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MANUFACTURING LEADERS' SUMMIT

DIGITAL TRANSFORMATION IN MANUFACTURING

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THE MANUFACTURER

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The manufacturing sector is undergoing a seismic shift, driven by the digital revolution and is currently going through a rethinking of manufacturing processes from the ground up.

There's no question that

Digital transformation
is at the heart of the future of manufacturing.

But what exactly makes a factory 'smart', what are the technologies that will drive this digital revolution, what are the associated benefits of this technology adoption and what are the barriers to entry?

In a nutshell, smart factories are manufacturing facilities that rely heavily on digital technologies to improve efficiency and productivity. This means incorporating 3D printers, cobots, 5G, artificial intelligence, SERP, cloud computing, edge computing, and more into the manufacturing process.

With so many cutting-edge technologies at play, smart factories are able to operate at a level of speed, precision and flexibility that traditional factories simply can't match. And as the world increasingly relies on digital manufacturing processes, smart factories are only going to become more prevalent – and more important.

TECHNOLOGY

There is certainly no one 'silver bullet' when it comes to creating a smart factory. Rather, it is a myriad of emerging technologies coming together to take manufacturing into a new era. Here, we highlight some of the key tech that will be integral to achieving this vision, but it's first worth highlighting the power behind these technologies, the fuel that's driving them; quite simply, data.

The last decade has seen a meteoric rise in the amount of technology and connected devices deployed within the UK manufacturing space. And, as machines and industrial processes have become more complex, sophisticated and connected, the volume of data they are generating has skyrocketed.

This increase in data granularity means that manufacturers have greater visibility than ever before into their products, processes and systems with unprecedented opportunities to create insights to drive the business forward and guard against future disruption and challenges.

However, there has been a sense of not seeing the wood for the trees. The sheer volume of data being generated means that manufacturers are facing growing challenges, not only around data storage and collection, but in how to extract meaningful insights from the data that they have; after all, data is not like oil – it has no value if it's not being used.

There are also additional problems being thrown up around data security, governance, skills and integration. For many manufacturers of course, this is all new territory. In generations gone by, there was little or no data being generated within many organisations, let alone a requirement for the skills needed to create value from it.

As such, many manufacturers are in need of help and guidance around what to do with their data, to say nothing of the fact that many are still juggling digital transformation strategies alongside the management and integration of legacy equipment.

However, there is no questioning the value and potential of the data that is now at manufacturers' finger tips. Here are some of the technologies that stand to benefit.

3D printing

A smart factory wouldn't be complete without a few 3D printers. These versatile machines can create parts and products from scratch, using digital designs as a guide. And because they can produce items on-demand, they're perfect for prototyping, small batch manufacturing or even custom orders.

3D printing, or additive manufacturing to give the technology its proper title, is creating a whole new world for design engineers. Ideal for rapidly creating functional prototypes and end-use parts that are high in detail, it has opened the door to complex geometries that are impossible via any other means.

Far from a one-size-fits-all technology there are a variety of processes, techniques and materials used in 3D printing, including stereolithography, selective laser sintering, multi-jet fusion, polyjet, fused deposition modelling (FDM), vacuum casting and direct metal laser sintering, which can all be used to quickly build parts in a range of plastics and metals.

3D printing can help reinvent manufacturing and the future of design.

In the modern world customers are demanding far greater levels of personalisation and customisation of products, and as such, 3D printing can be a differentiator in how manufacturers plan their supply chain strategies. Why stock a complete assembly of parts in high quantities when you have the capability to quickly print the exact part required on-demand, which will reduce the need for spares?

Robotics

It's predicted that by 2030, over 85 million positions will be unfilled in the UK, hampering economic growth and presenting challenges for organisations to find new ways to plug gaps in workforces. Other economic factors like Brexit, component shortages, supply chain disruptions and the legacy effects of the COVID-19 pandemic are exacerbating the problems. This is bringing into sharp focus the need for industry in the UK to embrace robotics and automation.

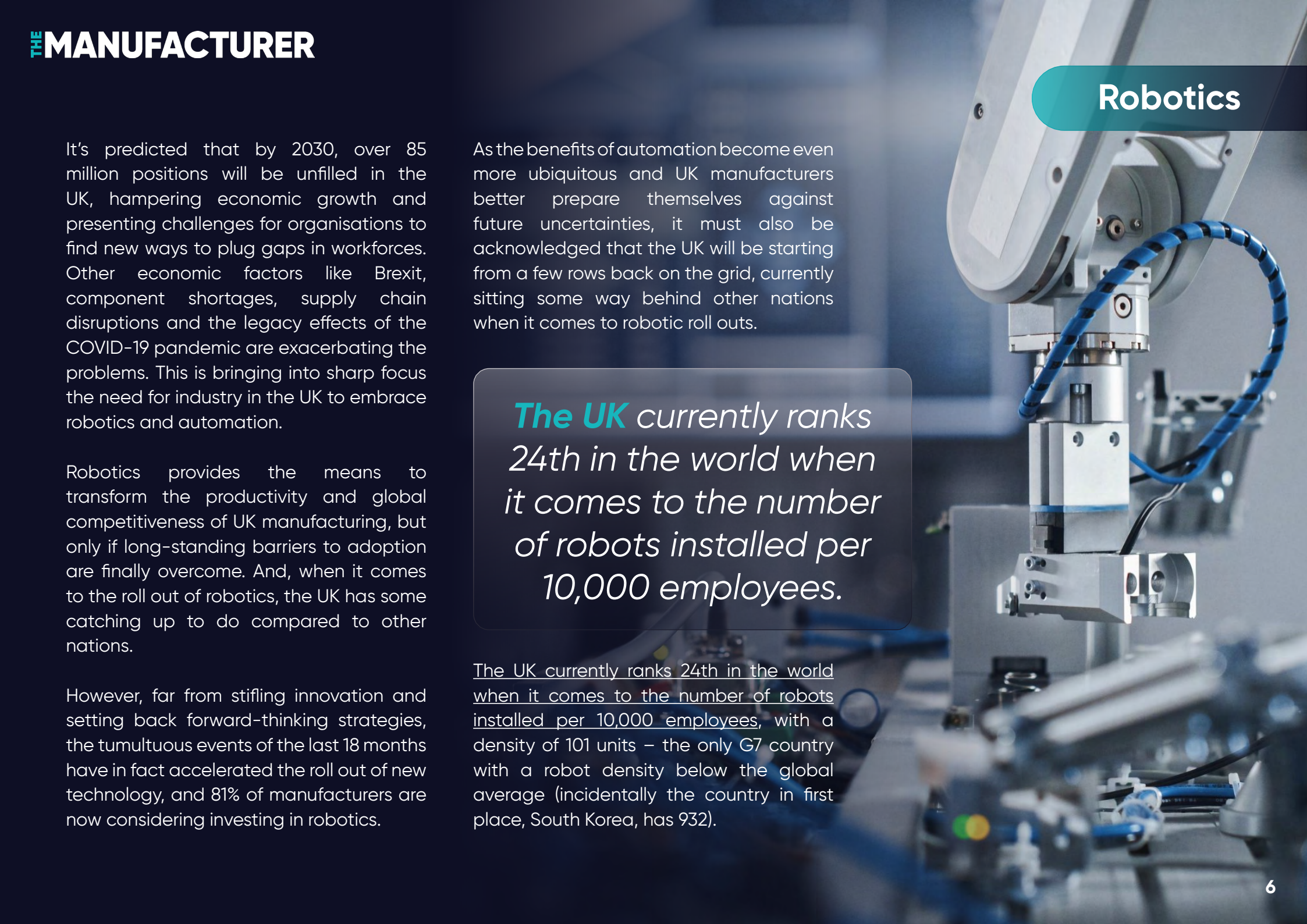
Robotics provides the means to transform the productivity and global competitiveness of UK manufacturing, but only if long-standing barriers to adoption are finally overcome. And, when it comes to the roll out of robotics, the UK has some catching up to do compared to other nations.

However, far from stifling innovation and setting back forward-thinking strategies, the tumultuous events of the last 18 months have in fact accelerated the roll out of new technology, and 81% of manufacturers are now considering investing in robotics.

As the benefits of automation become even more ubiquitous and UK manufacturers better prepare themselves against future uncertainties, it must also be acknowledged that the UK will be starting from a few rows back on the grid, currently sitting some way behind other nations when it comes to robotic roll outs.

The UK currently ranks 24th in the world when it comes to the number of robots installed per 10,000 employees.

The UK currently ranks 24th in the world when it comes to the number of robots installed per 10,000 employees, with a density of 101 units – the only G7 country with a robot density below the global average (incidentally the country in first place, South Korea, has 932).



Cobots

Collaborative robots, or cobots, are another key component of smart factories. These physically versatile machines are designed to work alongside humans, making them ideal for tasks such as packaging and assembly. And thanks to their user-friendly interfaces, cobots can be easily trained to perform new tasks as needed.

The UK has traditionally been slow on the uptake when it comes to robotics, however, running as a parallel stream of automation, cobots are experiencing fast growth, particularly within the SME sector which has the greatest opportunity for transformation.

Unlike traditional robotics, cobots can be deployed within a matter of weeks, and therefore can quickly save money. Other advantages of cobots for manufacturers is that they are easy to setup and programme, and flexible enough to be moved around the factory.

Cobots have the potential to take over 3D jobs – dirty, dangerous and dull – many of which are still performed by humans.

By working with cobots, employees can then focus their time on more fulfilling roles, and reduce their time spent on mundane tasks, improving overall wellbeing. This includes getting rid of the night shift, known to have an adverse effect on the health of workers.

5G is the next generation of wireless technology, and it's set to revolutionise manufacturing. That's because smart factories rely heavily on data, and

> *5G will provide the high-speed, low-latency connections that are needed to transmit large amounts of that data quickly and efficiently.*

5G can provide the means to tackle the manufacturing sector's greatest challenges, from achieving net zero and attracting future talent to maximising uptime and accelerating product development.

Offering almost limitless capability, the next generation of mobile connectivity has the potential to revolutionise every phase of a manufacturing operation, and with so many prospective applications, manufacturing is one of the sectors expected to benefit most from 5G's arrival.

5G is around ten times faster than 4G, with peak speeds capable of reaching above 1gbps (gigabit per second). And, unlike previous generations, 5G isn't simply an upgraded communication network. It has been built from the ground up to deliver better user experiences, empower new deployment models and deliver new services.

Artificial intelligence (AI)

Artificial intelligence (AI) is another area where smart factories are leading the way. AI can be used for tasks like predictive maintenance, quality control and material handling. And as AI technology continues to evolve, smart factories will only become more efficient and effective.

***The AI utopia** will see combinations of data collected from sensors, machines and people and then applied to algorithms designed to optimise operations or achieve lights out manufacturing.*

While we are some way off achieving that scenario there are many other use cases where manufacturers are adopting AI quickly and across the entire value chain of the industry.

Use cases exist around workplace safety, machine/building management, machine vision and cyber security. Combining AI/ML with other technologies such as sensors, machines and human inputs will dramatically improve operations and likely lead to new forms of innovation and productivity in the industry.

Machine learning (ML)

Machine learning refers to a method of data analysis that enables computer programs to grow and learn by studying predictive and statistical analytics, rather than by being explicitly programmed.

In the manufacturing industry, machine learning (ML) is a critical subset of artificial intelligence (AI), and involves the use of sophisticated algorithms to learn from and make predictions based on data.

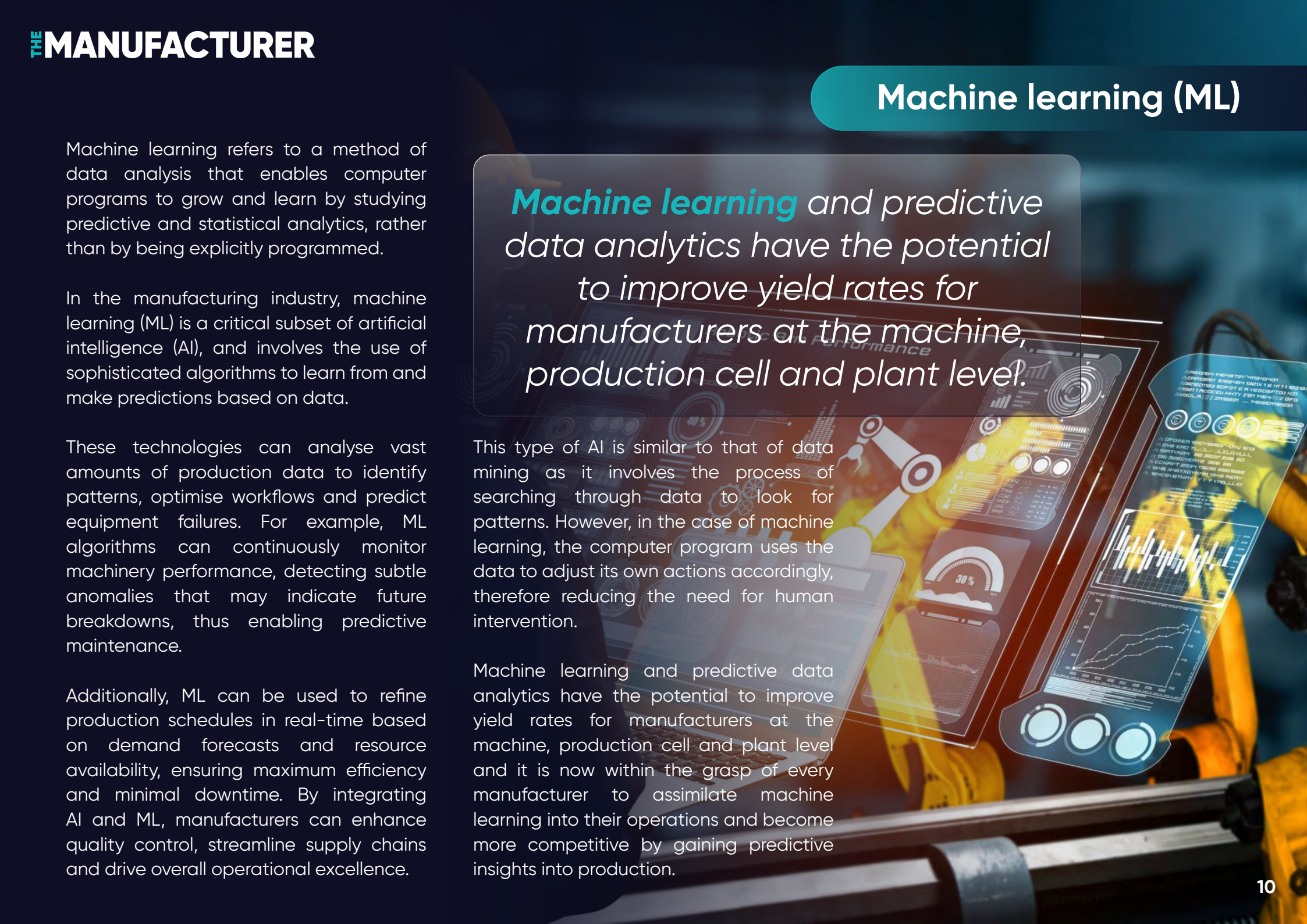
These technologies can analyse vast amounts of production data to identify patterns, optimise workflows and predict equipment failures. For example, ML algorithms can continuously monitor machinery performance, detecting subtle anomalies that may indicate future breakdowns, thus enabling predictive maintenance.

Additionally, ML can be used to refine production schedules in real-time based on demand forecasts and resource availability, ensuring maximum efficiency and minimal downtime. By integrating AI and ML, manufacturers can enhance quality control, streamline supply chains and drive overall operational excellence.

Machine learning and predictive data analytics have the potential to improve yield rates for manufacturers at the machine, production cell and plant level.

This type of AI is similar to that of data mining as it involves the process of searching through data to look for patterns. However, in the case of machine learning, the computer program uses the data to adjust its own actions accordingly, therefore reducing the need for human intervention.

Machine learning and predictive data analytics have the potential to improve yield rates for manufacturers at the machine, production cell and plant level and it is now within the grasp of every manufacturer to assimilate machine learning into their operations and become more competitive by gaining predictive insights into production.



IIoT

The Industrial Internet of Things, more commonly referred to as the IIoT, is the use of smart sensors, actuators and other devices, to enhance manufacturing and industrial processes. These devices are networked together to provide data collection, exchange and analysis. Insights gained from this process aid in more efficiency and reliability.

> ***IIoT** uses the power of smart machines and real-time analytics to take advantage of the data that machines have produced in industrial settings for years.*

The driving philosophy behind IIoT is that smart machines aren't only better than humans at capturing and analysing data in real-time, but they're also better at communicating important information that can be used to drive business decisions faster and more accurately.

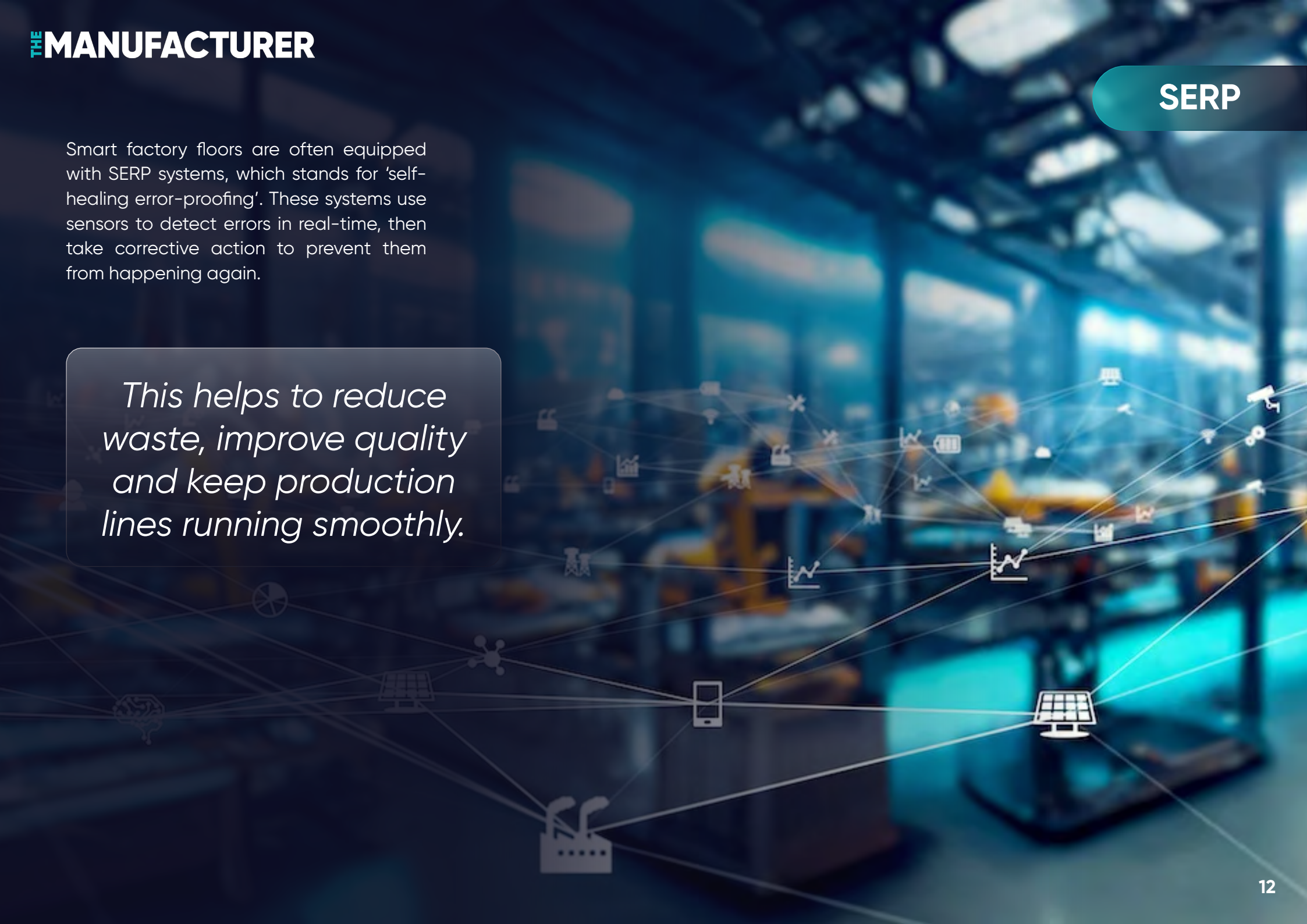
Connected sensors and actuators enable companies to pick up on inefficiencies and problems sooner, saving time and money while also supporting business intelligence efforts. In manufacturing specifically, IIoT has the potential to provide quality control, sustainable and green practices, supply chain traceability and overall supply chain efficiency. In an industrial setting, IIoT is key to processes such as predictive maintenance, enhanced field service, energy management and asset tracking.

The IIoT has the power to change and enable processes from raw materials and the supply chain all the way through to the final product, and sometimes even on into a deeper relationship with the product's use and direct consumer engagement.

SERP

Smart factory floors are often equipped with SERP systems, which stands for 'self-healing error-proofing'. These systems use sensors to detect errors in real-time, then take corrective action to prevent them from happening again.

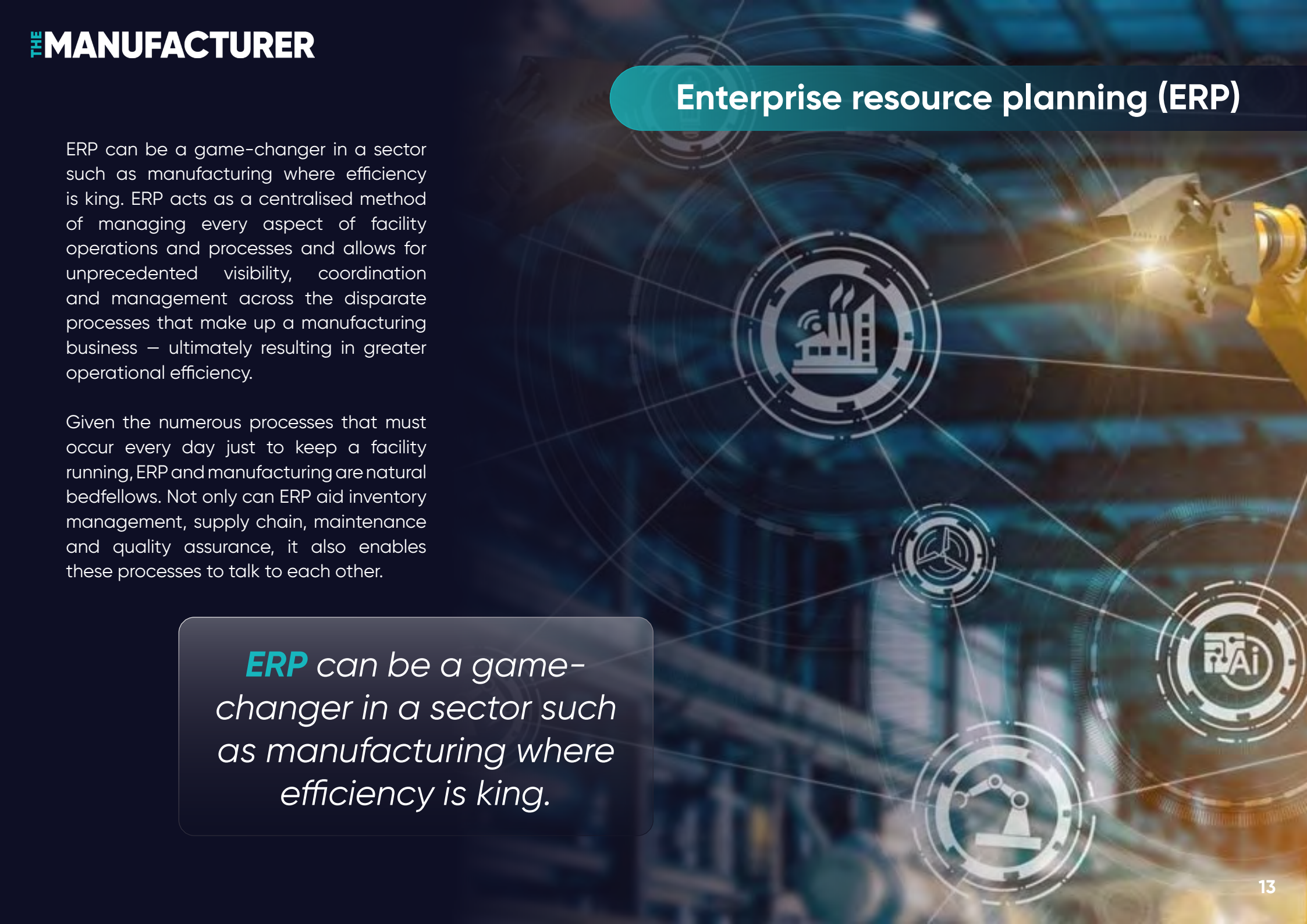
This helps to reduce waste, improve quality and keep production lines running smoothly.



Enterprise resource planning (ERP)

ERP can be a game-changer in a sector such as manufacturing where efficiency is king. ERP acts as a centralised method of managing every aspect of facility operations and processes and allows for unprecedented visibility, coordination and management across the disparate processes that make up a manufacturing business – ultimately resulting in greater operational efficiency.

Given the numerous processes that must occur every day just to keep a facility running, ERP and manufacturing are natural bedfellows. Not only can ERP aid inventory management, supply chain, maintenance and quality assurance, it also enables these processes to talk to each other.



ERP can be a game-changer in a sector such as manufacturing where efficiency is king.

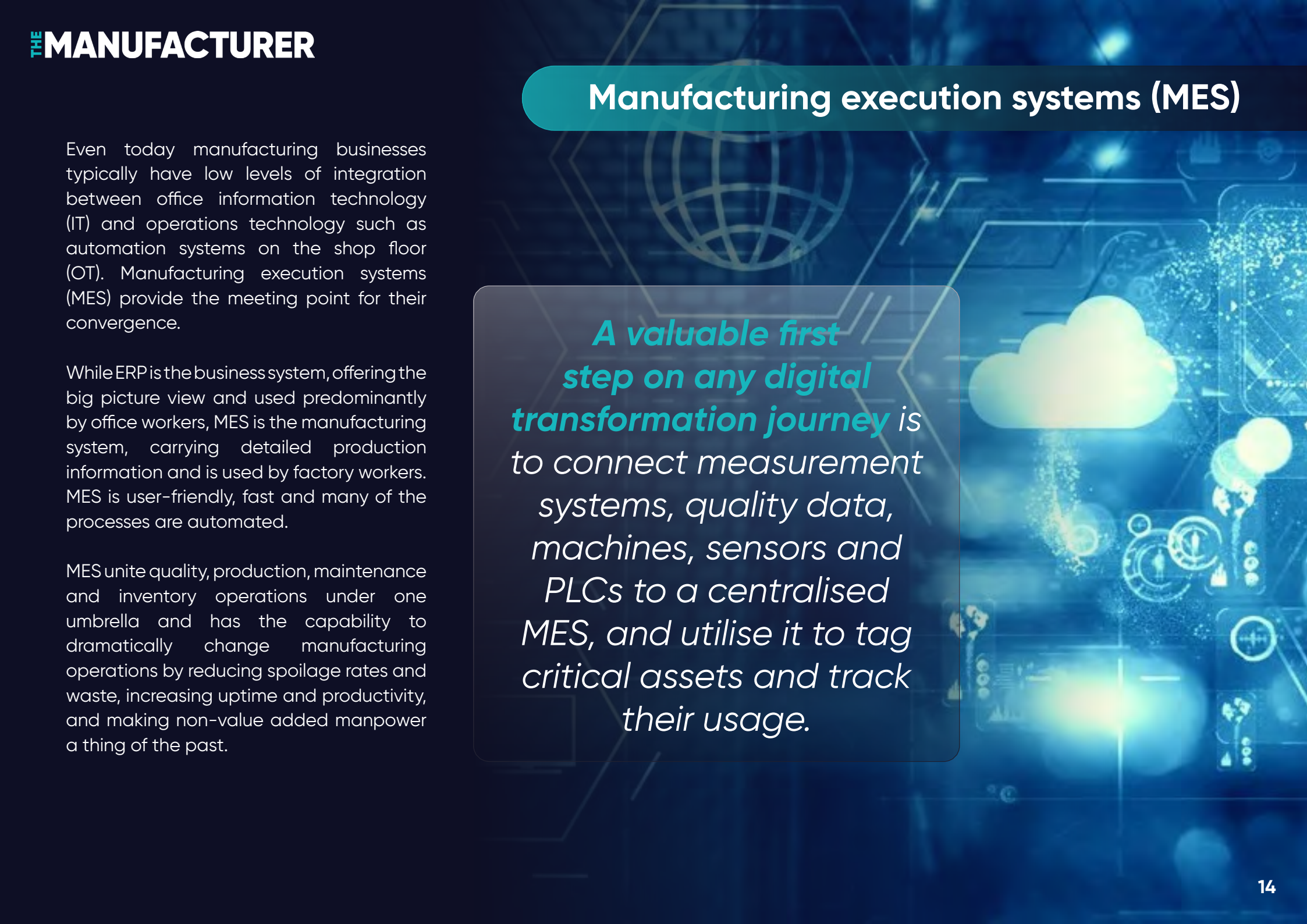
Manufacturing execution systems (MES)

Even today manufacturing businesses typically have low levels of integration between office information technology (IT) and operations technology such as automation systems on the shop floor (OT). Manufacturing execution systems (MES) provide the meeting point for their convergence.

While ERP is the business system, offering the big picture view and used predominantly by office workers, MES is the manufacturing system, carrying detailed production information and is used by factory workers. MES is user-friendly, fast and many of the processes are automated.

MES unite quality, production, maintenance and inventory operations under one umbrella and has the capability to dramatically change manufacturing operations by reducing spoilage rates and waste, increasing uptime and productivity, and making non-value added manpower a thing of the past.

A valuable first step on any digital transformation journey *is to connect measurement systems, quality data, machines, sensors and PLCs to a centralised MES, and utilise it to tag critical assets and track their usage.*



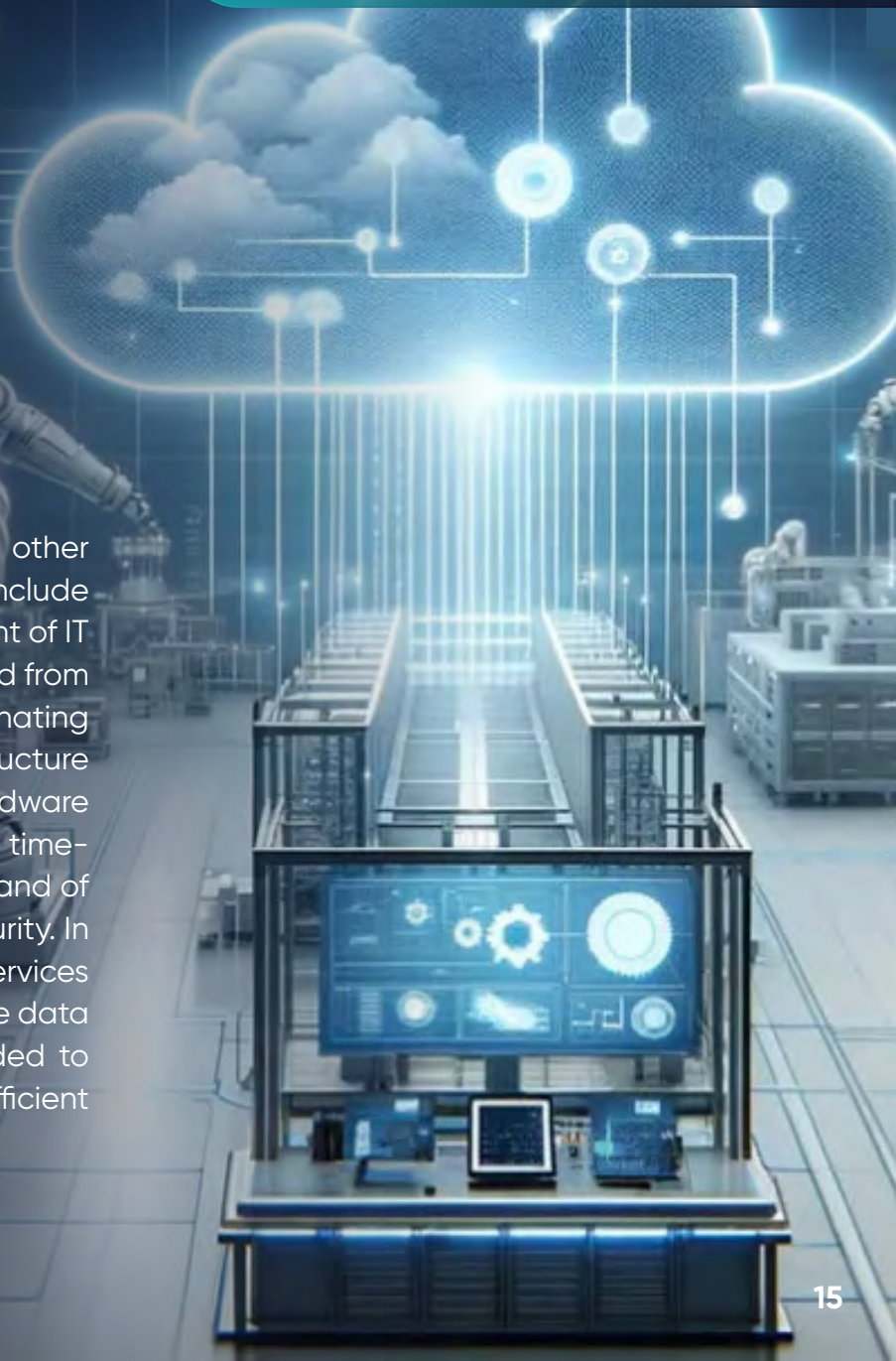
Cloud computing

***Cloud computing** is a must for smart factories and digital transformation.*

That's because cloud-based systems offer the scalability and flexibility that smart factories need to stay agile. Plus, they can help to reduce costs by eliminating the need for on-site hardware and software.

By delivering computing services such as servers, storage, databases, networking, software, analytics and intelligence over the internet (or cloud), manufacturers can achieve faster innovation, flexible resources and economies of scale. Cloud services typically operate a pay as you use model, helping companies to lower operating costs, run infrastructure more efficiently, and scale as business needs change.

As well as cost and speed, other advantages of cloud services include being able to deliver the right amount of IT resources when they are needed, and from the right geographic location; eliminating the need for complex on-site infrastructure such as 'racking and stacking', hardware setup, software patching, and other time-consuming IT management chores; and of course, increased reliability and security. In addition, many cloud computing services run on a worldwide network of secure data centres, which are regularly upgraded to the latest generation of fast and efficient computing hardware.



Edge computing

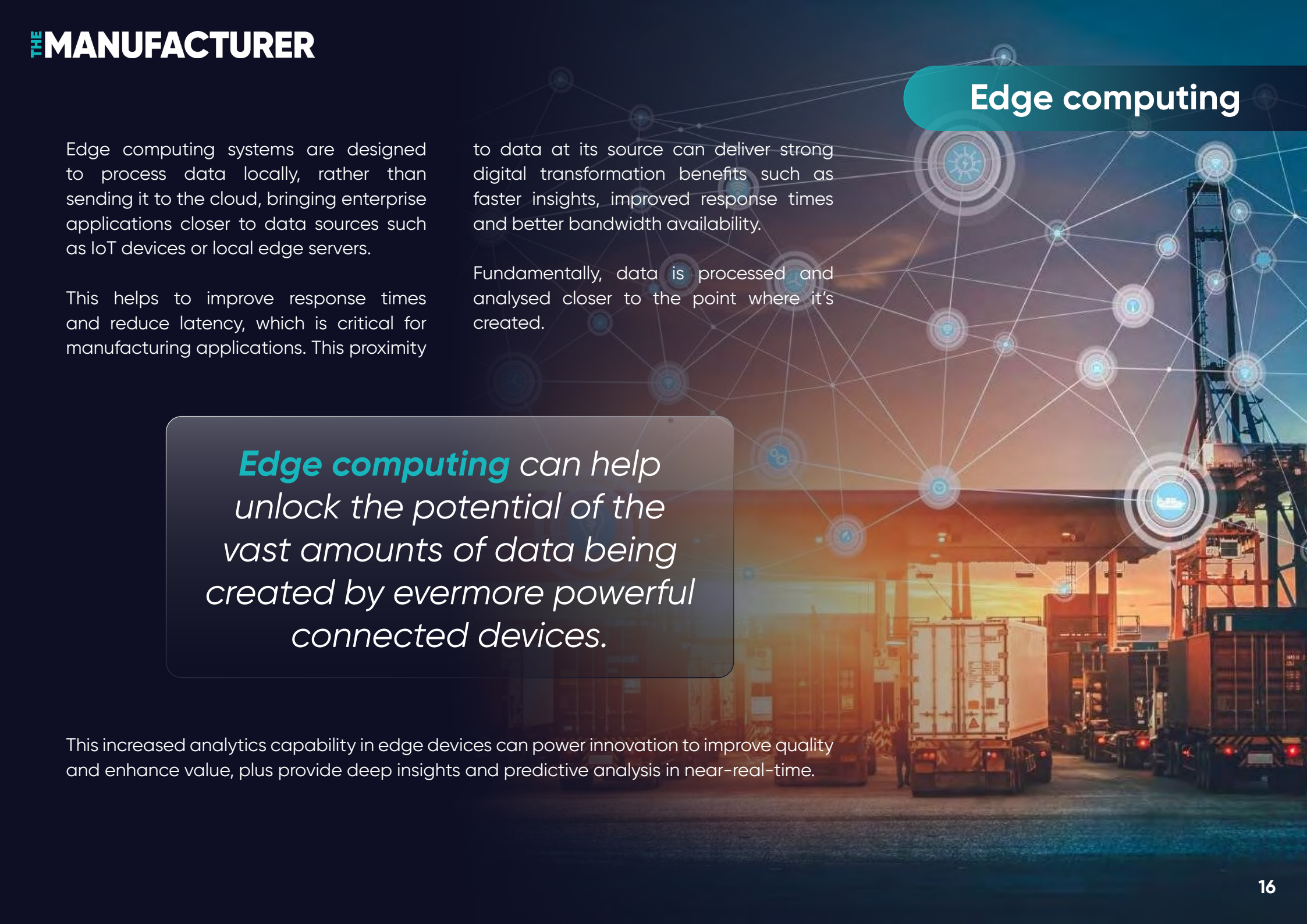
Edge computing systems are designed to process data locally, rather than sending it to the cloud, bringing enterprise applications closer to data sources such as IoT devices or local edge servers.

This helps to improve response times and reduce latency, which is critical for manufacturing applications. This proximity to data at its source can deliver strong digital transformation benefits such as faster insights, improved response times and better bandwidth availability.

Fundamentally, data is processed and analysed closer to the point where it's created.

***Edge computing** can help unlock the potential of the vast amounts of data being created by evermore powerful connected devices.*

This increased analytics capability in edge devices can power innovation to improve quality and enhance value, plus provide deep insights and predictive analysis in near-real-time.



Digital twins

A digital twin is essentially an assistance system for production facilities which uses integrated simulation models to find solutions quickly when problems arise. These simulations give operators a glimpse into the heart of physical assets to determine ideal operational workflows, drawing on current data flows to swiftly find clear options to help the system operators reach a decision; without the time and cost that would be involved in testing theories in the real world.

These highly complex virtual models act as an exact counterpart (or twin) of a physical 'thing'. Connected sensors on the physical asset collect data that can be mapped onto the virtual model. Operators looking at the digital twin can see crucial information about how the physical version is performing in the real world.

***Digital twins** are vital tools to help engineers and operators understand not only how products are performing, but how they will perform in the future.*

Analysis of the data from the connected sensors, combined with other sources of information, allows accurate predictions to be made.

Virtual reality (VR)

From product development to production implementation, through to training and customer support, the opportunities opened up by VR are enabling organisations to drastically enhance their manufacturing capabilities and performance.

Accelerated following the pandemic, VR is a key tool within the manufacturing arena, providing more focused and impactful training as the technology enables apprentices to better retain information, compared to traditional training methods.

It also helps to improve cross-division communication between design, engineering and sales and marketing, and can also avoid costly mistakes by communicating design changes to identify costly issues pre-assembly.

*Not only does **VR** reduce the number of physical prototypes that are needed, which results in a quicker time to market, but also allows for additional time for design refinement on the project.*

Viewing an object at its true scale is the best way to review large structures as imagery and animation will never tell the true story of proportions on transport, construction or architecture. VR provides those reviewing a model with more confidence and improved decision making.

A well deployed VR solution enables multiple users, in multiple locations, to experience the same scene at the same time, complete with avatars of each other. This saves money on travelling for on-site design reviews or costly prototype transportation for physical reviews.

Augmented reality (AR)

Augmented reality (AR) is one of the most exciting and impactful technologies making its way into today's manufacturing industries. Because AR applications work on a multitude of devices tailored to almost any environmental situation, AR is no longer a restricted technology, or a tradeshow gimmick.

Unlike VR, which creates a fully virtual environment around its users,

> ***AR** creates an illusion, as if virtual objects coexisted within the physical world.*

Simply put, AR is a means to present operational information in a completely new way – enveloped in a person's view of their real environment and acting as the perfect 'digital assistant'.

AR makes that digital assistance interactive, more practical to absorb, understand and act upon, because it relies on our innate mental capacity to process a huge variety of information from the physical world.

Despite some challenges, the first industrial AR applications on mobile devices are increasingly shifting to hands-free wearables such as head-mounted displays or smart glasses.

Enhanced mobile broadband (eMBB) will become available, in an incremental fashion, over the next few years. It will increase bandwidth by an order of magnitude over 4G, further facilitating the adoption of high-definition (HD) video-streaming and AR. Ultra-reliable low-latency communication (URLLC) will reduce the achievable latency and enhance the reliability of communication.

Cyber security

The drive towards a more digital future is key to the prosperity of manufacturing. However, digital transformation heralds a new era of connectivity which brings with it rising levels of cyber vulnerability. Indeed, 2021 saw manufacturing overtake financial services as the most cyber attacked industry.

Connectivity is taking manufacturing to the next level, helping to provide greater efficiency, visibility and productivity. However, each connected device represents a vulnerability and a potential avenue of attack for malicious actors with mischief in mind or devious designs on data.

Unlike the consumer space, manufacturing, a sector that is still in the relative early stages of digital transformation, is perhaps not fully aware of the dangers that can be ushered through the doors of a plant or factory with the deployment of emerging, digital, connected technology. To say nothing of the growing sophistication of the various threat actors at large.

There's no doubt that smart factories, driven by technology, are the future of manufacturing and will lead to the creation of a hyperconnected supply chain that offers a digital thread throughout the business and a real-time view of product lifecycles.

It is vital that ***the cyber risks*** *involved are known and understood.*

However, before manufacturers get too excited about digital transformation, it is vital that the cyber risks involved are known and understood. The risks involved for manufacturers, and the consequences of a 'it won't happen to me' approach, needs to be understood and taken seriously within the sector.

BENEFITS

Most manufacturers have acknowledged the fact that digital transformation is not an option. The debate on whether manufacturers should deploy emerging technology ended some time ago, and a universal truth within the sector is that standing still is not an option.

But what **benefits** can they expect to see from deploying this technology?

What **impact** are these technologies actually having on the bottom line of manufacturing businesses?

What does the ROI **look like**?

Production efficiency

By moving away from traditional paper-based and manual processes, manufacturers can benefit from significant production efficiency gains. One of the ways this happens is as a result of being able to identify every tiny issue in the production cycle. With complete visibility at every stage, manufacturers can focus on tackling small issues that cause inefficiencies in the process.

Leveraging digital technologies allows manufacturers to **reduce the time, effort and resources** required to produce their products, without sacrificing quality or improving upon the initial product quality.

Implementing automation, for example, can **reduce the time needed to execute repetitive tasks** such as data entry, order processing and inventory management; freeing up valuable time and resources for more productive tasks.

Digital transformation can also **optimise manufacturing workflows** by leveraging real-time data analytics to identify inefficiencies and bottlenecks in manufacturing processes, enabling manufacturers to take corrective action quickly and improve areas where improvements can be made.

In another example, machine monitoring technology provides reliable real-time data on machine utilisation, **enhancing resource planning** and enabling the manufacturer to identify areas for process improvement and cost reduction.

In another example, manufacturing execution systems (MES) can **improve a company's efficiency and provide complete traceability** of all products and processes. An MES can also allow a company to **refine production methods** through the introduction of controls and standardisation, further supporting quality management systems.

Business transparency

Business transparency or supply chain transparency in manufacturing is vital for success. It allows businesses and consumers to understand how goods are produced and distributed. This includes knowing where and how products are made, the labour practices involved, the journey of products from source to consumer and any environmental impacts that occur along the way.

Digitising business processes requires clear information management, which boosts transparency and accountability.

Additionally, if processes are digitally tracked, **management can trust** how things are done.

Within manufacturing supply chains, digital technologies can aid in the transparency of the business. An example of this is using technology such as barcoding or tagging; products can be tracked from start to finish and ensure sustainable and ethical practices are used during transportation. This allows businesses to confidently show customers their supply chains.

Other examples of digital transformation systems that aid in business transparency are digital record-keeping and data management, which can make information more easily accessible to the public and regulators; blockchain technology to create tamper-proof records of transactions; and AI to identify and flag potentially fraudulent activities.

Being transparent with data and your supply chain management can better **ensure customer trust**.

The deployment of digital technologies offers manufacturers vital **visibility into their systems and processes**, and therefore allows them **greater control** over how, where and when their products are manufactured. A knock-on impact of this is that it provides a window into an organisation's emissions. As the saying goes, you can't manage what you can't measure, and digital technology provides the vital information that manufacturers need in order to act on their emissions, deploy reduction strategies and ultimately hit looming net zero targets.

Digitalisation and **sustainability** go hand-in-hand – digital innovation will play a fundamental role in the mission towards decarbonisation and net zero through the advancement of cleaner technologies. Embracing digital solutions allows businesses to optimise operations, reduce waste and enhance resource management. One such example is additive manufacturing, or 3D printing, which can create complex parts on-demand, such as automotive parts or customised medical implants, reducing waste and streamlining supply chains.

The use of tools such as artificial intelligence and machine learning can also offer data-driven insights, allowing organisations to track metrics and leverage data to analyse and demonstrate environmental impact. By helping to identify energy inefficiencies and optimise consumption, adopting digital technologies can form a key part of companies' energy efficiency strategies and reduce carbon footprints.

Digital transformation will also help to improve efficiency and flexibility, helping to streamline work processes and allow businesses to adapt to industry demands. The adoption of technologies such as digital twins, for example, can help manufacturers simulate real situations and their outcomes, ultimately allowing them to make strategic decisions and enhance performance, while speeding up design cycles.

Embedding sensors in machines that constantly monitor operations, enables real-time data analysis which can then be applied in decision-making, allowing organisations to optimise processes and strategies for improved results. Leveraging these emerging technologies can also allow manufacturers to accurately predict consumer demand, and as a result, optimise product development, inventory management and supply chain efficiency.

visibility & control

emissions management

digitalisation & sustainability

operational optimisation

Supply chain resilience

A variety of challenges over the last few years have placed enormous pressure on manufacturing supply chains. A 'perfect storm' has impacted the manufacturing sector meaning that supply chain resilience is 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.

Technological innovation represents an opportunity to build resilience and gain an edge. In fact, the advances in smart automation and data-driven insight are opening the door for manufacturers to collaborate more effectively.

By becoming more data-driven, for example, manufacturing businesses will be able to make faster and more informed decisions. Being more agile in response to market changes reduces the impacts of disruption, wherever it may come from. From capitalising on the Internet of Things (IoT) to breaking down data silos across a business, modernising data infrastructure ensures you can take advantage of efficiencies as the manufacturing industry continues to digitally transform.

Supply chain data contains vital analytics that can power inventory, logistics and product development. Therefore, a cloud data platform can give a near-instant, elastic scalability of compute and storage for real-time insight across a business – even as it grows. This can aid smarter, more data-driven decisions that boost operational efficiencies.

Digital technologies enable manufacturers to have greater visibility up and down their supply chains, which can help **mitigate disruption and plan for future challenges**.

Inventory management

Inventory management in manufacturing is the process of tracking the inventory of products and goods in multiple stages of production.

Effective inventory management **reduces production costs** and **streamlines operations**.

Businesses must plan and utilise an inventory management system because it directly affects the production of goods and the supply chain. Using technologies to digitalise inventory management has a range of benefits, not only aiding in processes and efficiency, but digital transformation also helps businesses to enhance their customer experience. By digitalising, businesses can provide accurate stock information to customers, reducing backorders and improving satisfaction.

AI is at the forefront of many aspects of digital transformation in manufacturing. Within inventory management it can automate decision making, predict demand patterns and in turn, enhance efficiency.

Cloud technology allows for cross-team collaboration and flexibility which is required in today's fast paced manufacturing industry. Cloud technology often includes features like barcode scanning, meaning inventory can be seen from anywhere, not just the factory floor, providing a full view of data in real-time. Stock alerts can be created for low stock or high demand products, ensuring correct future ordering.

Newer technology such as augmented reality (AR) can improve warehouse accuracy and provide real-time information to workers, increasing efficiency and reducing errors.

Effective inventory management in manufacturing, enhanced by digital transformation, has long lasting benefits for a business and customer alike.

Reduced costs

In recent years, manufacturing costs have soared in all areas. The energy used in production, materials, transportation and labour, for example, has had an impact on small and large manufacturers alike. It is becoming more expensive for manufacturers to import components overseas due to geopolitical incidents, in turn raising prices of production and then raising prices for customers. Reducing costs is a never-ending goal for manufacturers.

However, digital transformation of manufacturing has been proven to reduce costs and improve productivity. Businesses need to be using the latest technologies to make better, more cost-effective decisions.

Streamlining processes through digital transformation can reduce costs as automation and digital tools will replace manual time-consuming tasks that workers are doing. It also cuts labour costs and requires a smaller, but more skilled workforce.

Reduced time to market

Implementing new technologies into a manufacturing business to automate and make processes more streamlined provides for increased efficiencies, productivity and ultimately profit. It allows products to become more standardised as manufacturers will have more control over the accuracy of the components in the manufacturing process. And because technology reduces the room for any errors, the likelihood of downtime is significantly reduced.

For example, robotics can automate repetitive tasks, reduce production times and increase output by eliminating the need for human labour, redistributing it to a more useful area of the business. In addition, AI and advanced analytics can alert a business before machines need maintenance, which reduces downtime and increases throughput on factory lines.

And, digital manufacturing can create a virtual production environment allowing engineers to identify and address production issues before they arise. When

When building or changing products, companies can speed time-to-market and identify potential issues by using **simulation**.

building new products, or introducing changes to existing products, companies can speed time-to-market and identify potential issues by using simulation to visualise production processes and product lifecycles, drive throughput, optimise processes and increase efficiency.

When it comes to speeding time-to-market, digital tools such as sensors, IoT platforms and data management solutions that incorporate advanced analytics, machine learning and failure analysis are critical.

In addition, technologies such as additive manufacturing offer enhanced customisation options, the ability to make parts on demand, and can reduce lead times and minimise excess inventory.

Improved CX

As Henry Ford once said: "You can have any colour as long as it's black". This 'one size fits all' statement very much epitomised the early days of mass manufacture, where there was little or no room for consumer nuances or customisation.

However, we live in a very different world today and businesses of all sizes are now heavily focused on giving tailored, end-to-end experiences to their customers. Manufacturing is no different with evolving customer preferences driving the need for a diverse product set with mass customisation options – the automotive sector being a prime example – and a notable shift towards direct-to-consumer models has emerged within the sector.

While this may have been difficult in previous generations, emerging digital technology is now making this a reality.

The advent of AI, for example, has empowered manufacturing firms to elevate customer interactions and deliver superior customer experience (CX). AI is repositioning CRM systems as the nucleus of CX, furnishing the foundational technology necessary for engaging customers and fostering repeat business.

Technology can help enhance CX by personalising marketing campaigns, emails and blogs, thereby improving customer engagement. Moreover, they aid interactions between service teams and customers, expediting issue resolution and improving customer satisfaction.

Customer interactions should consistently prioritise personalisation and customisation. Digital intelligence now makes it easier for manufacturers to provide seamless experiences, considering factors such as customer history, preferences and past issues.

A robust CRM with generative AI capabilities facilitates the development of products and solutions tailored to customer needs.

Customer-centric digital transformation initiatives can significantly improve CX, leading to **improved customer retention** and **revenue growth**.

Enhanced decision making

No one wants to make decisions on a whim, especially when the success of a business is at stake. Informed decision-making is crucial in the business world and is significantly enhanced by the data provided by digital technologies.

Data-driven decision making is essential for any successful manufacturing business.

In the sector, **digital tools** give companies extensive access to data, enabling them to make **informed decisions** and take **rapid action**.

The process involves collecting, analysing and interpreting data to identify trends, patterns and insights that guide better decision-making. This approach not only improves the customer experience but also streamlines operations.

One transformative step that manufacturers can take is by integrating ERP (enterprise resource planning) software. It consolidates many business processes and data into a unified platform. The software facilitates better collaboration and communication between departments across the whole business, allowing for enhanced decision making with all elements considered.

Another is PLM (product lifecycle management) which helps manage the complete journey of a product from initial ideation, development, service and disposal. It minimises errors, ensures product quality, accelerates development and facilitates collaboration.

By integrating platforms such as ERP or PLM, businesses can significantly enhance their decision making processes through digital transformation.

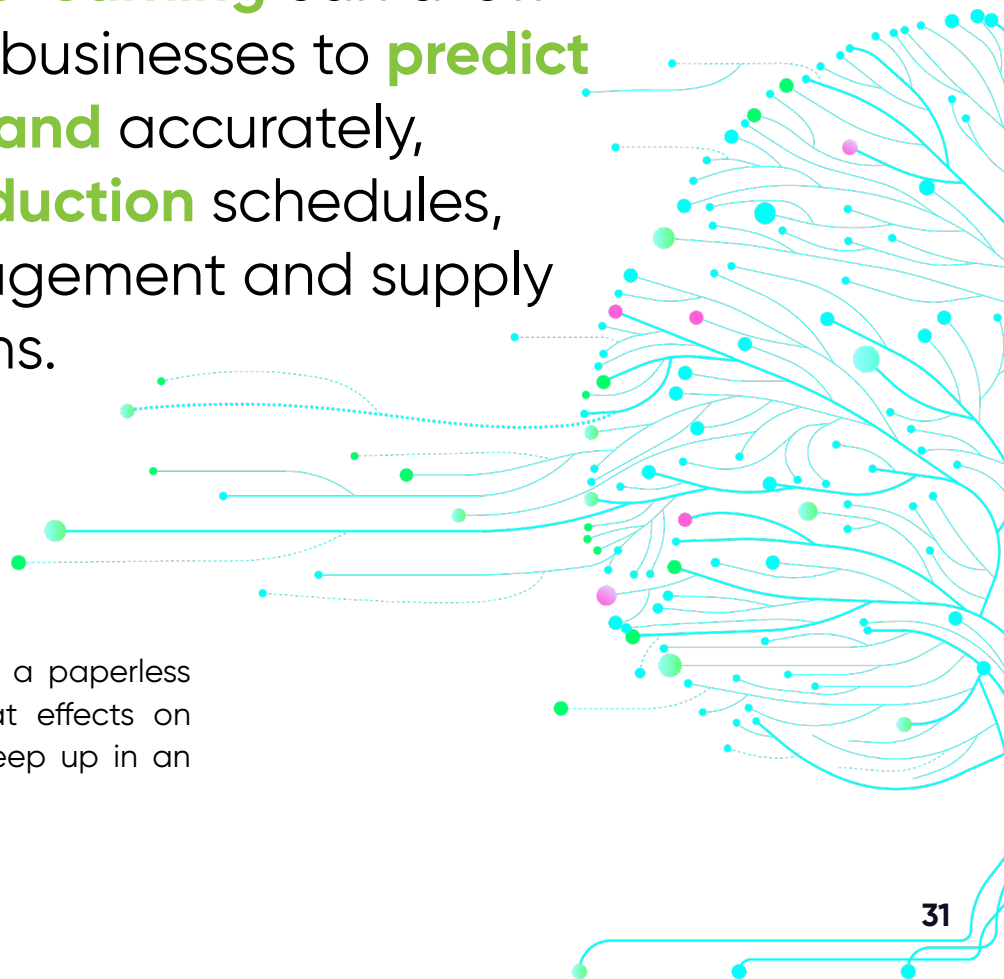
Everyone wants to be a winner and digital transformation helps companies achieve and maintain a competitive edge in their industry. Leaders who are embracing emerging technologies have the potential to learn faster, make data-based decisions, enable greater use of automation and encourage further innovation within the business.

But what's stopping everyone from being at their best? Slow adoption of technologies. Businesses will fall behind in terms of cost-effectiveness, product quality and customisation capabilities. Not only that, but they will lack the ability to integrate into global value chains and leverage emerging technologies, leading to weakened collaboration and partnerships.

Not only that, but looking at the long-term plan, and not the short-term wins. Manufacturing operations run around the clock with very limited downtime, making it incredibly difficult for plant managers to allocate time for evaluating and implementing new technology. Companies need to ditch the quick wins and look to integrate long-lasting digital technologies for continued transformation.

To remain competitive, implementing digital transformation technology such as

AI and **machine learning** can allow manufacturing businesses to **predict consumer demand** accurately, **optimising production** schedules, inventory management and supply chain operations.



Or even just transitioning to a paperless environment can have great effects on business output and help keep up in an ever-changing market.

Enhanced energy management

Few businesses will be able to anticipate changes to the cost of energy because it's the one commodity most sensitive to change. Still, companies can offset some of the uncertainty by making better use of what's already being consumed.

As mentioned earlier, when it comes to energy, you can't manage what you can't measure. Digital technology has enabled manufacturers of all shapes and sizes to better understand where, when and how they are using energy within their factories, systems and processes – much of it in real-time. That unprecedented visibility is providing organisations with all the information they need to roll out efficiency improvements and lower emissions.

It is predicted that Industry 4.0 technology will improve asset utilisation in manufacturing by 35-40%. Digital tools make it easier to optimise and execute energy strategies based on trends from real-time manufacturing data. Without this level of insight, it's impossible to know whether energy is being used effectively and if there are assets requiring attention.

Smart energy management also makes it easier for businesses to integrate distributed energy resources as they become available, such as microgrids and battery energy storage systems.

The deployment of digital technology can enable manufacturers to gain real-time visibility of energy usage to highlight ways to manage and reduce energy consumption for reduced costs; promote employee/stakeholder engagement to drive a culture of sustainability throughout the entire organisation; measure the baseline of carbon emissions to act as an indicator of energy efficiency and performance; determine organisational footprint to access opportunities to reduce carbon emissions across multiple business units; highlight energy-inefficient assets with energy usage and production data; and meet commercial and procurement requirements.

The industry's energy needs will only grow in the future and most businesses will need greater clarity around consumption to remain competitive – especially in the UK. Smarter management will provide that clarity, but also a means to take full advantage of emerging developments in the energy market.

The deployment of digital technology can enable manufacturers to gain real-time visibility of energy usage to highlight ways to **manage** and **reduce energy consumption**.

Real-time data

Data is all around us, and businesses across a wide spectrum of sectors are benefiting from the insights that can be gleaned from it. The industrial arena has huge potential to achieve significant efficiencies to help negate production line downtime, create uptime and deliver significant bottom-line cost savings.

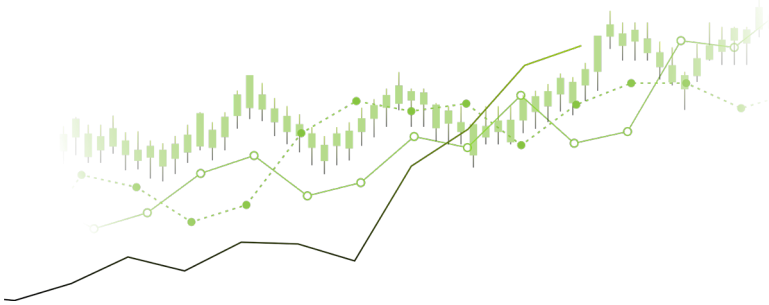
One of the key differentiators of modern technology, when compared to previous generations, is the speed in which it can get information to the user. In a sector such as manufacturing, where down-time (even a small amount), can have huge implications on the bottom line, this is vital.

Data is very much the fuel that drives any digital transformation so the quality of the data is essential to success and will provide the insight for manufacturers to improve operational efficiencies, secure long-term growth and remain competitive.

Real-time data, when measuring OEE for example, enables production managers to act quickly to uncover the root cause of problems. Shop floor teams can also use the data to uncover reasons behind process inefficiencies to drive improvement. This in turn creates a culture of continuous improvement, as operators become actively engaged with the system and see the value gained from it.

In addition, real-time visibility of quality issues such as non-conformance events or when a process is trending out of control, is imperative to achieve improved yield, reduced production waste and avoid costly product recalls. And, as mentioned above, measuring and monitoring energy usage in real-time, rather than through monthly or quarterly energy bills, empowers corrective action across the board.

Real-time data also offers manufacturers greater insight to help reduce production loses, optimise maintenance activities and understand labour costs. Investing in digital technology to support increased visibility of assets enables manufacturers to address the root cause of business challenges – often a more efficient and cost-effective alternative to investing in new facilities or machinery.



This in turn creates a culture of **continuous improvement**, as operators become actively engaged with the system and see the value gained from it.

Predictive maintenance

As the saying goes, prevention is better than cure, and when it comes to maintenance strategies within manufacturing this certainly rings true. Traditionally, businesses have tended to opt for a reactive, run to fail approach, whereby actions are only taken after a piece of equipment has failed. This means that, for any manufacturer using this method, a significant percentage of the work undertaken by maintenance teams essentially revolves around crisis management or 'firefighting'.

Alternatively, many have deploy a time-based maintenance strategy (preventive). Here, actions are taken based on a predetermined time schedule and on the statistical ageing of different components. However, because it is based around time schedules, equipment can be scheduled for repair or reconditioning either too early (before it's required) or too late (after the equipment has already failed).

However, the onset of digital technology has ushered in the possibility of a condition-based (predictive) maintenance strategy which means that equipment is first of all digitally connected and based on real-time data. The status or condition of equipment can then be analysed, and actions taken. This can be beneficial if, for example, an industrial environment is particularly hot which can cause electrical components to age much faster. Therefore, this strategy can make a huge difference for optimising the actions that are taken.

Sometimes it can even postpone actions that would have been taken with a preventive strategy, because it can show that equipment is actually in a better condition than was first thought, thus further enhancing sustainability.

The overall aim of predictive maintenance is to **pinpoint potential faults in machinery at the earliest opportunity**, with the goal of removing the need for more complex maintenance, repairs and even replacement.

Predictive maintenance takes data from multiple and varied sources, combines it, and uses machine learning techniques to anticipate equipment failure before it happens. Manufacturers can stream data from sensors mounted on their machines to uncover key usage and performance patterns in real-time.

Many businesses are already using continuous monitoring technologies – like Internet of Things (IoT) connected devices – which is a good start; but the key lies in not just simply monitoring the output of various data (which is how many companies use it today), but by taking the next step and employing advanced algorithms and machine learning to take action from real-time insights.

Predictive maintenance is widely considered to be the obvious next step for any business with high-capital assets looking to harness machine learning to control rising equipment maintenance costs.

As a whole, predictive maintenance offers manufacturers a tremendous opportunity to boost operational efficiency. The process can be easily automated through machine learning and cognitive data science, and can lead to reduced maintenance and down-time, improved safety and enhanced inventory management.

CHALLENGES

Although emerging digital technology will be integral to the future of any successful manufacturing business, it isn't simply a case of 'full steam ahead' when it comes to digital technology deployment. A number of barriers to adoption exist for manufacturers of all sizes which are slowing, hindering or holding back adoption across the sector.

So, what are these **barriers**?

How are **manufacturers navigating** them?

Are they really as **prohibitive** as some would have us believe?

Naturally, cost is seen by many manufacturers as a key barrier to digital adoption. Shiny new technology, complete with myriad bells and whistles, can come complete with an equally impressive price tag. And, while getting started on a digital transformation journey can be done on a budget, initial outlay is perceived as prohibitive to many businesses who want to dip their toe in the water, particularly as margins and bottom lines have been squeezed by recent wider challenges.

Industrial digitalisation offers huge benefits to manufacturers – not only could it increase profits within a company, but it can also improve productivity. However, the cost makes it hard, particularly for smaller manufacturers, to implement this revolutionary change. Over recent years, as other challenges took their toll on margins and revenue, many manufacturers opted for a 'what you've never had, you'll never miss' approach to digital technology, preferring to put any investment available into other areas of the business rather than into something unknown and not already proven.

There are many tips on how smaller manufacturers can overcome these obstacles, such as starting small and focusing on the small changes the business can make instead of the large, expensive and burdensome projects that can take years to make a profit.

Implementing smaller digital changes can have a huge impact without the added challenges associated with larger projects.

For example, companies can buy low-cost cobots or retrofit sensors onto legacy equipment to keep costs lower. Implementing many small digital changes can have the impact of one large change without the added challenges that come with larger projects, such as integration issues, added training and extra maintenance.

As such, 'Digital Manufacturing on a Shoestring', a programme created by the University of Cambridge, offers a low risk, low-cost approach to digital solutions, and outlines a set of 59 digital solution areas that can be reused, adapted and combined.

Pilot purgatory

Manufacturers just starting out on a digital transformation journey don't tend to throw themselves straight in at the deep end. Understandably, it's commonplace in the first instance to test, trial and pilot digital projects to evaluate their success and feasibility for a business in the long-term.

This negates the expensive initial outlay of full-blown digital solutions that can represent a cost barrier to adoption (as discussed above), and allows manufacturers to test the water and get a flavour for how the technology works and what it can do for their business.

However, this in turn can throw up a barrier of its own – commonly referred to as 'pilot purgatory'. Regardless of a pilot project's success, there can be subsequent issues that arise when a business decides to move on from the test phase and look more closely at a wider and more comprehensive roll out across the organisation – particularly if the business is large, complex and has a number of different divisions working in siloed units.

Digitialisation is a journey, and companies need to focus on how new technologies will help them build **long-term competitive advantage**.

Indeed, often scaling can prove to be a bigger hurdle than getting the ball rolling in the first place and is a key reason why such a large percentage of digital projects fail. As productivity pressures have ramped up and the choice of technology available continues to multiply, far fewer manufacturers have taken the leap towards wider roll-out.

As such, successful digital manufacturing projects are laser-focused on real business problems and companies should have a detailed business case that balances implementation costs against value-creation potential.

Additionally, digitialisation is a journey. Companies need to look beyond their immediate requirements and consider how the application of new technologies will help them build long-term competitive advantage.

Key to this is collaboration, internally across sites, functions and business units, and externally with a select group of technology providers and integration partners. In addition, there is also the need to have digital transformation led from the top of the organisation. The whole executive team and the company's P&L leaders should understand the organisation's goals and the new ways of working required to achieve them.

In addition, successful companies recognise the importance of new skillsets in their approach to digital transformation, and the significance of an organisational culture that facilitates development.

Culture change/risk aversion

Manufacturing is a sector that has traditionally been slow to change and adapt, and is typically averse to any risk perceived as unnecessary. As a consequence any new-fangled technology, however impressive, can initially be viewed with suspicion and scepticism, with already established processes and systems forming the go-to, trusted methodology. The ethos being that if something has always been done a certain way, why look for anything better?

This has led to legacy and outdated systems proliferating the manufacturing sector. And this is the case even when the potential benefits of digital technology are taken into account; the situation becomes far worse if there is a view that the introduction of new technology will be detrimental to the existing workforce – robotics being a prime example.

There is a stark difference in attitude towards investment in robotics between the UK and many of the leading automated nations. Therefore, for manufacturers, particularly SMEs, it's essential that staff are trained and educated on the benefits that the right technology solution can deliver.

Digitalisation is not just about technology; creating a digital culture is critical to the success of any transformation project. Digital disruption is a business priority, and it starts and ends with people. They are the lifeblood of any organisation and the most important part of the change management process.

Having a culture that supports digital transformation is at the heart of a programme's success. And reviewing the potential risks and considering them when you establish a culture of change, will lead to a more resilient organisation.

Including people in the process from the ground up is vital to cultivating a change that will be embraced by an organisation in the long-term. Businesses will only succeed in digitalisation if they create an inclusive culture that fosters innovation.

It's essential that staff are **trained and educated** on the benefits of technology.

Measuring ROI should be a recurring activity to ensure any investment is delivering results and boosting profits.

Linked closely to the aforementioned pilot purgatory, a digital technology barrier for many manufacturers is knowing when they will receive payback for any investment – commonly known as ROI.

Any business would be loath to make any investment if the benefits to the entire business in the long-term are not provable. However, the issue that many manufacturers have is that they just don't when, or indeed if, they will see that digital technology investment pay for itself; and if they can't get a definitive answer, it can put many firms off of even getting started.

It's important that digital technology is seen as an enabler rather than a cost, however, there is evidence to suggest that while the number of digital transformation initiatives are growing, their ROI is actually declining. In what can sometimes be a confusing landscape (particularly for the uninitiated), there can be a misalignment in the expected outcomes, goals and benefits of adopting digital technologies in the workplace.

An alarmingly high number of manufacturers report a less than satisfactory ROI on their digital investments. However, it is important to note that Rome was not built in a day, a phrase particularly apt for digital transformation. Remember, it is an ongoing journey rather than a single destination, and it doesn't happen overnight or in one go.

Technologies will evolve and new solutions will come online. As such, measuring ROI should be a recurring activity; the goal of which is to ensure the company is investing its resources in a solution that can deliver results and boost profits by a sizeable margin.

In terms of how best to measure the ROI of digital transformation, it is important for manufacturers to first establish the primary reason for embarking on the digital journey in the first pace and the business objectives that matter, whether that's to increase revenue, improve productivity or increase customer UX.

From there it is important to choose measurement metrics that are aligned closely with those objectives, so that what is being measured has a direct bearing on what is trying to be achieved.

From there, establish some time frames around which the measurement can be built. It is also important to establish where the business is now, where it wants to get to, and how long it will take to get there. Otherwise, garnering an accurate picture of ROI will be impossible.

Digital skills

An obvious barrier for many manufacturers is that they lack the necessary in-house skills to drive any digital transformation project forward; to select, deploy, manage and maintain such technology. Talented, skilled workers are the lifeblood of the manufacturing industry, but for many businesses, employing staff with the relevant digital expertise has become an ever-present challenge.

It's no secret that the sector has an ongoing issue around skills, with a lack of young people opting for manufacturing as a career. As such, manufacturing has an ageing workforce, many of whom will be reaching retirement age over the next two decades.

Not only does the sector have a supply and demand problem around what would be considered traditional manufacturing capabilities – welding, CNC machining etc – businesses are also crying out for emerging digital skills that they perhaps never needed in previous generations, but which will be vital to drive digitalisation and Industry 4.0 forward.

However, the fact that the requirement for these types of skills is relatively new to the sector has created recruitment challenges. And these have been exacerbated by competition; manufacturing is not the only sector in need of emerging digital skills, and it is currently losing talent to tech and finance, for example – sectors that have the perception among the younger workforce as being more exciting and lucrative – meaning many manufacturers are fishing in a relatively shallow talent pool.

The increase in the need for digital technology within manufacturing has highlighted the lack of key data analytics skills, for example, to enable companies to make the best use of what their data is telling them. And, with so many businesses using data and system integration technologies, it is vital that companies invest in data science skills and software engineering to capitalise on all that information.

It is also important to note that the digital skills needed in many roles have a shorter lifespan than ever before. In the new digital economy, where roles and capabilities are evolving constantly, manufacturers need to establish clear career development and training pathways to keep people in the business and the sector. And as such, partnerships between universities, business schools and employers will be critical.

Digital technology internship programmes, run by organisations such as Made Smarter, have helped connect graduates with manufacturers who have then been able to benefit from that fresh insight to help them adopt technological tools.

Manufacturers need to establish **clear career development** and **training pathways** to keep people in the business.

The pace of change of digital technology in recent years, combined with the risk and change averse nature of the sector, has resulted in most (if not all) manufacturers having to manage older, legacy equipment and systems, and a fragmented IT infrastructure – while at the same time trying to integrate new emerging technology into their processes.

A 'if it's not broken why fix it?' mentality has resulted in a plethora of systems still in operation beyond their natural lifespan, creating issues around interoperability with newer software and systems, and strategies for phasing out and decommissioning. However, as the need for digitalisation has become more pressing, manufacturers are faced with a decision; whether to upgrade existing assets or replace them with new ones.

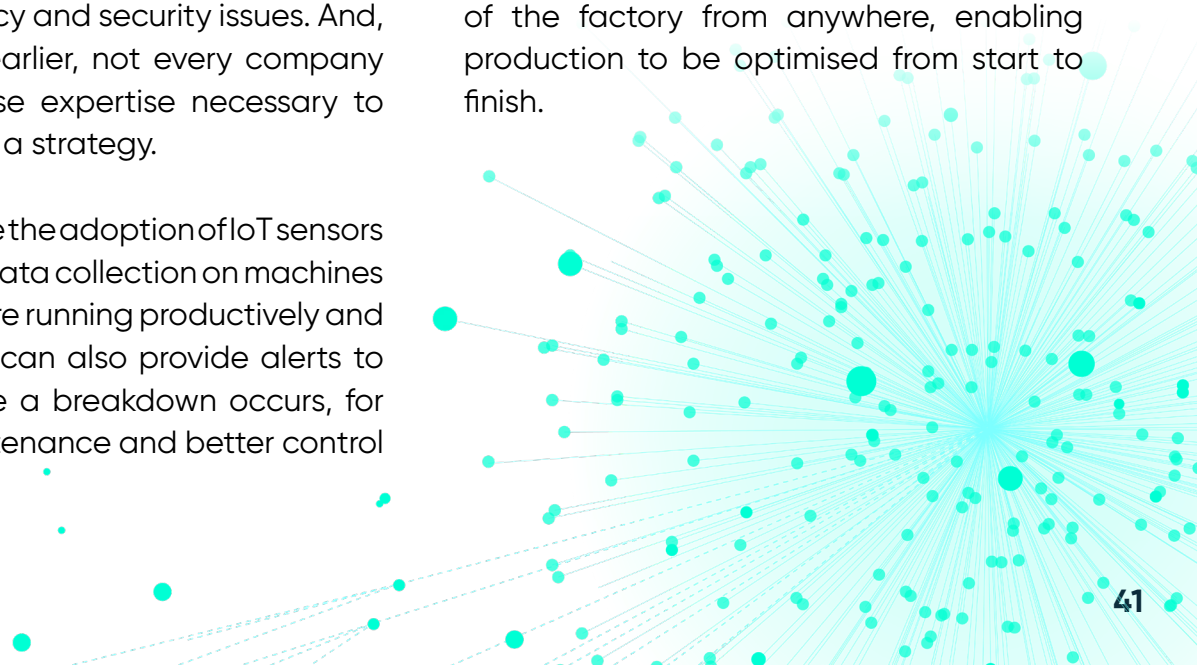
Outdated systems are not designed to integrate with new technologies, often making them incompatible with Industry 4.0 upgrades. Manufacturers could scrap all legacy systems and build a new infrastructure from scratch, but this is impractical. It's expensive, and it means shutting down for weeks or months.

As the pace of digitalisation has accelerated, so has the need for **effective legacy system** and **equipment management**.

An alternative would be to perform an inventory of systems, scrap and replace some and try to update others. However, that also takes time and money and could raise data privacy and security issues. And, as mentioned earlier, not every company has the in-house expertise necessary to implement such a strategy.

Solutions include the adoption of IoT sensors which allow for data collection on machines to ensure they are running productively and efficiently. They can also provide alerts to problems before a breakdown occurs, for predictive maintenance and better control of production.

Furthermore, integrated communications systems can be installed to collect and integrate data from CRM, ERP, SCM and PLM systems, as well as from the sensors on machines. Data can be displayed on easy to read and understand consoles placed anywhere. This lets users collect, visualise and analyse data from all areas of the factory from anywhere, enabling production to be optimised from start to finish.



Within a traditional manufacturing environment, IT/OT would typically operate as two separate entities of an organisation that would have been siloed from one another. As a result, a gap often exists between the enterprise and the shop floor.

IT, or information technology, is the central intelligence of an organisation, encompassing systems that can analyse and process operational and business data. These resources facilitate the translation of data into actionable insights, enabling workers to make informed decisions.

OT, or operational technology, forms the foundational infrastructure of a factory, traditionally relying on established and proven legacy systems. It interfaces directly with factory level hardware, including machinery and programmable logic controllers (PLCs). OT systems prioritise reliability and have historically operated independently from IT, with workers possessing unique skillsets tailored to their respective domains.

holistic roadmap to integrate IT and OT systems

As manufacturers further accelerate their digital transformation aspirations, converging IT and OT is a pivotal piece of the puzzle. After all, smarter shop floor machines produce better data. And better data helps to make machines operate more efficiently.

When it comes to enhancing the digital transformation journey, the mutual benefits for enterprise and the shop floor of IT and OT convergence are substantial. However, it may take some time to break down the traditional walls separating IT and OT systems and processes, to bring together the teams, processes and systems into a coherent whole.

Any IT/OT convergence can also throw up security concerns as IoT devices have been historically vulnerable to attacks, which means that the OT attack surface expands when it is integrated with IT. Cyber security should therefore be a major concern to the business, as OT is responsible for smooth facility operations.

In addition, existing IT and OT systems may use different programming languages, portals and/or platforms. To ensure smooth IT/OT convergence, the business may need to manually develop integrations.

Manufacturing leaders need to build a holistic roadmap to integrate IT and OT systems that align with the overall business strategy. On top of that, like any type of change management, business leaders must ensure organisation-wide alignment to maximise the chances of success.

A continued focus on workforce readiness by upskilling and reskilling employees is also needed to prime workers for ongoing and continuous improvement across the organisation, as well as to equip them with the tools necessary to thrive in today's digital-first world.

Confused marketplace

Not only can the sheer volume and rapid evolution of digital technologies, such as IoT, AI, cloud computing and big data, be overwhelming. As manufacturers have gradually opened the door to their digital journey, they will have been presented with a veritable smorgasbord of software, systems and solutions, from a plethora of vendors – all promising the Earth – around which they can build their transformation.

This has left many organisations unable to see the wood for the trees in terms of how and where to get started – creating such a complex, convoluted and confusing environment in some cases, that it has put manufacturers off from getting under way at all. Not ideal if a company has key stakeholder requests to satisfy.

With an overwhelming number of technologies, solutions and options that align with an organisation's specific needs, it can be difficult to navigate through all the choices to determine which ones will best support the organisation's goals. Making the wrong technology choice can be a waste of financial resources, as well as inviting compatibility issues or inefficiencies within existing systems, further hindering the transformation progress.

Integrating new technologies with existing systems can also cause delays and disruptions, as careful planning and coordination are required to ensure a smooth transition. Organisations need to approach their technology choices strategically to overcome any barriers they may present, taking into consideration factors such as scalability, flexibility and ease of integration. It may also be beneficial for companies to consult with technology experts, partner with trusted vendors, or participate in industry forums and conferences to gain the most current insights into emerging technologies and best practices

The first step is conducting a thorough needs assessment to define your organisation's requirements and goals. Then you can effectively evaluate different technology options, considering factors such as ease of use, scalability, integration, flexibility, adaptability and cost.

The first step is conducting a thorough **needs assessment** to define your organisation's requirements and goals.

Cyber security risks

By definition, the more a company invests in and deploys digital technology, the more connected that company's systems and processes will be to, not only the rest of the business, but to the outside world.

While this may be desirable to a degree – linking disparate and siloed elements of the organisation together, giving better transparency across business processes and enabling more real-time decision making – this increase in connectivity will of course increase the attack surface of the business, which malicious actors could potentially exploit.

Industrial cyber crime is on the rise, and as digitalisation has become more ubiquitous across manufacturing, it's no surprise that the sector is now the most targeted by cyber criminals. There have already been some high-profile attacks within the sector leading to worrying headlines around ransomware and the like. Unsurprisingly, this can sound the alarm bell for some businesses and give them pause prior to committing to any digital transformation project which could potentially give criminals and open invitation.

Manufacturing organisations are a particularly lucrative and accessible target for ransomware due to their low tolerance for downtime and relatively low level of cyber maturity compared to other sectors. Not to mention the ever-increasing sophistication of cyber attack techniques, making them something of a moving target when it comes to fighting back.

To prevent cyber security delaying the digital transformation journey, **it is important that manufacturers build cyber resilience into their organisations.** This can start with cultural change and a comprehensive governance strategy so that cyber security has clear ownership within an organisation. It also covers the importance of securing budget and resources, while also creating incentives to ensure that cyber security is an objective embraced by all.

In addition, a risk-based approach must be used to incorporate cyber resilience into the development of new products, processes, systems and technologies.

Again, **collaboration** is key so there is huge importance on fostering trusted partnerships and raising security awareness among stakeholders.

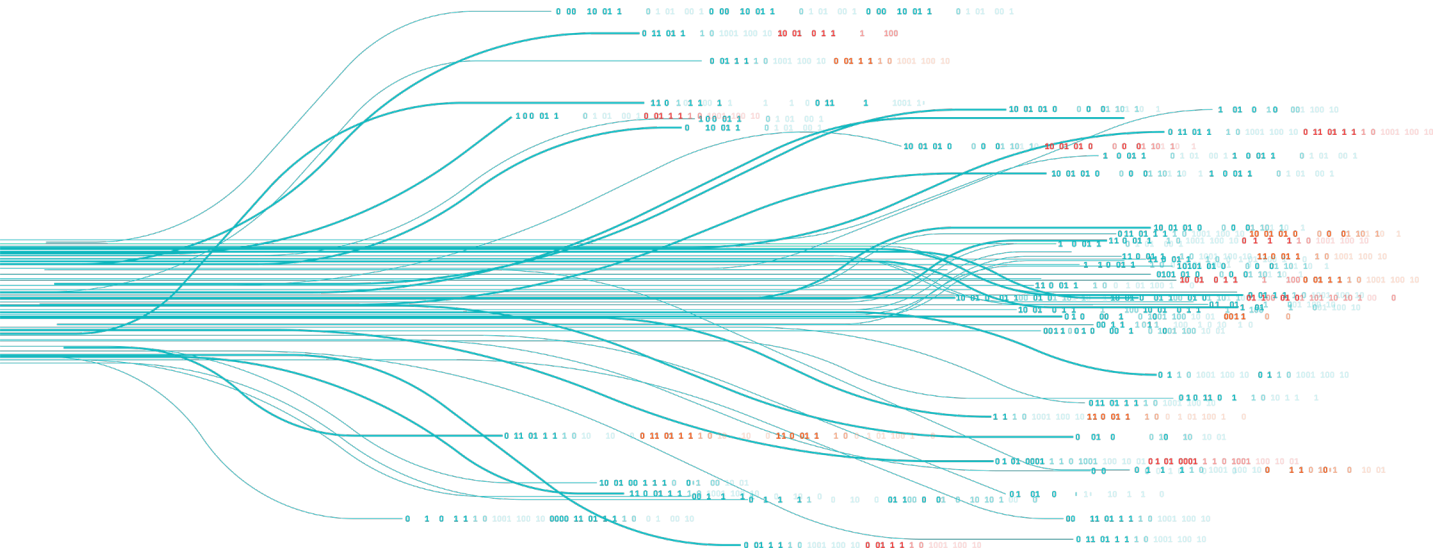
Rather than having one organisation exert control over a supply chain, an ecosystem approach involves encouraging all entities in a business network to collaborate to address cyber security issues.

Geopolitical uncertainty

It's a VUCA world out there – volatility, uncertainty, complexity and ambiguity currently reign supreme across the globe. And the more uncertainty persists the more a business is inclined to batten down the hatches and be averse to change or risk.

This is by no means ubiquitous across the sector, and the volatility of recent times has, in some cases, actually served as a catalyst for organisations to update their processes – the vulnerabilities of which were laid bare by recent disruption – and digitally transform their businesses to not only bring them up to date but also to safeguard against any future challenges.

Global uncertainty has heightened the need for businesses to digitally transform to help **safeguard against any future disruption**.



However, there have been some companies for whom global disruption – whether that be COVID-19, Brexit or supply chain issues caused by conflict in the Ukraine and Gaza – has caused digitalisation projects to be put on ice.

Not only has uncertainty caused companies to be more risk averse, it has also contracted the bottom line and profit margins, meaning that in some cases, any resources set aside for digitalisation projects were retargeted towards shoring up supply chains or investing in extra inventory etc.

Data management

Data is of course, the fuel that powers digital transformation, and any project is only as good as the data behind it. The success or failure of a digitalisation project can all hinge on the quality and integrity of the data, and how it is managed within the organisation. Indeed, ineffective data management can lead to fundamental flaws in any business decisions.

The problem that many organisations now face with regards to data is that there is now a lot of it. As manufacturers have embraced emerging technologies so the volume of data created by their machines and systems has increased; far beyond the levels experienced in previous generations.

Therefore, a recurring problem for manufacturers is not only how to effectively and efficiently harvest all this data, but also what to do with it once they have done so. Data is unlike oil; it has no value when it is just being stored, so achieving actionable insights from data is imperative for any modern business.

Prioritising **efficient data management practices** is the solution to this challenge.

This involves establishing processes and policies that enable your organisation to collect, store, retrieve, analyse and utilise data in a way that is secure, accurate and compliant with relevant regulations.

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.

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