

11 Ways AI & Automation Will Shape the Future of Manufacturing

Breakthroughs in artificial intelligence
will unlock innovative solutions





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The Road to Automating Intelligence

Exploring AI's potential is key in bolstering industry growth as manufacturers pursue efficiency & innovation

AI (artificial intelligence) has become a buzzword across virtually all industries. The term encompasses a wide variety of applications. AI can generate blog posts, compile data sets, and even learn to prevent accidents in the workplace. This year, professionals are capitalizing on the solutions and improvements AI brings to the table — and manufacturers are following suit.

We'll take a closer look at AI's place in manufacturing and focus on one area where the technology is creating tangible change in the industry: automation. We'll also spotlight the current work of automotive manufacturers and the ways they implement AI-powered automation to achieve futuristic goals.

SECTION 01

The Role of AI in Manufacturing

Think, Learn, Execute, Repeat

By incorporating AI into routine processes, manufacturers can build a digitized supply chain & safeguard their workplace

It's an unfortunate truth that many essential operations within manufacturing are tedious, overwhelming, and error prone. One mistake in a lengthy paper trail can significantly disrupt the supply chain, and a single byte of overlooked data can wreak havoc on a tight production schedule. Many manufacturers are overdue for a technology refresh that enables organization, efficiency, and progress on a large scale.

This is where AI comes in. When manufacturers embrace the benefits of this technology, they not only choose an efficient path forward — they advance design research and development (R&D), unlock the potential for improved safety practices, and create the foundation for a better workplace for all.

In the section ahead, we'll dive into four trending areas of AI integration that manufacturers can expect to see in 2023 and beyond. At a glance, these trends focus on:

- Deep learning
- Generative AI
- Reshaping big data
- Virtual simulations

We'll also see how AI directly impacts automation and is shaping the future landscape of manufacturing.

AI saves and makes money for manufacturers

↓ 42%

of manufacturers say AI implementation cut their costs in 2021

↑ 61%

of manufacturers say AI implementation increased their revenue in 2021

Source: "[The State of AI in 2022 — and a half decade in review](#),"
December 2022, McKinsey & Company



TREND #1

Deep learning will tap into existing IoT integrations

Deep learning allows machines and programs to simulate human decision making. Self-driving cars, also known as autonomous vehicles, use this technology to visualize lanes. Ongoing **research** suggests deep learning can reduce the alarming number of crashes self-driving cars are notorious for.

A machine's ability to make independent decisions is promising for manufacturers. By connecting deep learning applications to Internet of Things (IoT) technology, manufacturers can theoretically **fully digitize** the supply chain. Deep learning works in manufacturing by analyzing a facility's IoT network and recognizing problems or failures in warehouse machinery— completing the work that a human would normally be responsible for. While this technology is still developing, manufacturers can expect further breakthroughs to simplify and expedite daily procedures.

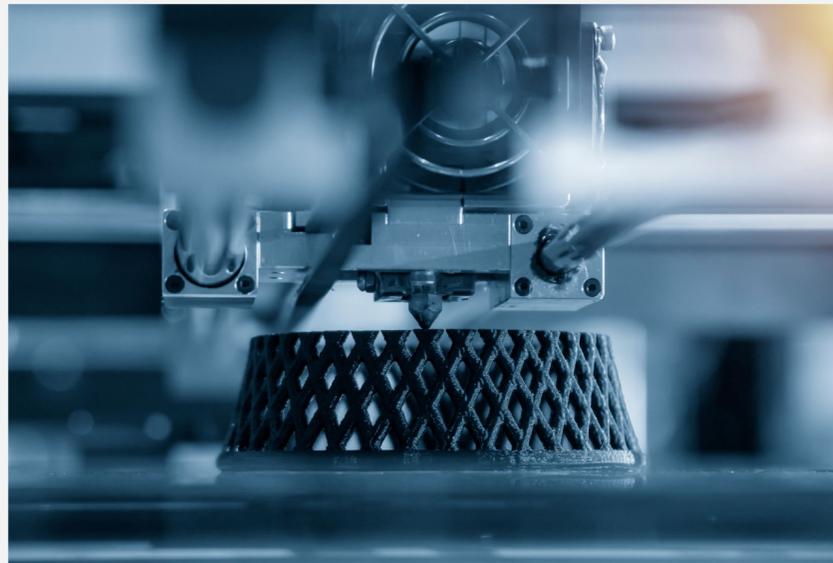




TREND #2

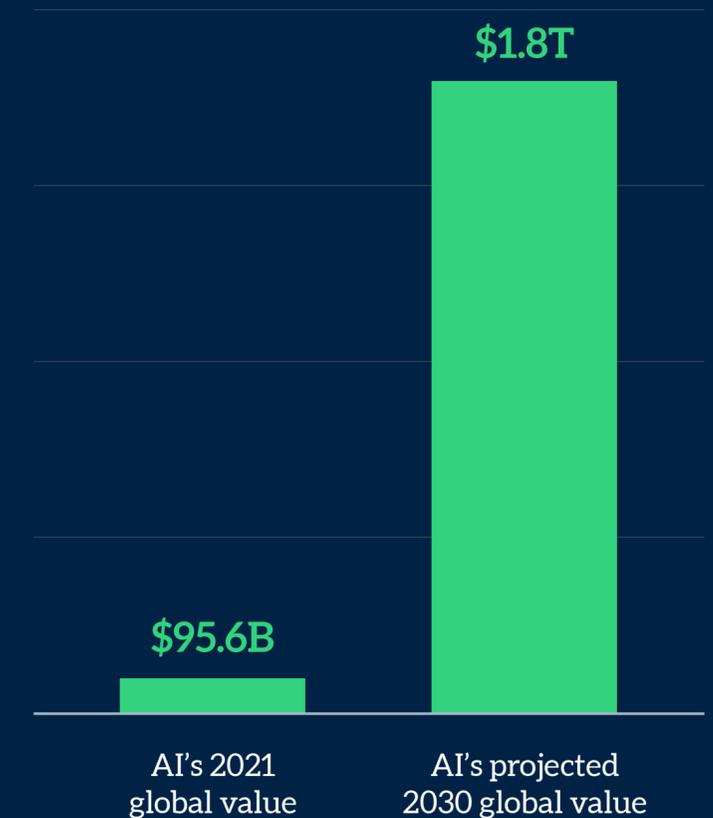
Generative AI will inspire R&D

You may already be familiar with generative AI applications like [Midjourney](#) or [DALL·E 2](#), which turn text prompts into visual images. Generative AI works by tapping into an existing bank of images, text, or data to create a composite. While impressive, generative AI is capable of much more than artistic exploration.



Manufacturers can capitalize on generative AI by implementing it during R&D. Feeding the AI existing designs for parts or components allows the [technology](#) to fulfill manufacturing initiatives, such as generating sustainably constructed designs or creating cheaper parts without sacrificing quality. In 2023, manufacturers will likely see a large number of startups providing versions of this technology, and should consider providers who will best suit their needs going forward.

AI's exponential growth in value



Source: "[Artificial Intelligence Market by Component, Deployment, Application, and End-User Industry](#)," January 2023, Next Move Strategy Consulting

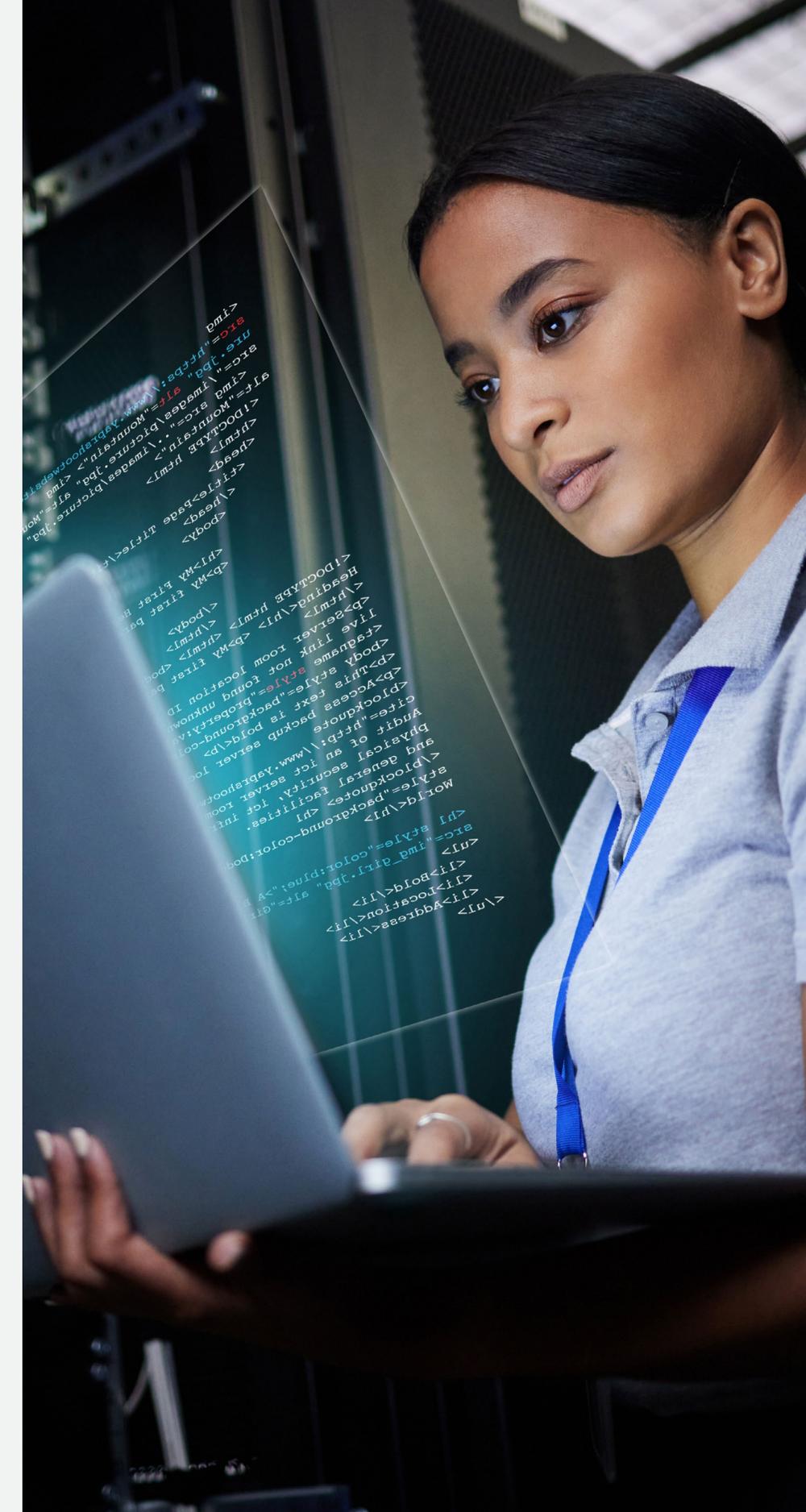


TREND #3

AI will transform manufacturers' relationship with big data

Big data is an amalgamation of individual data sources that comprise virtually all aspects of life — even outside the professional sector. In manufacturing, big data provides a record for all steps of the supply chain, from R&D to delivery. However, with IoT contributing new data to the existing mass of big data, manufacturers are struggling to maintain current data records at pace.

In 2023, manufacturers can look to AI as an **effective model** for recreating the way they analyze big data. For example, shifting central processing unit (CPU) hardware to a more powerful alternative — similarly to AI's utilization of graphics processing units (GPU) — can unlock unique digitized insights to data that speed the supply chain. However, manufacturers should take caution when considering CPU alternatives, as heavy reliance on GPUs may **negatively impact** sustainability efforts. This **research** is ongoing, and manufacturers should anticipate new developments in this field.



The global value of big data in manufacturing



Source: "Big Data in Manufacturing Industry Size, Share & Industry Analysis," March 2020, Fortune Business Insights



TREND #4

Virtual simulations will power advancements in safety and cost efficiency

If AI is a popular buzzword defining advancements across industries, then the word [metaverse](#) is a byproduct of AI's widespread integration. Popularized by [Meta](#), the term metaverse refers to a virtual environment modeled after real-world places where users can explore and interact with each other.

While the metaverse is commonly associated with entertainment, it holds [practical applications](#) for production that manufacturers are already utilizing. For example, shifting to virtual safety [testing](#) could reduce workplace injuries and eliminate costly, time-consuming procedures within the supply chain. This holds particular value in automotive manufacturing, which we'll explore later.



SECTION 02

Automation: How Manufacturers Become Proactive

Automated Systems, Effective Solutions

By deploying automation, manufacturers support local economies, boost production, & develop the technology that shapes our future

For some, automation may sound bittersweet. After all, streamlined production completed by an AI or other application often comes at the [cost](#) of real jobs for real people. It's no surprise, then, that advancements in technology and automation can create discomfort.

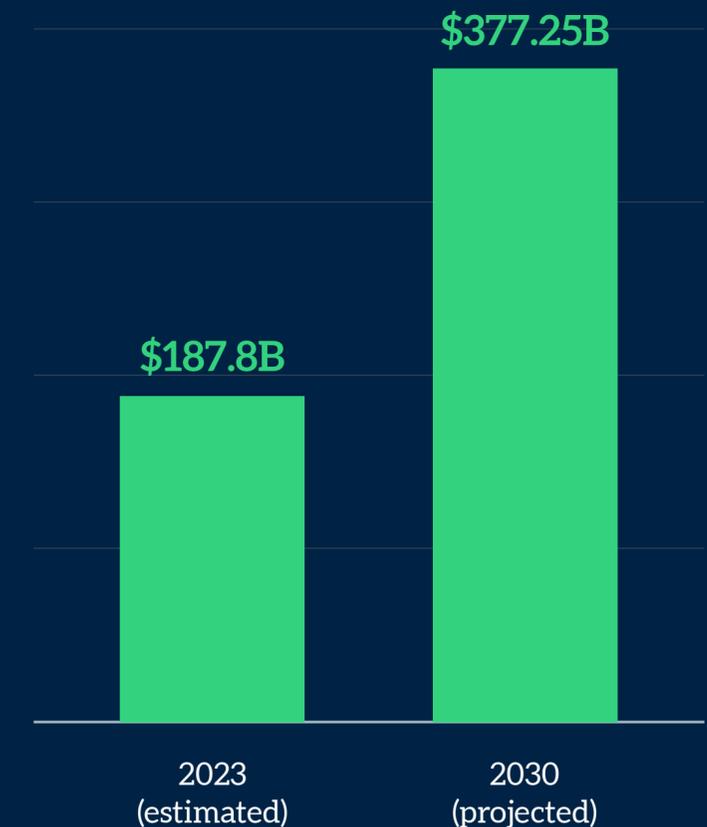
But the good news is this: Rather than [replace](#) manufacturing jobs, automation helps manufacturers become better at their jobs. By automating routine tasks, manufacturers create additional time for themselves to develop new [opportunities](#) and drive innovation within the industry. Automation allows manufacturers to invest in their most important assets: their people and their future.

As manufacturers continue to build back stronger from ongoing effects of the COVID-19 pandemic, key trends in automation emerge, pointing to solutions that not only get manufacturers back on track — but enable them to pave a new path entirely. We'll uncover four of these trends and explore how manufacturers can plan ahead as automation becomes more widespread. The four trends are:

- Automation in manufacturing at a glance
- How automation powers efficiency
- Using automation to fulfill local demand
- The role of automation in reshoring semiconductor manufacturing

Automation's global impact

The global market value of automation and control systems:





TREND #5

Automation will aid manufacturers' sustainability efforts

It's important to contextualize how manufacturers fit into modern sustainability initiatives. Currently, investors are encouraging and [funding](#) manufacturers to implement sustainable practices. Environmental, social, and corporate governance ([ESG](#)) ideology reinforces that push. Additionally, [Industry 4.0](#) — the new standard in developing business and production practices — emphasizes how crucial sustainability is to global health.

Effective automation may be the solution that addresses ESG concerns. Manufacturers can use [automated data analytics](#) to ensure accountability, measure emissions and waste, and track advancement to future goalposts. By prioritizing automation, manufacturers are in line with progress — and returning on investments.





TREND #6

Automation will make manufacturing processes more efficient

Manufacturers face **several concerns** in 2023: Ongoing supply chain backups, inflation, and a possible recession all create challenges within the industry. To combat these challenges, manufacturers should consider the value of automating wherever they can.



For example, **intelligent document processing** (IDP) is an AI-powered automation technology that scans documents for pertinent information. The AI quickly organizes large amounts of data with minimal to no human input. This automation could be the key to anticipating problems within the supply chain by identifying inventory errors or tracking delivery progress. By automating routine processes, manufacturers unlock efficiency and accuracy.

Sustainability reporting shows steady growth

Percentage of top revenue-producing manufacturers who report on their biodiversity impact

2020



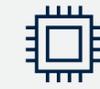
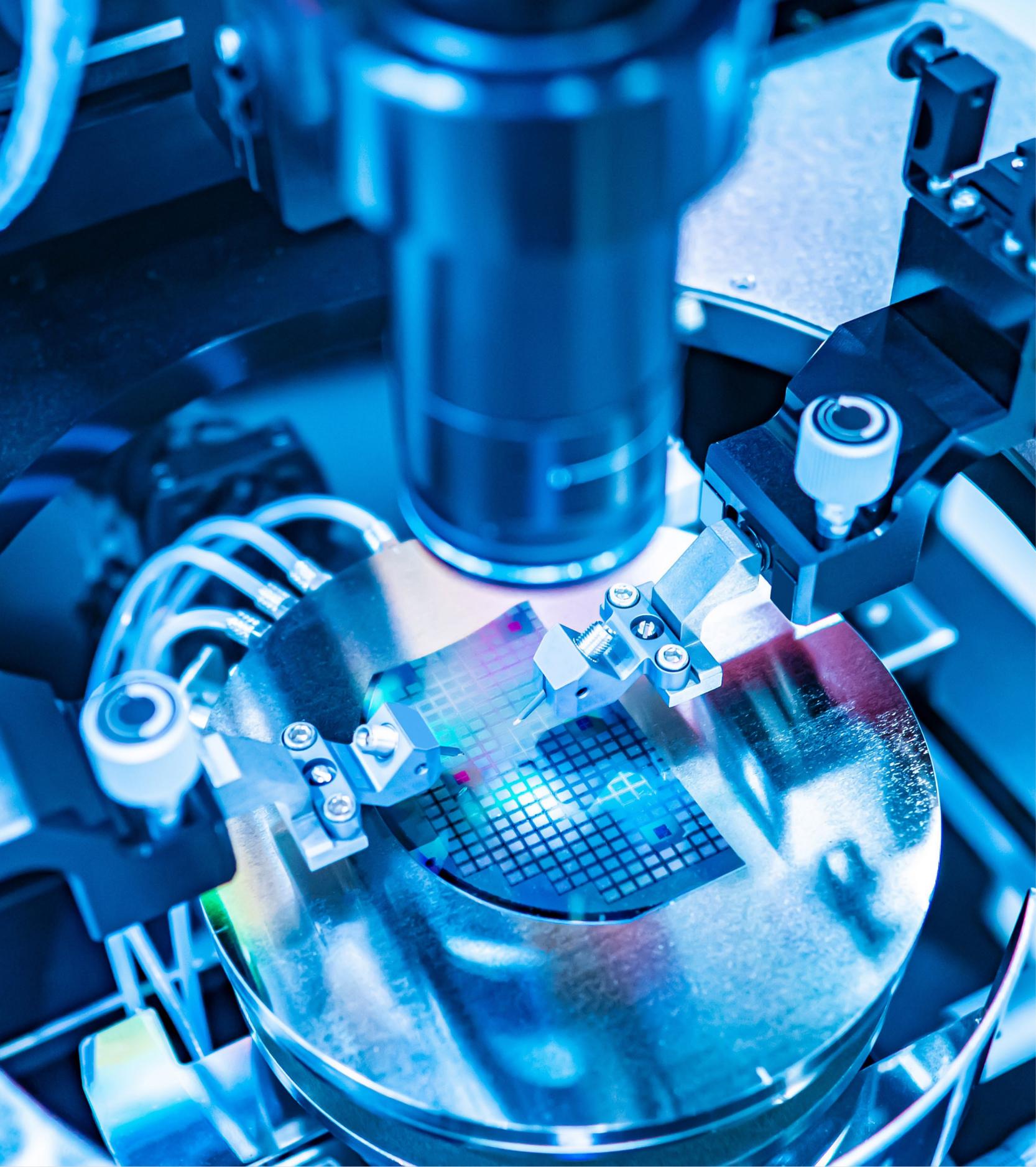
29%

2022



58%

Source: "[Big shifts, small steps: Survey of Sustainability Reporting 2022](#)," October 2022, KPMG



TREND #7

Manufacturers will require automation to fulfill production reshoring demands

The [2022 CHIPS Act](#) was a resounding success for US-based manufacturers. The act reshores semiconductor production and aims to [create](#) a vast number of plants and jobs for manufacturers. The CHIPS Act also serves as a base for eliminating the [semiconductor shortage](#) currently affecting industries around the world.

However, as manufacturers ramp up production, the sudden influx of demand will require solutions and practices that can help manufacturers keep up the pace. Deploying [flexible automation](#), which enables machinery to produce on a mass scale and receive programming input from manufacturers, could prove helpful as semiconductor production goes full steam ahead.



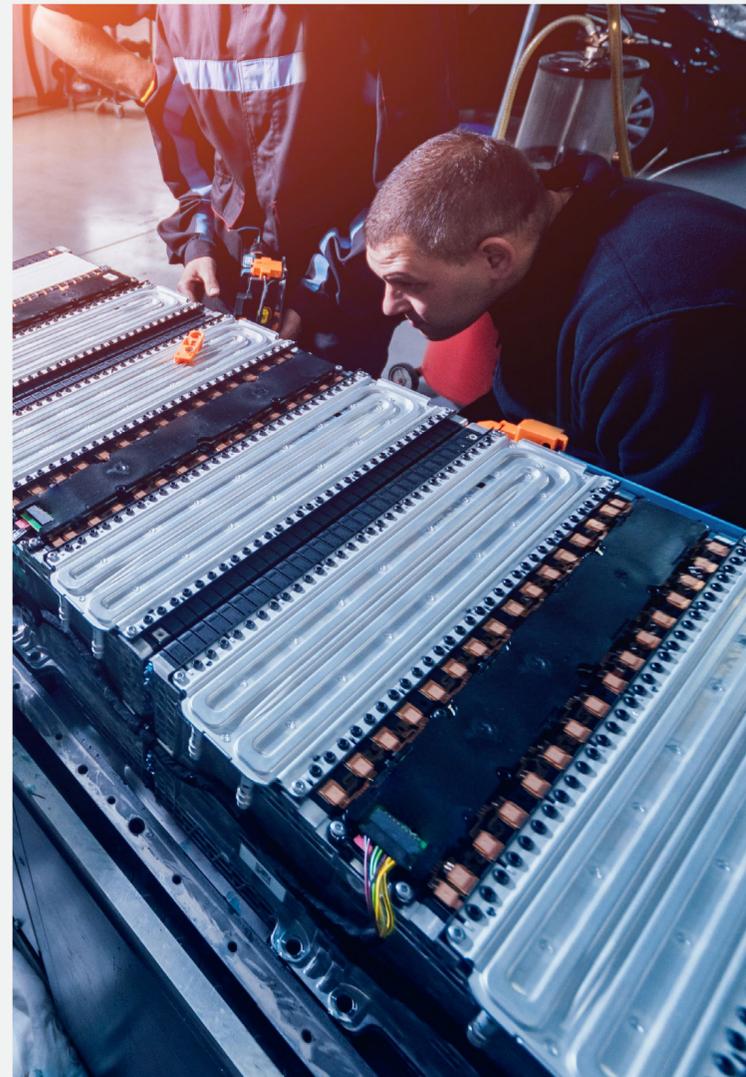
TREND #8

Automation will expand local manufacturing opportunities in specialized areas

To segway into our next section, let's focus on a key area where automation will equip US manufacturers with unique opportunities: the electric vehicle (EV) market.

[The Bipartisan Infrastructure Law](#) invests billions in EV manufacturing efforts across the country, from charging stations to battery production. Like the CHIPS Act, this effort will likely create domestic manufacturing jobs that are powered by automation.

Manufacturers should anticipate AI-powered solutions, like [simulated testing](#), to increase efficiency and boost local EV production efforts.



Reshoring production impacts employment

200,000+

Number of US jobs created through CHIPS Act initiatives, as of 2022



Source: "[2022 State of the US Semiconductor Industry](#)," November 2022, Semiconductor Industry Association

SECTION 03

Automotive
Manufacturing:
AI-Powered Trends

The Intersection of Progress & Practicality

Automotive manufacturers stand to benefit from advancements in AI & automation

The automotive industry is giant — particularly in the US. [Over a million](#) personal vehicles were sold in January alone. These impressive sales enable automotive manufacturers to create impressive designs that unlock industry progress.

[Self-driving cars](#), for example, are common across the country, from large cities to small towns. Trends now point to [hydrogen fuel cells](#) as a promising energy source for EVs, as opposed to standard lithium ion batteries. Breakthroughs in automotive development are only achievable because of the innovative efforts of manufacturers. And manufacturers can point to AI-powered automation as the tool they use to build the industry's future.

In this final section, we'll look at three trends in automotive manufacturing that manufacturers should watch in the months ahead. We'll discuss:

- Internal and external development strategies for autonomous car designs
- Hydrogen batteries as an alternative energy source
- Applying new technology to automotive R&D

Additionally, we'll explore ways to get involved in automotive manufacturing conversations and gain access to new trends — in AI, automation, and beyond — as the year progresses.

The scale of automotive manufacturing

1,000,000+

Number of manufacturers employed across the US automotive industry as of January 2023





TREND #9

OEMs will explore new options for self-driving vehicle design

Facing troubling [reports](#) on catastrophic failures that risk lives, automotive manufacturers will search for alternatives to future and current autonomous vehicle R&D. Manufacturers may [choose](#) to address these concerns either inhouse or through external partnerships. There are benefits to both:

- **Internal R&D:**

Original equipment manufacturers (OEM) developing patented technologies may benefit from the exclusivity of inhouse design. This will require talent — either new or existing — who can understand the complex AI powering autonomous vehicles.

- **External partnerships:**

Automotive manufacturers may also benefit from collaborations with existing technology leaders. Professionals in tech provide a more comprehensive understanding of AI and its integration in vehicle design.





TREND #10

Manufacturers have already begun development of hydrogen FCEVs

Honda released a [statement](#) confirming development of its first hydrogen fuel cell electric vehicle (FCEV): a new model of its popular Honda CR-V. The FCEV is a [hallmark](#) in sustainability because it produces no harmful emissions and has greater output [capabilities](#) than its traditional lithium ion counterpart. While FCEVs are not widely available, the emerging technology is promising, and manufacturers are already part of the conversation.

Because FCEV production is typically more [expensive](#) than standard EV production, manufacturers will need to plan for efficiency at all stages of development. Flexible automation is a potential [solution](#) to FCEV production cost concerns since the technology enables mass production while still ensuring quality control.



Manufacturing and technology partnerships

Waymo, an autonomous vehicle developed by Google, partners with OEMs to develop automotive bodies for their self-driving vehicle technology.



Source: "[Waymo Safety Report](#)," February 2021, Waymo



TREND #11

Automotive manufacturers will utilize 3D printing for parts to increase efficiency

The 3D printing automotive market is [projected](#) to reach an impressive market share of \$11.5 billion by 2029. Automotive manufacturers use 3D printing throughout the manufacturing process, incorporating the technology into:

- Developing prototypes
- Designing lightweight part alternatives
- Creating spare parts

Automotive manufacturers will continue using 3D printing technology in the coming months — but may consider implementing breakthroughs in

related technology. For example, researchers are already exploring the potential for [AI integration](#) in 3D printing. Common errors in 3D printing can quickly reduce a functional part to unusable raw material. Deep learning can enable AI applications to identify these errors and correct them, saving time and money.

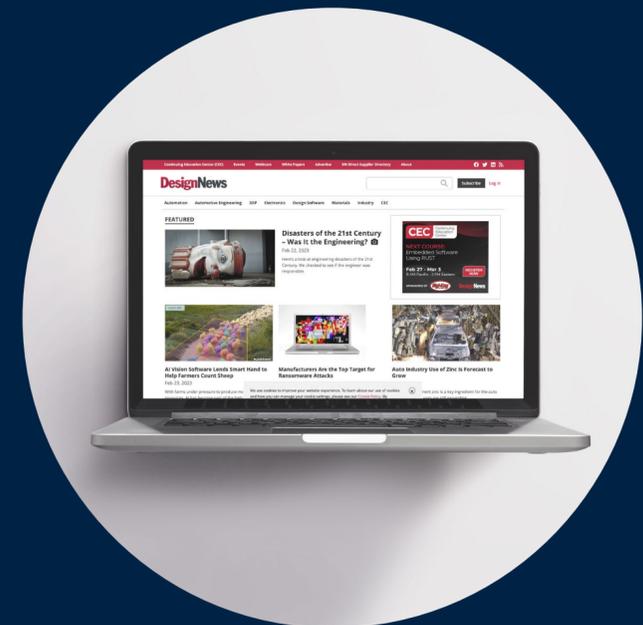
As automotive manufacturers seek automated solutions that bolster cost-effective practices like 3D printing, tuning into AI developments may provide interesting perspectives in the future.

Closing Thoughts

AI technology, and its ability to automate routine processes, is certainly impressive. But moving the idea of AI from paper to practice can be complicated, confusing, and time consuming. As manufacturers shape automated models for their organizations, collaboration is key to staying informed of new trends and technological breakthroughs. Networking with other manufacturers can unlock industry knowledge and prepare manufacturers for the future ahead. Consider attending conferences and industry shows to deepen connections with your network and position yourself at the forefront of manufacturing innovation.



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