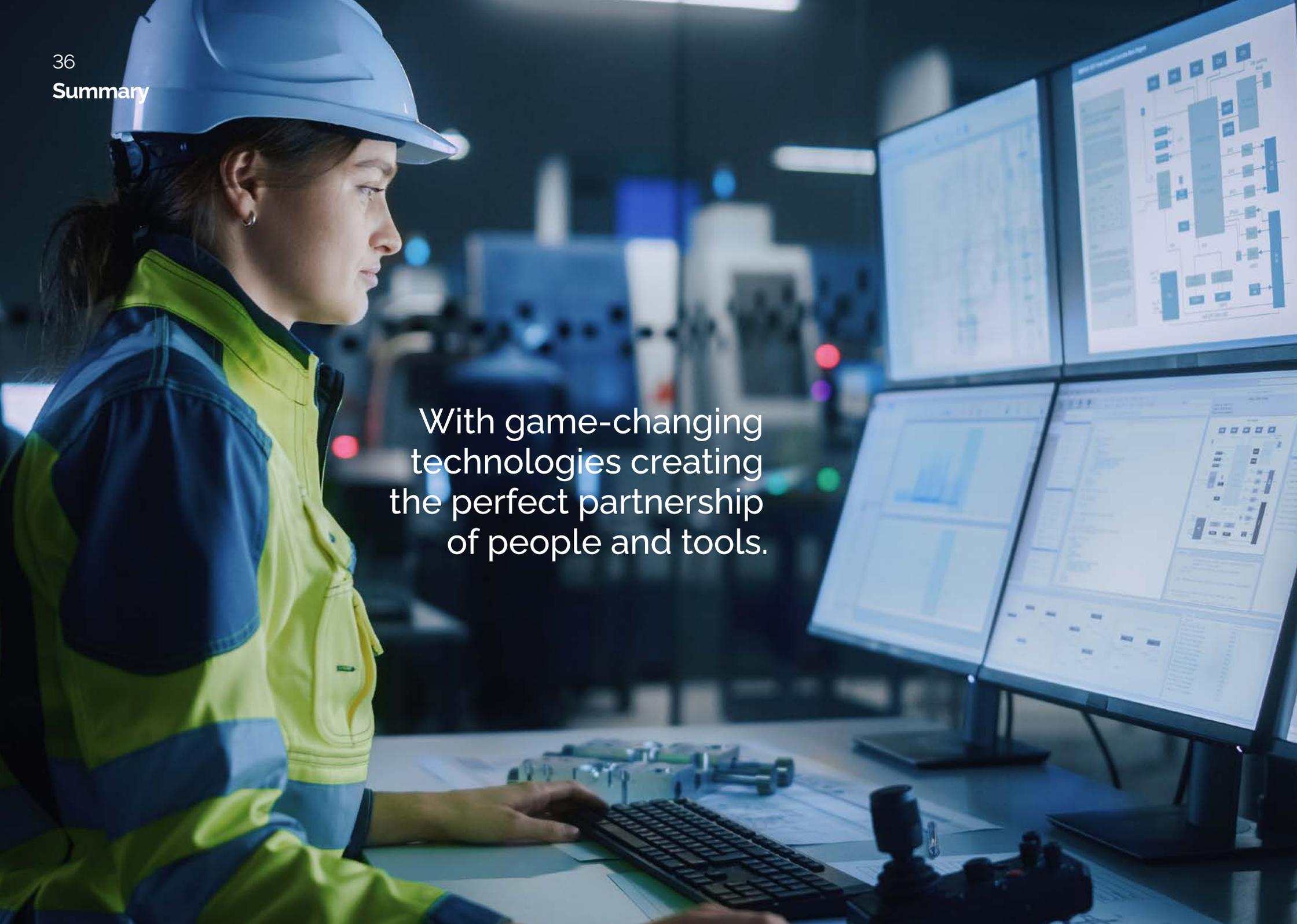
The Manufacturer has been at the heart of the sector for over 30 years, giving us unrivalled reach and expertise in the industry. As rapid advances in technology drive transformation in the industrial landscape, we're on the frontline of that change, working with the most innovative manufacturers and technology providers. We share that insight with our community.

Manufacturers prosper because we make sense of the change and maximise resulting business opportunities for our community, putting them ahead of the curve. We do this every day, meeting and talking with manufacturing companies across the UK, Europe and the USA, and reporting on their challenges and successes across our multimedia portfolio, providing the insights and connections to help them make the right decisions and thrive.

365 days a year.

The knowledge you need, delivered the way you want it. Daily news, interviews and thought leadership across our publishing channels. If daily is too much, we publish weekly digital briefings and hold monthly physical and virtual learning and networking events. Annually, we host the leading industry awards programmes that recognise manufacturing talent and business excellence.

In-digital, in-print, or in-person, *The Manufacturer* offers ideas, insight and innovation to the manufacturing community when they need it, in the format they desire. Because sharing the knowledge benefits everyone.



With game-changing technologies creating the perfect partnership of people and tools.

Made Better. Made Stronger. Made Smarter.

And truly make the difference to your business.

**MADE
SMARTER**

•••••
HENNIK

Nineteen
GROUP

Hennik Research Ltd
(part of Nineteen Group),
Central House,
1 Alwyne Road,
Wimbledon,
SW19 7AB
themanufacturer.com

The margins for
success in business
are narrow.

Researched and Produced by:
THE MANUFACTURER

**MADE
SMARTER**
INNOVATION

DIGITAL SUPPLY
CHAIN HUB