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MAKE uk
The Manufacturers' Organisation

# FUTURE FACTORIES POWERED BY AI

makeuk.org

# EXECUTIVE SUMMARY

UK manufacturing is on the cusp of a significant digital transformation. With recent advancements in Artificial Intelligence (AI) applications, Machine Learning (ML) and the rapid acceleration of Large Language Models (LLMs; Generative AI), we are witnessing levels of innovation not seen since the invention of the steam engine. We are entering a new and exciting digital age that has the potential to bring about numerous benefits to the manufacturing sector.

These technologies are transforming industries by automating tasks, optimising production and revolutionising the way we approach problem-solving.

As AI, automation and robotics continue to evolve and speed up processes on the factory floor and elsewhere, their potential to drive economic growth and reshape industries is becoming increasingly clear, and the manufacturing sector, and its factories of the future, have a central role to play. Manufacturers agree; indeed, more than 70% of firms agree with the statement, "AI is a transformative force in the manufacturing sector, seamlessly integrating with advanced technologies to enhance productivity and efficiency and overall industry."

The sector brings stability and resilience to the economy, and provides the jobs and goods needed to ensure that communities across the country thrive.

However, despite being a major contributor of growth to the UK, the manufacturing sector faces a significant challenge when it comes to productivity and automation adoption. Just 7% of the companies we surveyed as part of this report regarded themselves as "very knowledgeable" about AI, and we remain behind in many global rankings when it comes to metrics such as robot density.

Yet there are huge financial gains to be had. For example, the AI industry in the UK is expected to contribute $1 trillion to the economy by 2035.[1] And as an economy, and as a manufacturing sector, we have the potential to realise these gains. After all, manufacturing contributes some 47% of all private R&D spending in the UK.[2]

This report aims to highlight to manufacturers what their factories could look like in five, ten or twenty years' time, by adopting already existing digital technologies to transform them into the factories of the future and to help boost efficiency and productivity, not just on production lines, but also in other areas such as decarbonisation and occupational health and safety.

It explores where digitalisation and adoption of AI is already taking place and examines the challenges to adoption – including costs, skills and a lack of awareness and knowledge.

In order to build on the momentum both the sector and the economy have, against the backdrop of a new industrial strategy, our report makes a series of recommendations to government as well as calls to action for industry.

**Methodology:** We surveyed 151 manufacturers between July and August 2024. In addition, we have spoken to numerous manufacturers to test our findings, including firms that sit on our Technology, Innovation and Digitalisation Policy Committee.

**Definitions:** Within our survey of manufacturers and throughout this report we refer to various types of AI. The definitions we have used can be found in the Appendices at the end of the report.

[1] United Kingdom AI Market | International Trade Administration
[2] UK Manufacturing The Facts 2024 | Make UK

# CONTENTS

# PART 1
# DIGITAL TRANSFORMATION IN UK MANUFACTURING

## MANUFACTURING OUR FUTURE

UK manufacturers are making the difference on the issues that matter. From pioneering renewable energy solutions that will secure the UK's future as a clean energy superpower, to creating the next generation of medicines and medical equipment to make the NHS fit for the future, our sector is essential to innovation, progress and prosperity for all.

Manufacturing is not just the catalyst of economic change, helping the UK achieve the highest sustained growth in the G7. It's an engine for social advancement, providing high-skill, high-paid jobs in every region and nation of the UK. Manufacturers are committed to breaking down barriers to opportunity by investing in skills and ensuring a diverse and inclusive workplace.

While government is helping to lay the foundations for growth though a modern industrial strategy, it is businesses that must bring the ideas and investment to make success reality. Make UK and our manufacturing members are working with policymakers at every level, from Whitehall to town halls, to increase productivity, accelerate adoption of new technologies and empower local communities to realise their full potential.

Yet there is more we can do, together. By increasing the manufacturing sector from 10% of UK GDP to 15%, we can add an extra £142 billion to the UK economy, increasing exchequer contributions to fund public services, while also driving a substantial uplift in long-term domestic and foreign investment.

**Accelerating digitalisation will play a key part in achieving this ambition**

We are in the midst of a digital transformation characterised by the fusion of digital, biological and physical systems. This transition is driven by advancements in technology such as data and AI, robotics, the Internet of Things (IoT) and biotechnology.

Unlike previous industrial revolutions – powered by steam, electricity and computers – this digital transformation connects digital and physical worlds, creating smart factories where machines communicate, learn and adapt.

Factories are becoming fully automated and data-driven technologies are transforming how we live and work. If the UK is to compete on the global stage, long-term investment must be paired with widespread digital adoption, therefore digitalisation and automation should be a strategic priority for any manufacturing company.

But to what extent are manufacturers fully embracing this new digital era? Are we seeing the seismic shifts in digital advancements that are expected? Just where are manufacturers on their digital journey?

# STAGES OF DIGITALISATION – BUILDING THE FACTORY OF THE FUTURE

We asked manufacturers where they are on their digitalisation journey, particularly with regard to implementing digital technologies such as robots, collaborative robots (cobots), AI, Virtual Reality (VR)/Augmented Reality (AR), digital twins and 3D printing. The findings show that progress is slow, at best.

**Pre-conception:** Companies who are not considering digitalisation within their businesses.

Just 9% of manufacturers are at the pre-conception stage. These companies are not considering investing in digital technologies. All of these companies are SMEs (10–249 employees). While there is clearly work to be done here, this is a marked improvement from 2022 when this figure stood at 18%.

**Conception:** Companies who are thinking about digitalisation.

Three in ten (30%) manufacturers are at the conception stage. These businesses are aware of the available digital technologies, are interested in investing and are currently evaluating how these technologies could be applied to their operations. Companies in this stage are exploring their options, which may include determining which digital tools would fit into their manufacturing processes, prioritising investment, and seeking guidance and support for successful implementation.

**Evolution:** Firms who are transforming their businesses through digitalisation and data.

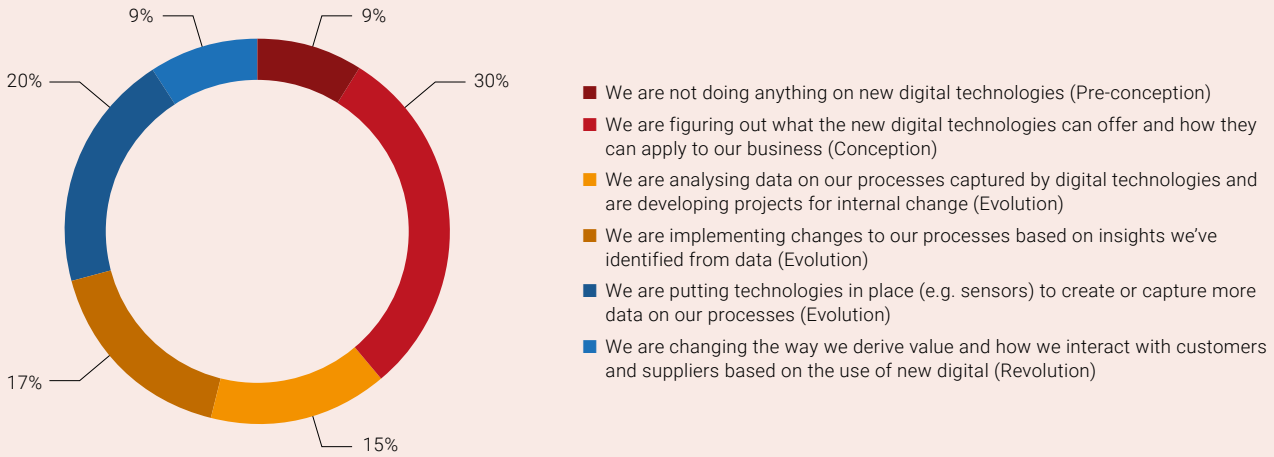
More than half (52%) of manufacturers are at the evolution stage. This stage involves manufacturers committing to the use of digital technologies, implementing these into workflows and beginning the process of integration. Training, setup and customisation typically take place at this stage. Arguably this is the most intensive stage for companies as by now they would have set out a strategy which they are beginning to execute.

**Revolution:** Manufacturers that are starting to derive value from their investment.

One in ten (9%) manufacturers are in the revolution stage. The technology is actively used in day-to-day operations, delivering recognisable value and efficiency. The revolution stage is the final and most transformative phase of a company's digital journey, where new technologies fundamentally reshape how the entire business operates. In this stage, businesses move beyond incremental changes and adopt fully integrated, automated and intelligent systems that allow them to run more efficiently, respond to changes dynamically and create innovative products and services. Businesses report that the technology becomes deeply integrated into daily routines across business operations; it is no longer seen as something new, but as an essential and seamless part of processes. Large manufacturers (defined by headcount and turnover) are twice as likely, compared to small firms, to have reached the revolution stage.

**Chart 1 – The stages of digital adoption**

*% of companies citing which stage of digital adoption they are at*




Source: Make UK/Autodesk, Future Factories Survey (2024)

# PART 2
# THE BUILDING BLOCKS OF A FUTURE DIGITAL FACTORY

## THE ADOPTION OF DIGITAL TECHNOLOGIES AMONG UK MANUFACTURERS

We are standing on the brink of a new revolution in digital transformation, powered by data and AI. Technologies such as AI, automation and Machine Learning (ML) are creating a seismic shift in how industries like manufacturing function. For manufacturing, we are starting to build future, digital factories.

Policymakers and funding bodies might assume that a digital, smart or future factory must be a startup – built from scratch (greenfield), fully connected and automated. While this approach may seem more straightforward, it is not the only path to becoming a factory of the future. Digital factories are possible today at any stage of a manufacturing facility's life cycle, whether design, construction or operations phase. Future factories are not always about constructing new facilities filled with the latest technologies. They can also emerge through the transformation of long-established (brownfield), traditional manufacturing companies led by visionary leaders who see the potential in digitalisation and AI-driven innovation.

In this way, the future factory is as much about evolution as it is about innovation – redefining what is possible not by starting from scratch, but by reimagining the capabilities of what already exists. It is a journey that blends tradition with transformation, turning today's factories into the intelligent factories of tomorrow.

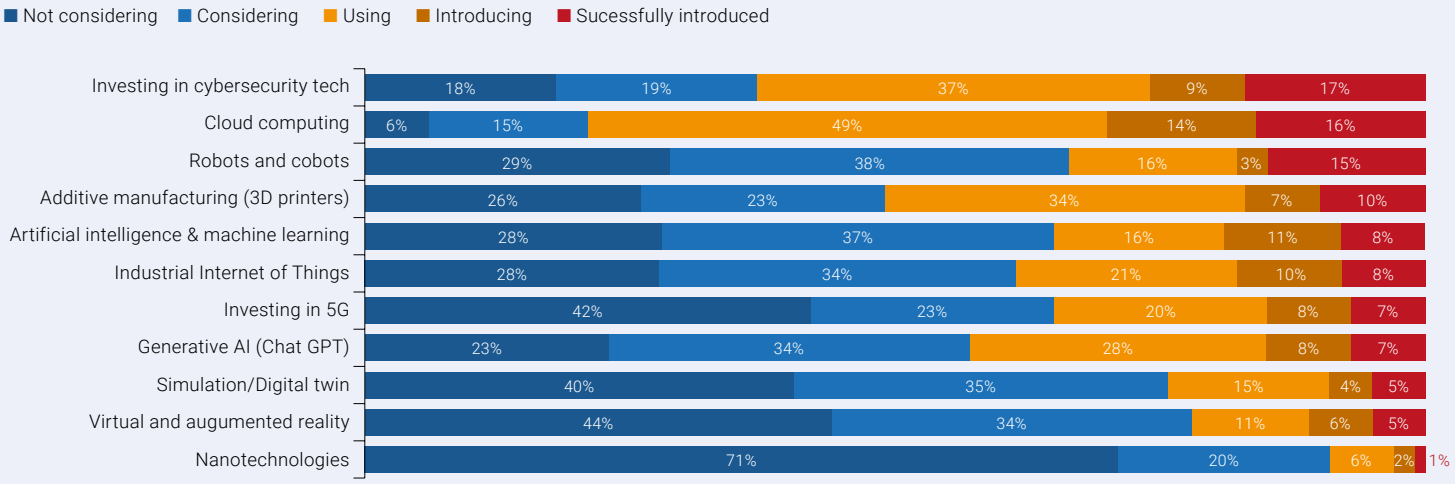
Despite being at different stages of digitalisation, our survey finds that digital technologies are already transforming manufacturing and supply chains. For some companies, these technologies are revolutionising product design, automating workflows and unlocking data-driven insights.

However, not all of the technologies available are being used across the manufacturing sector.

ALMOST
**2/3 OF MANUFACTURERS AGREE**
THAT THE FUTURE FACTORY WILL BE AN
**AUTOMATED FACILITY,**
POWERED BY NEW DIGITAL TECHNOLOGIES TO
**FULLY OPTIMISE OPERATIONS**

## Chart 2 – Manufacturers are adopting a range of digital technologies

*% companies citing whether they have introduced digital technologies into their business*




Source: Make UK/Autodesk, Future Factories Survey (2024)

**Cloud computing and cybersecurity:** Both cloud computing and cybersecurity show the highest levels of usage and successful adoption, signifying their importance and maturity in the digital landscape. This is driven by a combination of cost efficiency, technological maturity, enhanced security measures and ease of integration. The rapid acceleration of remote working and the need for resilient business operations has further pushed cloud adoption. Cloud providers have also built robust ecosystems that cater to a wide range of business needs, from small startups to large enterprises, making it a versatile and reliable solution.

**The Internet of Things (IoT)** has enabled factories to connect digitally, linking machines not just across a single factory shop floor, but also across multiple locations and delivering different types of industrial data, to provide global context and enable businesses to address operational risks and opportunities. As the chart above shows, this is increasingly being used across manufacturing.

IoT, encompassing sensors and smart meters, generates copious amounts of data and is usually more cost-effective than digital technologies. This data can greatly advance analytics, and AI can extract valuable insights. Manufacturers can leverage AI-driven algorithms to optimise processes, enhance product design and make data-driven decisions.

**AI:** Generative AI is fairly evenly distributed between businesses considering it (34%) and those using it (28%), suggesting that many organisations are actively exploring or adopting the technology. However, only 7% of companies have successfully introduced this technology, indicating that full-scale adoption is still in development.

**Digital twins:** A digital twin in manufacturing is a virtual replica connected to physical systems used for real-time monitoring, insights and optimisation. For example, Rolls-Royce uses this technology to improve aircraft engine performance and enable predictive maintenance. However, 40% of manufacturers are not considering, 35% are considering and only 5% have successfully adopted the technology.

# MANUFACTURERS' KNOWLEDGE OF AI

Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks typically requiring human intelligence.[3] These tasks include understanding natural language, recognising patterns, problem-solving and decision-making. Its beginnings can be traced back to the 1950s, right here in the UK, when pioneers like Alan Turing and John McCarthy laid the foundation for machines to mimic human cognition. AI is the simulation of human intelligence in machines; it mimics human cognition and includes ML, robotics and natural language processing and is used in applications like virtual assistants, autonomous vehicles and recommendation systems.[4]

Today, AI is a central part of many industries, including manufacturing, healthcare, HR and finance, logistics and entertainment. The rise of ML, a subfield of AI, has significantly advanced AI capabilities. ML algorithms learn from data to improve their performance over time, making modern AI systems far more versatile. Deep learning, a branch of ML inspired by neural networks, has enabled breakthroughs in image recognition, natural language processing and autonomous driving.

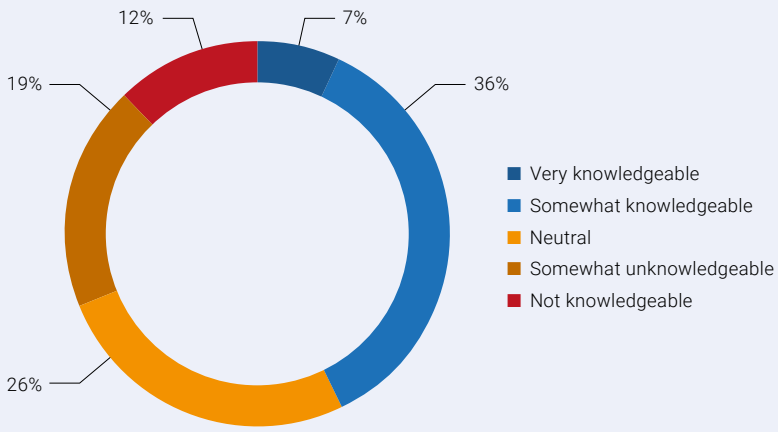
In manufacturing, among other benefits, AI can help to optimise production processes, reduce downtime and improve quality control. But to achieve these things, manufacturers need to be aware of AI, understand the benefits of AI to their business, overcome any barriers to adoption and ensure that its capabilities are maximised in a manufacturing setting.

YET JUST
**7% OF MANUFACTURERS**
CONSIDER THEMSELVES TO BE
**VERY KNOWLEDGEABLE**
ABOUT **AI APPLICATIONS** IN THE MANUFACTURING SECTOR

That said, more than one-third (36%) consider themselves somewhat knowledgeable. A first step is to ensure manufacturers have the understanding to successfully apply AI.

**Chart 3 – Knowledge about AI is mixed across manufacturers**

*% companies citing whether they consider themselves knowledgeable about AI*




Source: Make UK/Autodesk, Future Factories Survey (2024)

[3] Artificial intelligence | The Alan Turing Institute
[4] Predictive Maintenance in Manufacturing | BCG

# USE OF AI AMONG UK MANUFACTURERS

Manufacturers have been exploring and implementing AI and ML technologies since the late 20th century, but widespread adoption truly began around the early 2010s. Initially, AI was used for basic automation and robotics, to help with repetitive tasks and simple process optimisations. However, with advancements in processing capabilities, data availability and algorithm development, AI and ML applications in manufacturing have significantly expanded over the last decade. By the mid-2010s, predictive maintenance, quality control and process optimisation became more popular, as manufacturers increasingly recognised the potential of AI and ML to enhance productivity and efficiency in their business.

DESPITE THEIR
**TRANSFORMATIVE POTENTIAL,**
ONLY **36%** **OF MANUFACTURERS**
ARE CURRENTLY UTILISING
**AI TECHNOLOGIES**
**IN THEIR OPERATIONS**

- **Production line automation:** Some 44% of manufacturers use AI in production line automation to enhance manufacturing efficiency by automating tasks such as assembly, quality control and equipment monitoring. Technologies like robotic arms and computer vision enable consistent, accurate production while reducing errors and downtime, ultimately leading to increased productivity and lower costs.

- **Predictive maintenance:** A similar proportion of businesses – 43% – use AI for predictive maintenance to forecast equipment failures and schedule timely maintenance, thereby reducing unplanned downtime and maintenance costs. By analysing data from sensors and historical maintenance records, AI algorithms can identify patterns and anomalies, allowing manufacturers to anticipate issues before they escalate. This proactive approach enhances the lifespan of machinery and ensures smoother production processes.

- **Connecting new technologies with legacy machinery:** More than one-third (37%) of firms are using AI to connect new technologies with legacy machinery by enabling data integration, predictive analytics and process optimisation. It allows for real-time monitoring through new sensors, predicts maintenance needs to prevent breakdowns and enhances workflow efficiency. This integration ensures that manufacturers can optimise operations without completely changing existing equipment, leveraging their previous investments while adopting modern solutions. Additionally, as a result of this data integration, downstream operations information can be leveraged to inform the design of factory facilities and equipment to further enhance operational efficiency.

- **Connecting technology across sites:** 37% of respondents are also using AI to connect their equipment across different sites, sometimes in different countries. AI enables the connection of technologies across different locations by allowing seamless data sharing and communication. AI algorithms can analyse data from various sources to optimise resource allocation, enhance supply chain logistics and synchronise production schedules.

- **Inventory management and supply chain optimisation:** These can complement one another and are used by 31% and 30% of manufacturers respectively. AI can improve inventory management by advancing demand forecasting, real-time tracking and automated reordering. It analyses historical sales data and trends to predict inventory needs, reducing excess stock and stockouts. AI systems provide visibility into inventory levels across locations, facilitating informed replenishment decisions. Automated reordering maintains optimal stock levels with minimal manual intervention. Additionally, AI optimises supply chain logistics by identifying inefficiencies and enhancing coordination with suppliers. This can lead to improved delivery times and cost savings across the entire supply chain.

- **Quality control:** AI plays a key role in quality control in manufacturing. Currently, three in ten companies are already applying AI there. AI enables real-time monitoring, defect detection, predictive analytics and process optimisation. Continuous observation of production lines – something difficult for the human eye to match – allows immediate detection of defects. Integrating AI improves product reliability and reduces defect-related costs.

- **Customer Service and support:** AI has the potential to reshape the customer service environment. Currently 28% of manufacturers are using it to engage with their customers. AI can often enhance customer service by providing 24/7 availability through chatbots, allowing businesses to address customer inquiries at any time and improve overall satisfaction. By gathering and analysing feedback, AI also helps companies identify trends, enabling continuous improvement of services.

- **Virtual assistants:** These have moved on since the Microsoft paperclip in the 1990s and are now used by just under one-quarter (24%) of manufacturers. These AI-powered systems can manage supply chain processes, monitor production lines and handle inventory control through natural language interfaces. They enhance productivity by providing workers and managers with timely information and alerts, enabling faster response times and improved efficiency.

- **Product design and development:** Somewhat surprisingly, just 13% of manufacturers are using AI for product design and development. AI in product design and development can accelerate innovation by automating complex design tasks, running simulations and generating new concepts. ML algorithms analyse vast amounts of data and user preferences to create optimised designs, reduce material usage and shorten development cycles. It can save costs and can predict how products will perform under different conditions, allowing for faster prototyping and better decision-making during the design process. It can also reduce material wastage and energy consumption by providing insights into manufacturing feasibility, different materials and methods, before anything is manufactured.

- **HR and recruitment:** Only 9% of companies reported using AI in HR and recruitment, and they are automating routine tasks such as screening résumés, scheduling interviews and managing candidate communication. AI-powered tools analyse applicant data to identify top candidates based on specific skills and qualifications. A few manufacturers are using AI to write compliance-related statements and forms and quality assurance; some use intelligent cloud products to manage the HR side of their workforce.

**Chart 4 – How AI is being used in manufacturing companies**

*% manufacturers citing where in their business AI is being utilised*


Source: Make UK/Autodesk, Future Factories Survey (2024)

Globally, engineers are using AMAIZE, the first AI copilot for additive manufacturing, to print first-time-right complex geometries, saving valuable engineering time and enabling more sustainable solutions. This offers an opportunity to have an AI-powered, manufacturing-specific module within our products that is capable of doing both process simulation and correction. Within Autodesk Fusion, AMAIZE uses physics-informed AI to predict print issues and generate machine-compatible and optimal print scan strategies in minutes.

## GENERATIVE AI EXPLORED

Generative AI is a type of Artificial Narrow Intelligence (ANI), meaning it specialises in specific tasks rather than having the broad capabilities of human-like intelligence seen in Artificial General Intelligence (AGI). Generative AI is designed to create new data or content, such as text, 3D objects, images or music, by learning from existing data and patterns.

NEARLY
**1/2** (46%) **OF MANUFACTURERS**
HAVE EMBRACED OR ARE ACTIVELY EXPLORING
**GENERATIVE AI**

By integrating Generative AI, manufacturers can streamline operations, enhance innovation and better meet customer demands across various stages of the production and marketing life cycle. According to our survey, generative AI is most likely to be used for:

- **Marketing and contention creation (47% of firms)**
- **Process optimisation (46% of firms)**
- **Research and development (37% of firms)**
- **Product design and development (33% of firms)**
- **Customisation and personalisation (27% of firms)**

The role of Generative AI is rapidly expanding and is poised to become integral to every aspect of the manufacturing process. Our survey data indicates that this technology is already making a significant impact across manufacturing businesses: in marketing, design and production; translation in worldwide communication to speed up transactions; and to complement and improve existing documentation, such as processes and procedures and logistics.

Its ability to streamline processes could lead to higher productivity and cost reductions. Moreover, the accessibility of many AI tools lowers the barriers to adoption, particularly for small manufacturers. These businesses can benefit from AI even in areas where they traditionally face skills shortages, allowing for greater efficiency across the board.

Claudius Peters, manufacturer of heavy equipment for industries such as cement, gypsum and power plants, used Autodesk's generative design to improve a part in its cement production machine, making it lighter by 30-40%. This change cut material costs, sped up production and reduced energy use, leading to a more efficient and eco-friendlier product. The company used this new design method with traditional manufacturing processes and plans to use it for more parts in the future.

Sports goods retailer, Decathlon, has been applying generative design to create products that are lighter, more durable and easier to recycle, while minimising environmental impact. Using Autodesk Fusion, the organisation can experiment with sustainable materials and innovative designs, optimising the manufacturing process and reducing waste. Among its key innovations are the recyclable titanium bike frame and a diving fin which is twice as light and has half the carbon footprint as the market benchmark.

Apiar is a UK-based independent watchmaker, which prides itself on manufacturing as much as it can locally. It has strong partnerships and supply chain onshored in the UK. The horology industry has seen major technological changes throughout the years: the rise of quartz technology in the 1970s, miniaturising circuit boards and digital displays made it possible for more accurate timekeeping. This disrupted the industry, marking a major change in traditional watch-making. However, the most common way to manufacture watch cases has been with subtractive processes, CNC'd out of a block of stainless steel. Apiar has been exploring a different approach, with 3D-print metal watches. The company uses additive manufacturing to 3D print its watch cases using Laser Powder Bed Fusion from Grade 23 titanium powder. By bringing together a CAD and CAM workflow, every aspect of the watch (excluding the movement) has been meticulously designed, rendered and documented in its respective workspaces. Additive Build Simulation was used to set up the printing process for a near-net case shape print. CAM toolpaths were then created for case post-processing as well as dial manufacturing. This approach, combined with onshore manufacturing, gives the company more control over its logistical carbon emissions. Not only does this reduce material waste by using additive manufacturing, but sustainable materials are also used in watch straps and protective packaging.

Based in East Sussex, PEMBREE is one of the few UK manufacturers of bicycle components, and also exports its products worldwide through an established network of distributors. Phil Law founded the business in 2020, without prior manufacturing experience. Using Autodesk's Fusion, Law was able to develop his bike pedal designs before exploring all his manufacturing options. He was able conceptualise some ideas, create 3D models and even 3D print parts to see if the components could be manufactured, fit together and ultimately work as an assembly. Sustainability is also at the heart of the business.

"We are taking a holistic view of our products. We look at the product design, how we manufacture the product, its service, and ultimately how somebody can recycle it. The challenge for many companies is that they use materials that are not recyclable. By its very nature, sustainability is something you can continuously repeat, and too many manufacturers claim to be sustainable by just paying a carbon offsetting fee. Everything we do is sustainable – even our factory is powered entirely by solar and wind power."

Technology has allowed PEMBREE to optimise its processes, reducing the potential for scrap and waste. The firm can load parts into the machine and align them correctly via a feedback loop, whereby a measuring probe is used to capture the shape and positioning of parts and send data back into the CAM system. From here, software will re-align the pre-defined machining strategy with the position of the part. This eliminates errors and scrap when they conduct the first operation, but more critically when they move from the first to the second operation and conduct secondary part clamping, ensuring they are not misaligning and subsequently scrapping parts.

# THE ROLE OF AI IN INDUSTRIAL DECARBONISATION

AI promotes sustainability in manufacturing by optimising energy use, enabling predictive maintenance and improving supply chain efficiency. AI-driven insights help manufacturers lower carbon emissions and make data-driven decisions for sustainable, resource efficient production and decarbonisation. While the overall knowledge and awareness of using AI has room for growth among manufacturers, with 26% saying that they are using it to decarbonise their factories. Of those using AI in this way:

- **93% are optimising energy consumption:** This means they are using energy more efficiently, by implementing AI technologies to monitor and control energy use in real time. By analysing data from smart meters and sensors, AI can identify peak usage times and adjust operations accordingly, leading to significant energy savings.
- **64% of manufacturers are reducing waste and emissions:** AI enables predictive maintenance and process optimisation, which can significantly reduce waste and emissions. By forecasting potential equipment failures, AI allows companies to address issues before they lead to excess waste or inefficiencies.
- **57% are improving resource efficiency:** AI algorithms analyse operational data to identify inefficiencies in resource use. By optimising production schedules and processes, AI can help companies use fewer raw materials and generate less waste, ultimately improving resource efficiency.
- **43% are monitoring and reporting environmental impact:** AI tools can automate the collection and analysis of environmental data, making it easier for organisations to track their impact in real time. Advanced analytics can also provide insights into trends and areas for improvement, supporting transparent reporting and compliance with regulations.
- **21% are developing sustainable products and processes:** AI can assist in the design phase by simulating the environmental impact of various materials and processes. This helps companies choose more sustainable options before production begins. ML algorithms can also optimise product designs for sustainability, reducing material waste.

Many people around the world live daily with food and **fuel poverty, and for 3.3 billion people,** rice is life. Traditional rice milling is both wasteful and uses a lot of power. **Koolmill has developed a truly innovative milling process, a radical super-efficient displacement** technology that will have a positive impact for many.

Rice is a major polluter, responsible for **around 2.5% of all global human-induced GHG emissions** – its climate footprint is comparable to that of international aviation. The 60 million tonnes of paddy lost annually releases circa 80 million tonnes of $CO_2$ and consumes 1.5 trillion litres of water, for no gain. To meet the expected demand by 2050, we must make better use of what is already grown. Simply growing more rice is no longer a viable option.

Koolmill is using Autodesk Fusion, HoloLens (augmented reality) and 3D CAD to deliver power **savings of up to 90% and maximise the return of food from** a valuable resource by avoiding wasted rice and power. The low-power Koolmill process brings, for the first time, potentially zero emission state-of-the-art milling to all millers, regardless of size and location.

The scalable, off-grid mills, which require less extensive infrastructure, **empower 1.5 million previously excluded smaller millers** to compete directly on quality and price with large commercial mills.

Based in the **UK, Koolmill is working with rural millers in seven different countries that historically would have been excluded from accessing this type of technology.** The subscription-based model takes away the capex for less cash-rich customers. They pay a subscription fee until they've paid it off, with the technical risk staying with Koolmill. Software as a Service means upgrades are included in the contract, rather than having to buy more.

The annual global potential power savings when using Koolmill's milling system compared to traditional methods are:

**– Water: 167 trillion litres**
**– Power: 11.8bn kWh**
**– $CO_2$: 9.3 million tonnes**

# THE ROLE OF AI IN MAKING OUR FACTORIES A SAFER, SMARTER PLACE TO WORK

AI is making factories safer, smarter places to work. It predicts risks before they occur, automates dangerous tasks and reshapes how we approach health and safety, turning factories into proactive environments where human well-being is prioritised, and innovation drives the industry's shift toward a more secure future. From 36% of manufacturers that invested in AI tools, 20% are using it to become safer and risk averse companies. For example:

- **73% of companies employ AI for personal protection equipment (PPE) compliance monitoring:** AI-driven image-recognition systems can automatically check if workers are wearing the correct PPE, such as helmets, gloves or masks, ensuring compliance with safety standards.
- **64% of firms are using it to identify poor safety behaviours**: AI analyses worker behaviour to detect unsafe practices – such as not following protocols or using equipment improperly – triggering alerts and offering corrective measures to avoid accidents. It's hugely effective in preventing accidents.
- **64% use AI to monitor ergonomic activities:** Via motion tracking and analysis, AI identifies ergonomic risks and recommends adjustments to workflows or postures, reducing the risk of injuries.
- **64% of manufacturers use AI to monitor vehicles or workers in restricted areas:** AI systems, including facial recognition and geofencing (utilising GPS or RFID), can track movement of workers and vehicles to ensure they remain within authorised areas. Alerts can be triggered if someone enters a restricted zone, enhancing security and safety.

Lambda Function is working with Autodesk Research to accelerate smart manufacturing via AI solutions. The company's software combines CNC machining domain knowledge with the latest advancements in computer science and artificial intelligence to deliver new tools that augment the technical workforce. This works through higher machine uptime, reduced rework and scrap, optimised spend on cutting tools, increased staff productivity, reduced programming time and improved forecasting of machining costs.

**Marks and Spencer Cuts Incidents by 80% Using AI**

Marks and Spencer (M&S), a major UK retailer, saw a surge in demand at their Castle Donnington ecommerce distribution centre, leading to an increase in staff. To ensure workplace safety, the Health, Safety, and Environment (HSE) team explored new tools to identify risks and make proactive decisions. They chose Protex AI, a system that integrates smoothly with existing CCTV, acting like an extra set of eyes to help spot unsafe events.

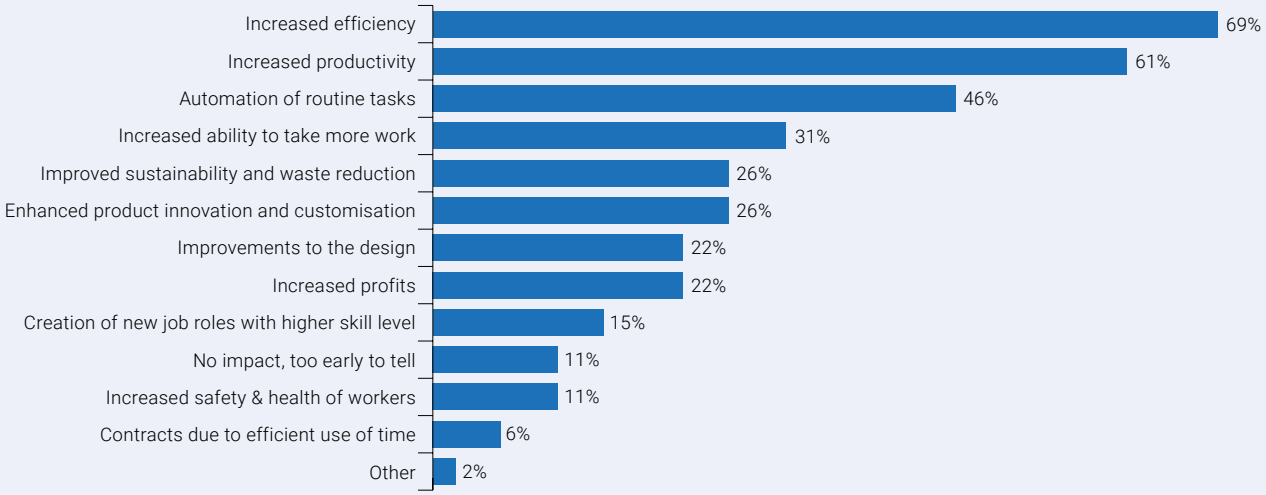
According to Alice Connors, HSE Specialist at the site, "Protex AI helps us keep our colleagues safe." The results were immediate: incidents dropped significantly, with a sustained 80% reduction over the first three months, and the HSE team has successfully maintained these lower levels.

# PRACTICAL APPLICATIONS AND BENEFITS OF AI

The application of AI in manufacturing is a strategic move that offers significant benefits, fundamentally reshaping how factories operate. When we asked manufacturers to identify the top four benefits of adopting AI, the responses overwhelmingly highlighted improvements in efficiency and productivity.

**Chart 5 – Increased efficiency and productivity are the main benefits of AI**

*% companies citing the benefits they have experienced after adopting AI in their business*




Source: Make UK/Autodesk, Future Factories Survey (2024)

## OPERATIONAL EFFICIENCY

Productivity growth – more output with the same amount of input to boost profitability – is at the forefront of every company's effort to achieve returns. It's therefore important to highlight that AI is significantly increasing both efficiency and productivity in manufacturing by streamlining various processes.

ALMOST
**7/10** (69%) **MANUFACTURERS**
REPORT AN **INCREASE IN EFFICIENCY**

**AI enables operational optimisation** through automation, predictive analytics and real-time monitoring of production lines. By reducing downtime, it improves equipment utilisation, detects inefficiencies and minimises human errors in repetitive tasks. For example, AI-powered predictive maintenance systems analyse machine data to predict failures before they happen, thereby avoiding costly breakdowns and reducing overall maintenance costs.

**AI can also assist in resource allocation** and workflow optimisation, so that production processes are executed in the most efficient manner. This can lead to reduced waste, better energy management and faster production cycles.

AS A RESULT,
**61% OF FIRMS CITED INCREASED OUTPUT**
AND PRODUCTIVITY AS A MAJOR BENEFIT

Sustainability is increasingly important for UK manufacturers, and it's encouraging to see AI's impact on overall **sustainability and waste management**. AI-driven systems analyse production data to fine-tune machinery, reducing resource use and waste.

MORE THAN
**1/4** (26%) **OF MANUFACTURERS ARE SEEING IMPROVEMENTS**
IN ENVIRONMENTAL RESPONSIBILITY
**BY CUTTING WASTE AND ENERGY USE**

## WORKFORCE AND JOBS

UK manufacturers face significant labour shortages, with 61,000 live vacancies in the sector right now. Manufacturers continue to cite challenges in recruitment, commonly mentioning a lack of technical skills among applicants.

Conversations about digital technologies and specifically AI need to be balanced with the opportunities and risks for the workforce. Concerns shouldn't be ignored or dismissed. However, to get broader buy-in, leaders in government and industry must actively articulate how AI will improve existing roles, as well as deliver new employment opportunities for workers.

**Our research shows that 15% of manufacturers have created new, higher-skilled job roles as a result of AI adoption.[5]**

**When asked if automation will impact their labour needs, two-fifths (42%) said it would have no impact.**

The industry recognises that the potential benefits vary, depending on the use case. For the workforce, there are potential productivity-enhancing AI features that automate complex, repetitive and error-prone tasks in the design process. It can also help to break down siloes between the design and manufacturing process, by combining workflows for better collaboration.

Another area of the workforce affected by automation is the role of robotics. First used in the 1960s, industrial robots in manufacturing have become more widespread during the automation age and the increasing digitisation of the economy. Today, industrial robots are widely used across the manufacturing sector. These robots are enabling enterprises to carry out work at larger scales and standardise many processes.

Industrial robotics in manufacturing are automated, programmable machines that carry out industrial tasks, such as pick and place, welding, gluing, inspection and more, using a series of actions on an object or workflow. These actions are repeated on an indefinite number of units in high-volume, low-mix tasks, and every action is as detailed and accurate as the first. Industrial robots are also finding use in low-volume, high-mix tasks where they may perform slightly different operations every time, using intelligent software and sensors like cameras and lasers to adjust what they are doing.

Industrial robots in an automated workflow can shift human jobs from often dangerous roles to new positions that connect workers' know-how with the visibility analytics AI can provide. Human workers are increasingly designing, implementing and managing robotic workflows that do the challenging work, while they use their creativity and experience to make the business better.

In the factory of the future, the manufacturing or industrial worker will have a different role. They'll need experience with the way robots work and the position they occupy in a factory workflow. But when humans design and construct new manufacturing functions (or repurpose existing ones), they won't simply be machinists or operators; by definition, they'll be managers. Humans will design, control and outline the overall view of what industrial robots and their connected technologies will need to accomplish using creative problem-solving.

Odico, a Danish robotics company, uses advanced robotics to improve wind turbine manufacturing. Its Drill Mate robot automates the precision drilling of wind turbine blades, increasing productivity threefold. This technology allows front-line workers to make rapid design changes using a tablet, making the process faster and more flexible. By enhancing efficiency, Odico's robots help meet the growing demand for renewable energy while ensuring that human workers are upskilled to adapt to the new technology.[6]

## BUSINESS AND FINANCIAL GROWTH

AI technologies can lead to significant outcomes for companies around profitability, with 22% reporting enhanced profits and 31% experiencing an increased ability to take on more work. This shift underscores the significant impact of AI on operational efficiency and competitiveness within the industry. These advancements reflect a broader trend in the manufacturing sector, where leveraging AI not only improves existing processes but also drives creativity and responsiveness to consumer demands.

[5] Automation, opening the gates to productivity **NEED LINK**
[6] Odico | Manufacturing Robots for Construction | Autodesk

# PART 3
# THE CHALLENGES IN AI ADOPTION

Despite the numerous benefits of AI adoption, for many companies there remain a number of challenges. Even those that have adopted AI find themselves experiencing initial teething problems, challenges in scaling up adoption and difficulties in optimising its use in order to reap the real benefits and move into that all-important revolution stage of digitalisation.

When asked about the barriers to adoption, the most commonly cited challenge was **complexity and systems integration** (cited by 44% of manufacturers), with firms unable to understand how to integrate new technologies with existing systems.

Another major challenge, again cited by 44% of firms, is the **costs associated with implementation**. Manufacturers continue to face significant cost pressures. Recent announcements to increase employment-related costs at the 2024 Autumn Budget and Spending Review is another example of how manufacturers will have to make difficult decisions regarding investments which promote productivity gains and growth, including in digital technologies.

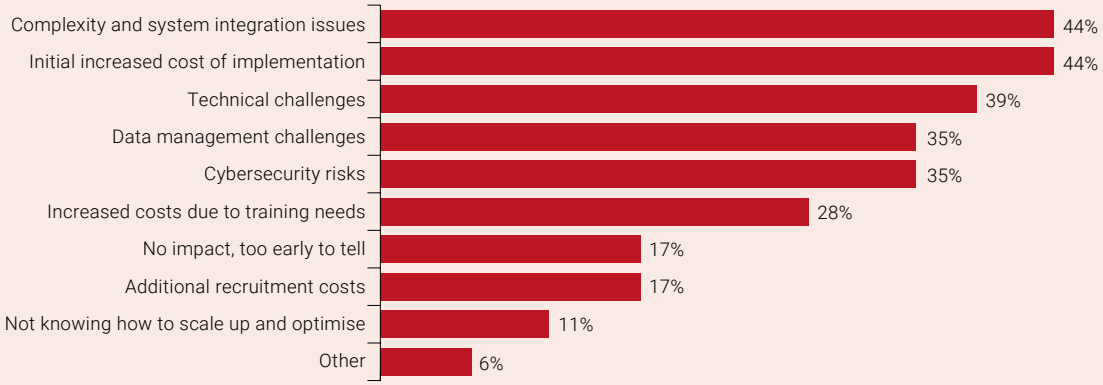
**Technical challenges** were cited by four in ten (39%) manufacturers. This is unsurprising for a sector that is already facing both labour and skills shortages. And with AI requiring more specialised skills, such as data science and software engineering, these are even more scarce. As a result, firms are struggling to implement AI-based solutions without hiring external experts or investing heavily in niche workforce training. This drives up the cost of implementation even further. It is for that reason that almost three in ten companies (28%) said **increased training costs** are a barrier to adoption.

Linked to this are **additional recruitment costs** (cited by 17% of manufacturers). If firms can't find the talent in-house, they will need to look to increase recruitment, and when looking for specialist skills, these can come at a price.

Beyond people and costs, **cybersecurity** also remains a barrier – a common theme of Make UK's research on digitalisation. In fact, more than one-third (35%) of companies said cybersecurity risks were stopping them from AI adoption in their business. Cybersecurity concerns are not to be taken likely. Indeed, Make UK's 2022 Cyber Security in Manufacturing report found that more than two-fifths of manufacturers had faced a cyber attack in the past 12 months.

**Chart 6 – Costs and systems integration are the biggest barriers to AI adoption**

*% companies citing the main barriers to adopting AI*




Source: Make UK/Autodesk, Future Factories Survey (2024)

# PART 4
# THE PATH FORWARD: STRATEGIES FOR AI INTEGRATION

More than 70% of manufacturers agree with the statement: "AI is a transformative force in the manufacturing sector, seamlessly integrating with advanced technologies to enhance productivity and efficiency and overall industry growth."

## FUTURE FACTORIES REQUIRE INVESTMENT

Manufacturers are realising that if they want to be part of the future, they need to embrace new technology and commit to full automation in the long term. As our research has found, AI-driven automation can significantly reduce downtime, optimise supply chains and improve overall output quality, ultimately leading to rises in resilience and efficiency. These tools offer scalability, allowing manufacturers to adapt quickly to market demands and remain competitive.

With the global manufacturing landscape becoming increasingly competitive, AI adoption is essential to keep pace with international players. Luckily, manufacturers are showing a strong commitment to investing in new digital tech and AI to overcome productivity challenges that have historically limited growth in the industry.

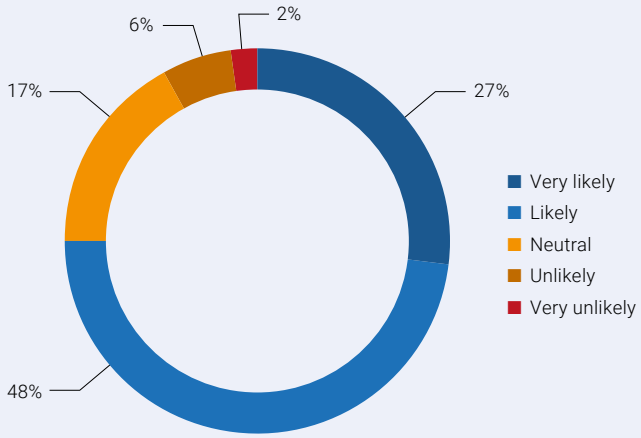
- 27% of manufacturers are "very likely" to increase their AI investments
- A further 48% are "likely" to do so

This represents a powerful majority of manufacturers looking to leverage AI to boost efficiency, streamline operations and enhance competitiveness.

Interestingly, 17% of manufacturers remain neutral on AI investment. These companies may be taking a wait-and-see approach, perhaps due to uncertainty around AI's implementation costs, the need for skilled labour to manage AI systems or doubts about immediate returns on investment. By contrast, only 6% are unlikely and 2% are very unlikely to invest, suggesting that resistance to AI is minimal but still present, potentially due to budget constraints or lack of awareness of AI's benefits.

**Chart 7 – Manufacturers' plans to increase investment in new digital tech in the next year**

*% companies citing how likely they are to increase investment in digital technologies*

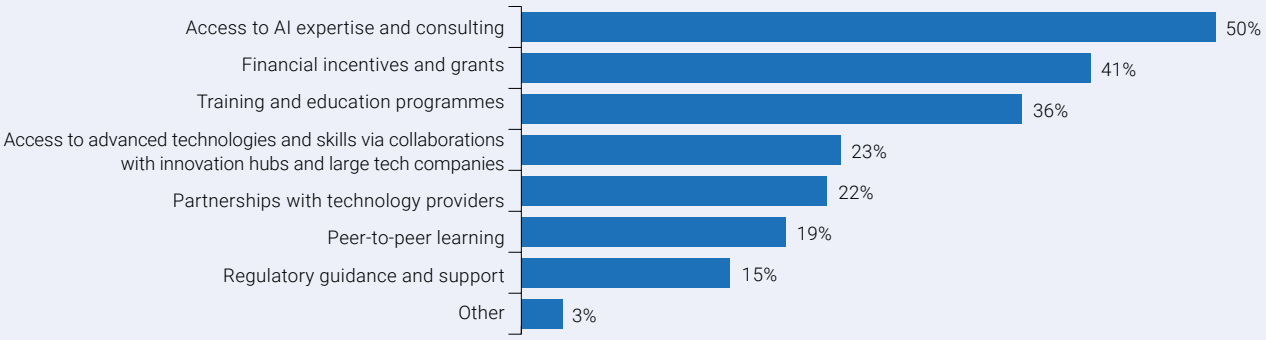



Source: Make UK/Autodesk, Future Factories Survey (2024)

# BUILDING MORE FACTORIES OF THE FUTURE: EXPERTS, EDUCATION AND INCENTIVES

**Chart 8 – Experts, education and incentives**

*% companies citing the sort of support their business needs to successfully adopt AI*




Source: Make UK/Autodesk, Future Factories Survey (2024)

As the previous section found, there are barriers to adoption of AI and it is important we explore what support is needed by manufacturers to overcome these, to accelerate use and optimisation of AI in the future factories.

It is unsurprising, given the challenges around knowledge and technical expertise, that the most commonly cited type of support was **access to AI expertise and consulting** – cited by half of the firms surveyed. This confirms the findings about the knowledge of AI applications in manufacturing and the strong need for external knowledge to help companies understand how to effectively implement and leverage AI for their specific needs. It highlights the skills gap around AI expertise and the complexity of deploying AI systems without appropriate guidance.

Four in ten manufacturers (41%) are seeking **financial incentives and grants** to help them successfully introduce AI. This again directly correlates to the challenges cited by firms, including the costs of implementation and the additional training and recruitment costs. Financial support, particularly in the form of grants, can help offset the initial high upfront costs associated with AI technology and digital transformation.

More than one-third of manufacturers (36%) emphasise the need for **training and education programmes**. Skills continues to be at the top of the agenda, and with technology forging the future of manufacturing it is important to upskill workers and management to ensure the workforce is capable of integrating and using AI systems effectively. Tailored and specialist training programmes can help bridge the skills gap, enabling employees to work alongside AI technologies and contribute to their successful implementation; this can also ensure that employees can develop their skills to reduce the risk of being replaced by the technology.

Just under one-quarter (23%) of manufacturers point to the need for **collaborations with innovation hubs and research centres**. This underlines the role of partnerships with cutting-edge tech hubs to access both the latest technologies and the specialised skills necessary for AI implementation. For example, we can see that companies in the Oxford–Cambridge Arc, a region known for its innovation centres and research institutions, tend to be in the profit-making stage of their digital transformation. This area, which is a hub for cutting-edge technology and academic collaboration, provides companies with access to advanced R&D resources, enabling them to innovate more effectively and accelerate their journey toward profitability.

Similar to collaboration with innovation hubs, 22% of manufacturers see partnerships with technology providers as crucial. This highlights the reliance on external tech providers to help supply and integrate advanced AI tools and solutions into existing systems.

Around one-fifth of respondents (19%) indicate the importance of **peer-to-peer learning**, reflecting the value of sharing knowledge and experiences between companies. Peer networks can provide practical insights, helping manufacturers avoid common pitfalls and learn from successful AI implementations in the industry.

**Regulatory guidance** is seen as essential by 15% of manufacturers. This highlights concerns about navigating AI-related regulations and ensuring compliance. Manufacturers are seeking clear guidelines to help them implement AI while avoiding potential legal and regulatory issues.

Against this backdrop, we have produced a series of policy recommendations for government as well as calls to action for industry to help overcome these challenges and push more and more companies into that all important revolution stage of digital adoption, specifically related to AI.

## POLICY RECOMMENDATIONS FOR GOVERNMENT

1. **Create further opportunities for universities, innovation agencies and catapults to work with industry:** The aim should be to map the total end-to-end journey of research-to-market product development, aiding the commercialisation of innovation.

2. **Establish frameworks for secure data exchange and collaboration:** These should enable manufacturers to leverage shared datasets for AI development and optimisation, driving advancements in process efficiency and product quality.

3. **Create regulatory sandboxes and testbeds for manufacturers:** These should be available to firms of all sizes to test new AI applications under controlled conditions, allowing regulators to assess risks and develop appropriate use and regulations. This can help manufacturers navigate regulatory complexities and ensure compliance while innovating with AI technologies.

4. **Review the business rates system:** The business rates system must not disincentivise investment in digital technologies but seek to incentivise it, and this should be a key principle in any future reform of the business rates system.

5. **Define the role of the AI Safety Institute (AISI):** The AISI should be a statutory, independent technical body that supports the evaluation and monitoring of AI systems. However, it should not act as a regulator. Instead, it should promote international safety standards, collaborate with sector-specific regulators and advance the science of AI safety.

## CALLS TO ACTION FOR INDUSTRY

1. **Accelerate the upskilling of leaders and managers to effectively embrace technological change.** Decision-makers must focus on equipping their teams with the right management skills, empowering them to lead the transition to digital technologies and shape a clear vision for the future factories.

2. **Peer-to-peer networks and sharing best practices should continue to be encouraged,** especially as manufacturers lead in adopting AI and other digital technologies.

3. **Invest in training around robotics and automation.** The human skills that will be in demand in the future aren't just technical or physical. Factory workers will be systems engineers and managers; they'll need to speak the language of data analytics and algorithms, and business owners and operators need to prepare for that world by investing in appropriate training now.

# AUTODESK VIEWPOINT

AUTODESK

## The UK ranks 12th in the world for the size of its manufacturing sector. With an output of £217bn and employing 2.6 million people, it will play a central role in the UK's future success.

But UK manufacturers are facing a pivotal change where embracing digital tools is not just advantageous but essential. Advancements in design and manufacturing technologies, cloud connectivity and AI are making digital more accessible to boost efficiency and productivity. In today's landscape, marked by macroeconomic issues including rising energy costs, skills shortages, and market instability, digitalisation offers a pathway to enabling more streamlined and resilient manufacturing operations to adapt to these ongoing pressures

When it comes to innovation Make UK's research shows positive signs of curiosity from the industry, with 30% of UK manufacturers thinking about digitalisation and 52% already transforming their businesses with digital tools and data. Yet, only 9% have started seeing positive returns on their investments. It's important to note that taking advantage of cutting-edge technologies isn't a one-off investment and the silver bullet for change. Instead, embracing these technologies demands a shift in mindset and an iterative approach over time.

This is especially true when attempting to deliver the digital factories of the future. We know that manufacturers often find themselves in a catch-22: they recognise the importance of digitalisation, yet feel uncertain about where to begin or, especially in the case of SMEs, the journey doesn't seem financially viable.

Though digital transformation is important across the whole lifecycle of a factory – from planning to design, to building and operating – building a digital factory doesn't require a complete overhaul to current processes. It can be achieved through gradual and intentional steps and is underscored by the value of a data-driven system that can adapt to changing market demands. Autodesk's Birmingham Technology Centre is one way we support this transition locally, giving manufacturers access to the latest digital tools and collaborative resources to explore new technologies and build the digital competencies needed for success. Other programmes like Make UK's training initiatives further enable manufacturers to adopt digital technologies by bridging gaps in understanding and implementation strategies.

We were pleased to see, through the recent Industrial Strategy Green Paper and announcements of greater support for programmes such as Made Smarter, that the UK government recognises the importance of this sector. These are vital steps.

But a continued and concerted effort will be needed to achieve the industry transformation and workforce with the skills and capacity required for a future-ready economy. With this, the UK manufacturing sector can emerge as a global leader in AI-driven innovation, setting the new standard for manufacturing excellence.

Autodesk remains committed to working with policymakers and industry to deliver this vision.

**Srinath Jonnalagadda**
VP, D&M Industry Strategy, Pdms-Product Development & Manufacturing Solutions, Autodesk

# APPENDICES

## SURVEY METHODOLOGY AND DATA

Methodology: We surveyed 151 manufacturers between July and August 2024. In addition, we have spoken to numerous manufacturers to test our findings, including firms that sit on our Technology, Innovation and Digitalisation Policy Committee.

## GLOSSARY OF TERMS

### Definitions for the purposes of our survey

While conducting our survey, we used the following definitions to describe and differentiate between AI, ML and Generative AI. The purpose of this was to obtain a better understanding of which AI subfields are being used.

**Artificial Intelligence (AI):** AI is the simulation of human intelligence in machines, enabling them to perform tasks like problem-solving, learning and decision-making. It mimics human cognition and includes ML, robotics and natural language processing, and is used in applications like virtual assistants, autonomous vehicles and recommendation systems.

**Machine Learning (ML):** ML is a subset of AI that uses algorithms and statistical models to enable computers to learn from data and perform tasks without explicit programming.

**Generative AI:** A subset of AI that creates new content, such as text and images resembling human-created content. It produces new data and utilises neural networks and deep learning. Used in design, simulation testing and process optimisation.

### Types of AI

AI is classified into different types based on capability and functionality:

- Reactive Machines (basic systems responding to specific inputs)
- Limited Memory AI (which can learn from past data).
- Artificial Narrow Intelligence (ANI; task specific, such as image recognition)
- Artificial General Intelligence (theoretical human-like intelligence)
- Artificial Superintelligence (exceeding human capabilities)
- Theory of Mind AI and Self-aware AI

**Reactive Machines:** These are the simplest forms of AI systems. They only react to current scenarios and cannot use past experiences to inform decisions. They lack memory and the ability to learn from past actions, operating strictly based on predefined rules and logic for specific tasks.

Example: Robotic arms for assembly line tasks: In many manufacturing environments, reactive AI systems are used in robotic arms to perform repetitive tasks such as welding, assembling parts or painting cars. These robots follow pre-defined rules and instructions to carry out specific actions but do not adapt or learn from past experiences. They are highly efficient for tasks that require precision and consistency.

**Limited Memory AI:** This type of AI can make decisions based on historical data or past experiences. It can improve its decision-making by learning from prior outcomes. These systems are designed to store information temporarily to make better predictions or judgments. Limited Memory AI includes autonomous vehicles, personalised marketing and fraud detection.

Example: Predictive maintenance systems: AI systems with limited memory are widely used in predictive maintenance to monitor the condition of machinery. These systems use data from sensors to track equipment performance and detect early signs of failure, predicting when maintenance is needed. By learning from historical data, the AI can anticipate breakdowns before they occur, reducing downtime and saving costs.

**Artificial Narrow Intelligence (ANI):** This is the most prevalent form of AI today. ANI is designed to perform a specific task or set of tasks within a limited context. It excels in specialised areas but cannot adapt to new tasks or environments without significant retraining. It operates within predefined parameters, typically using data-driven learning to perform its tasks.

Example: Supply Chain Optimisation: By analysing data related to demand, inventory and logistics, AI algorithms can predict supply chain bottlenecks, improve demand forecasting and optimise stock levels to prevent overproduction or shortages.

**Artificial General Intelligence (AGI):** AGI refers to a theoretical form of AI that could perform any cognitive task that a human can. It would have the ability to understand, learn and apply knowledge across a wide range of domains.

AGI would exhibit flexibility and general problem-solving abilities, similar to human intelligence. It could adapt to new tasks and environments without needing extensive retraining.

**Artificial Superintelligence (ASI):** ASI is the idea of AI surpassing human intelligence across all fields, including creativity, decision-making and even emotional intelligence. ASI would not only perform tasks better than humans but could also innovate, create new fields of knowledge and solve complex, global challenges. It raises significant ethical concerns.

**Theory of Mind AI**: This refers to AI that can understand human emotions, beliefs, intentions and social interactions. It would be capable of adjusting its behaviour based on understanding people's feelings and needs. While this kind of AI is still theoretical, it would have advanced social intelligence, allowing it to interact more naturally with humans.

In the future, Theory of Mind AI could enhance human–robot collaboration on the factory floor. Robots would be able to understand and respond to human emotions, intentions and needs, improving teamwork and productivity. For instance, robots might detect when a human worker is stressed or fatigued and adjust their behaviour to provide assistance or avoid accidents. Some advanced virtual assistants and robots are beginning to develop early forms of emotional understanding, but true Theory of Mind AI has not yet been realised.

**Self-aware AI:** This is the most advanced form, where AI not only understands human emotions and social cues but also possesses consciousness and self-awareness. This type of AI would have its own awareness, motivations, desires and beliefs. It would be capable of introspection and could potentially think abstractly about itself and the world. Currently, self-aware AI is purely hypothetical. It is the subject of many discussions in AI ethics and philosophy but remains far from reality.

**Porsche's Complex Electric Car Factory – Digital Planning for Zero Impact**

Porsche set out to build a new, highly complex electric car factory, aiming for a design that was both sustainable and efficient. The primary goal was to achieve "zero impact" by minimising environmental and operational disruptions throughout the planning and construction phases.

The vision was to leverage digital planning tools to streamline the process and ensure that all elements were meticulously planned with sustainability at the forefront. This approach aimed to integrate digital twins and other advanced modelling tools to visualise every aspect of the factory layout, equipment placement and energy use before construction began.

Using Autodesk's digital factory tools, Porsche created a comprehensive digital model of the factory, allowing engineers and planners to optimise workflows, minimise material usage and reduce potential errors. This virtual planning approach enabled Porsche to foresee challenges and adjust the design proactively, ensuring precision and reducing waste.

The digital planning strategy led to a seamless construction process with minimal environmental impact and helped Porsche achieve its zero-impact goal. The result was a highly efficient electric car factory that aligns with Porsche's sustainability objectives, demonstrating the value of digital planning in modern manufacturing.

Make UK, The Manufacturers' Organisation, is the representative voice of UK manufacturing, with offices in London, every English region and Wales.

Collectively we represent 20,000 companies of all sizes, from start ups to multinationals, across engineering, manufacturing, technology and the wider industrial sector. Everything we do – from providing essential business support and training to championing the manufacturing industry in the UK and internationally – is designed to help British manufacturers compete, innovate and grow.

From HR and employment law, health and safety to environmental and productivity improvement, our advice, expertise and influence enables businesses to remain safe, compliant and future-focused.

**makeuk.org**

**@MakeUKCampaigns**
**#BackingManufacturing**

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