

ORACLE

Rethink Manufacturing: Six Priorities to Deliver on Now

Facing growing cost pressures, you may be tempted to pull back from major tech initiatives. That could be a mistake. Here's where to focus.



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By Mark Jackley
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Manufacturers are navigating a turbulent year. Although the industry grew a respectable 3.8% in 2022 and pandemic-related supply issues are largely in the rearview mirror, prices remain unstable and future demand is difficult to predict. New orders are dropping sharply, due in part to inflation, high interest rates, and a post-pandemic shift in consumer spending from manufactured goods to services.

In June 2023, the US manufacturing industry contracted for the eighth consecutive month. China too is experiencing a slowdown, though in other countries the picture is mixed.

UK aerospace orders are making that country's outlook somewhat less gloomy than a few months ago, while Germany is forecasting modest improvements in an otherwise sluggish year. In US manufacturing, there are pockets of growth—in aerospace, automobiles, electric car batteries, and defense, for instance, and in production associated with the CHIPS and Science Act and the Infrastructure Investment and Jobs Act (more on those initiatives below). Globally, worker shortages are widespread in the industry.

Manufacturing priorities

Executives ranked the following initiatives in order of importance to their company:

	First	Second	Third
Digitalization	40%	27%	24%
Smart technology	29%	33%	22%
Sustainable manufacturing	17%	21%	28%
Workforce development	15%	19%	25%

Source: October 2021 global survey of 291 manufacturing executives by Oracle and IndustryWeek





While experts note the importance of protecting profit margins by lowering costs, they also urge manufacturers to invest in growth, including end-to-end digitalization, smart manufacturing and smart factories, more resilient supply chains, a more tech-savvy workforce, and new service-based business models—all while ensuring that they and their suppliers adhere to strict environmental and social standards. One clear lesson from the COVID-19 emergency: Companies that accelerate innovation and digitalization during the toughest times emerge from the storm stronger, ready to lap the competition.

For example, in January 2020, just weeks before COVID-19 swept across the world, [Hormel Foods](#) moved their entire portfolio of 50-plus brands—including SKIPPY, Planter's, SPAM, and Dinty Moore—to an integrated cloud-based platform consisting of supply chain management (SCM), enterprise resource planning (ERP), and human capital management (HCM) applications. All Hormel brands now manage demand planning, financial reporting, and talent development in a uniform way, sharing data across processes.

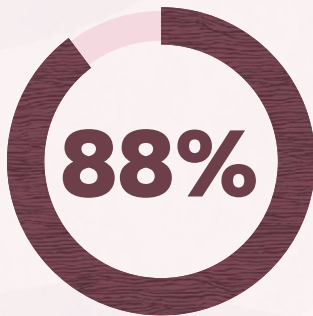
Jim Sheehan, Hormel's former executive vice president and CFO, says he received phone calls from disbelieving peers. "They'll say, 'You're not running one instance for all your brands, are you?' The answer is, 'Yes, we actually are, and it's a huge advantage.'"

A 2020 McKinsey study shed some light. During the first year of the pandemic alone, companies across industries reported moving 20 to 25 times faster than they initially expected on several digital initiatives, including migrating assets to the cloud, increasing nearshoring activities, and building redundant supply chains. That research also showed that 75% of executives in North America and Europe expected investment in automation to

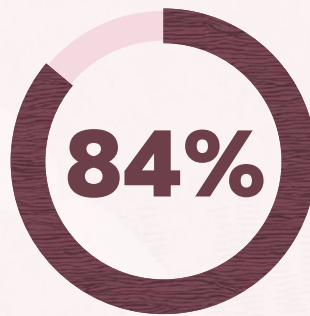
increase until 2024. In manufacturing, recent automation investments have sped up demand planning, financial reporting, and the conversion of marketing leads.

In a 2021 survey of more than 300 global manufacturing executives by advisory firm LNS Research, 88% said their companies are either planning or implementing digital transformation programs, and 84% said they're accelerating these efforts despite economic uncertainty. The study further revealed that manufacturers with aggressive programs

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(roughly 20% of survey respondents) were reaping major rewards—89% of this group reduced their cost of goods sold by an average of 10%, 98% increased revenues by about the same amount, and 86% increased operating margins by an average of 5%.

“Such investments are no longer optional,” says Niels Andersen, LNS principal research analyst. “If they don’t choose transformation, they’ll fall behind and may not ever get back on track.”

What follows are the biggest priorities.

1 Digitalize the business

If you're sick of hearing the term "digital transformation," remember that digitalizing every production, procurement, warehousing, supply chain, and other manufacturing process makes all the other priorities covered later in this ebook possible. Those include smarter factories powered by the Internet of Things (IoT), AI, and machine learning, as well as new service-based business models. Underpinning every digitalized process and the resulting efficiencies is the ability to easily gather, analyze, and share vast amounts of data to make better decisions.

According to an October 2021 survey by IndustryWeek and Oracle, the competitive gap is widening between manufacturers investing in digital capabilities and data-driven processes and those that aren't. When asked to rank four areas in order of importance, global survey respondents chose digital transformation ahead of smart technology, sustainable practices, and workforce development by a wide margin—though digitalization is core to all three of those movements.

Top focus areas for the manufacturers surveyed included improving efficiency (identified as a top priority by 55% of respondents), production development and innovation (53%), and responsiveness to market demands (42%). To address these challenges, manufacturers are

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Niels Andersen
Principal Research Analyst
LNS Research



relying on digital upgrades, which among other things make it possible to take advantage of powerful analytics fueled by AI and machine learning.

Shifting to digital processes gave [Bonnell Aluminum](#), a maker of custom fabricated and finished aluminum extrusions, clear visibility across their supply chain. Custom jobs represent 80% of Bonnell's orders and require goods made to spec and delivered at precise times. After moving to an integrated suite of ERP and SCM applications, the company better understands which products are in highest demand; spots supplier delays, related inventory issues, and other bottlenecks more easily; and can make necessary changes, such as reallocating labor.

As the flow of data increases, manufacturers need sophisticated software to analyze and extract insights from all that information. 60% of the manufacturing executives interviewed for a 2023 Deloitte survey identified analytics software as a top focus, mainly to improve forecasting and spot shortages of product components and raw materials before they affect the manufacturing line.

For example, [HarbisonWalker International](#), which makes refractory products capable of withstanding extreme heat and pressure, turned to analytics to enhance their demand forecasting, fine-tune inventory levels, and improve on-time delivery to more than 90%. Other manufacturers use AI capabilities in analytics applications to optimize shipping routes, reducing the amount of fuel consumed while speeding delivery times.



2 Reduce supply chain risk

As companies rethink their supply chains in the wake of COVID disruptions and ongoing geopolitical and trade tensions, they're balancing the need for lower-risk suppliers with the need to protect profit margins by containing labor costs.

For example, in 2022 nearly twice as many US manufacturers cut their investments in China compared with the prior year—19% compared with 10%, according to a report by the American Chamber of Commerce in Shanghai. “Confidence has been shaken,” the organization says.

However, the report showed that only nine US companies had moved more than 30% of their manufacturing capacity out of China, while the vast majority of companies in industries such as chemicals, pharmaceuticals, devices, and life sciences planned to keep their Chinese operations. Affordable labor with lower risk has made other Southeast Asian countries a popular alternative. Vietnam, with a young (median age of 32) and rapidly growing workforce, is considered an especially attractive option.

Meantime, in 2022 manufacturers announced they were adding 364,000 jobs in the US, thanks to reshoring or foreign direct investment, according to the advocacy group Reshoring Initiative. Largely responsible for this growth are two recently passed federal laws: the US CHIPS and Science Act, which sets aside US\$52.7 billion for the domestic semiconductor industry, and the Infrastructure Investment and Jobs Act, which allocates US\$1.2 trillion for transportation and infrastructure, the group reported.

More than 60% of US and European manufacturers expect to reshore some of their Asian operations over the next few years, according to a 2022 study by Supply Chain Movement. EU companies are looking at central and eastern Europe as possible locations, especially the Czech Republic, Poland, and Hungary, with some also considering Germany, the Netherlands, Belgium, and Luxembourg.

The war in Ukraine, another cause of supply chain disruption, is prompting Scandinavian and northern European manufacturers to shift their focus, at least in part, from lower cost to lower risk. The European Commission is promoting the development of so-called

European value chains in strategic industries to lower supply chain risk and promote green manufacturing.

In 2022, Bloomberg reported that a growing number of large US companies are absorbing the higher costs of manufacturing in Mexico, and even domestically, to avoid Chinese tariffs and continued supply chain uncertainty. Smaller manufacturers with typically lower margins are taking a wait-and-see approach, according to the report.

Digital supply chain management technologies play a crucial role in reducing risk. They give companies visibility into the workflows, schedules, and capacities of suppliers, fleets, distribution warehouses, and end customers. The real-time status updates provided by these systems make it possible to quickly detect, identify, and resolve bottlenecks that stress supply chains in almost every industry. For example, machine learning capabilities embedded in supply chain planning applications help manufacturers identify lead time trends, anomalies, and their potential impact, offering prioritized actions and resolution suggestions.

67% of CEOs said they planned to increase investment in disruption detection (analytics-powered risk models and market intelligence gathering) and other digital innovations, according to a 2022 KPMG study.

Golf equipment maker [TaylorMade](#) upgraded to a cloud SCM platform in 2018, letting it connect data across business teams and update it more frequently—a boon to demand planning. The enhancements proved crucial two years later, when the company responded flexibly to COVID supply disruptions instead of being whipsawed like so many other manufacturers.

“Our ability to take new information and build plans around it... was critical. We were able to understand what we had to do when demand dropped off and also when it started taking off again.”

Dave Brownie, Senior VP, TaylorMade

Describing how the company’s 2018 upgrade to a cloud SCM platform helped it deal with COVID-related supply chain disruptions

3 Invest in smart manufacturing

Industry 4.0, by which manufacturers collect and analyze reams of data generated by connected shop floor machines, trucking fleets, warehouses, you name it, is producing big efficiency gains for the industry: speeding production, improving product quality, and automating system maintenance.

It's big business. Global spending on smart manufacturing—mainly investments in digital technologies that connect and automate factories—will grow to more than US\$950 billion in 2030, up from US\$345 billion in 2021, according to ABI Research.



For example, manufacturers are investing in drones that fly above their factories, performing tasks such as monitoring for structural defects or harmful emissions, or detecting anomalies in plant equipment. Robots and cobots (robotic “coworkers”) handle repetitive physical labor. Automated guided vehicles (AGVs) transport materials such as metal, plastic, and rubber. Cloud applications automate demand planning, order management, and other key tasks, reducing human error and inaccurate information.



“Digital twins,” digital representations of manufacturing facilities, processes, and products, simulate the impact of supply and demand fluctuations on assembly line output and the dimensions of new products. Technicians use augmented reality (AR) headsets to check manuals when fixing machines in order to accelerate repairs, and companies are turning to 3D printing to produce spare parts.

5G, with its ultralow latency, high bandwidth, and capacity to maintain connections among far more sensors than either wired or previous cellular networks, has the potential to serve as the backbone of most smart factories while connecting them to edge facilities such as distribution centers. By 2030, factories worldwide will be equipped with 4.7 billion wireless modules, valued at more than US\$1 trillion, according to Ericsson projections.

Most, if not all, of the Industry 4.0 technologies cited above can work in concert. At one factory, parts are delivered to production lines by AGVs managed over the plant’s 5G network. An “intelligent warehouse” attached to each line monitors inventory and requests additional parts as needed. Sensors on machines identify potential manufacturing problems and command robots to fix them before they disrupt production.

While automation isn’t new, adoption rates for robots, drones, and AGVs are rising as companies seek to reduce labor costs, improve workplace safety, and increase productivity. According to the Association for Advancing Automation, automakers accounted for more than 50% of record-breaking robot sales in 2022. The global market for industrial robots is expected to expand at a compound annual growth rate of 10.5% from 2023 to 2030, according to Grand View Research.



4 Build a tech-savvy workforce

With unemployment levels at historical lows, about 750,000 manufacturing jobs remain unfilled in the US, according to the Bureau of Labor Statistics. By 2030, the number will swell to 2.1 million, Deloitte Insights forecasts. In the EU and UK, up to 40% of people may live in regions with shrinking labor markets when the next decade dawns, according to McKinsey research.

While assembly line workers, fabricators, welders, machine operators, industrial machinery mechanics, production supervisors, and other traditional manufacturing workers are still in high demand, the biggest labor shortages in the coming years will be in specialized technology areas, including robotics, computer programming, smart systems integration, data science, prototyping, cybersecurity, industrial control systems, and project and program management.

“We’ve seen a very big focus on connected frontline workforce initiatives as manufacturers look to solve critical labor shortages,” says Andersen of LNS Research. “CFW initiatives digitally connect employees with real-time information and knowledge. This enables the multidirectional flow of data they need to do their jobs safely and efficiently.”



Meantime, baby boomer manufacturing workers are retiring faster than they can be replaced while younger, more technical workers are being drawn to industries that pay more and are considered more cutting edge—software, automotive technologies (connected cars), financial services, and the like.

How can manufacturers turn the tide?

Decades of labor offshoring and outsourcing have damaged the reputation of the industry as a source of good, stable employment. Manufacturers can combat this perception by showcasing their eagerness to nurture careers and their commitment to providing rewarding jobs. Training and upskilling programs are key.

The Institute for Advanced Composites Manufacturing Innovation has started a program called America's Cutting Edge, with the goal of training people for the machine tools industry. The National Association of Manufacturers and The Manufacturing Institute have a program called Creators Wanted to connect people with training, job openings, and new career pathways. Colleges and universities across the US, such as Northeast Wisconsin Technical College and Northwestern University near Chicago, Illinois, offer Industry 4.0 study programs covering cybersecurity, the Internet of Things, and robotics.

Manufacturing Matters

In the US, the world's largest economy, manufacturing accounts for

12 million US jobs

35% of productivity growth

US\$2.3 trillion in GDP

60% of exports

20% of capital investment

70% of R&D spending

In the EU, manufacturing accounted for **32.2 million jobs in 2022**, the most of any industry. In China, the manufacturing sector employs **18% of the nation's massive labor force**.

Sources: US Bureau of Economic Analysis, US Bureau of Labor Statistics, McKinsey Global Institute, World Bank, Hang Seng China.



The European Commission has declared 2023 the European Year of Skills for industries including manufacturing and is showcasing skills development workshops and similar events in Europe. It's also pushing to broaden many job qualifications, in part by recognizing the value of high school and university coursework.

In the US, women account for less than 30% of the total US manufacturing workforce, and the percentage of Black, Asian, and Hispanic employees (women among them) is only slightly higher, at about 35%, according to January 2023 data from the Bureau of Labor Statistics. Two national efforts to get those demographic groups more involved in the industry are a US\$6.2 billion training and reskilling initiative sponsored by the Department of Defense and a National Association of Manufacturers campaign that provides mentors to women and seeks to change perceptions of the industry.

Upgraded recruiting systems can make a difference, too. Luxembourg-based [ArcelorMittal](#), one of the world's largest steel producers, moved to a cloud-based recruiting application that helped fill technical jobs in highly competitive markets such as Poland. In only eight weeks after rolling out the system, the company received 1,400 job applications. Previously, the company's HR teams would receive just one or two applications per job opening in key markets. [Arconic](#), an aluminum manufacturer based in Pittsburgh, Pennsylvania, that was once part of Alcoa, uses a cloud-based suite of HCM applications to give business decision makers self-service access to real-time data on hires, terminations, and employee demographics, helping them get a clearer picture of their employee population and analyze whether seasonal changes affect demand across job functions.

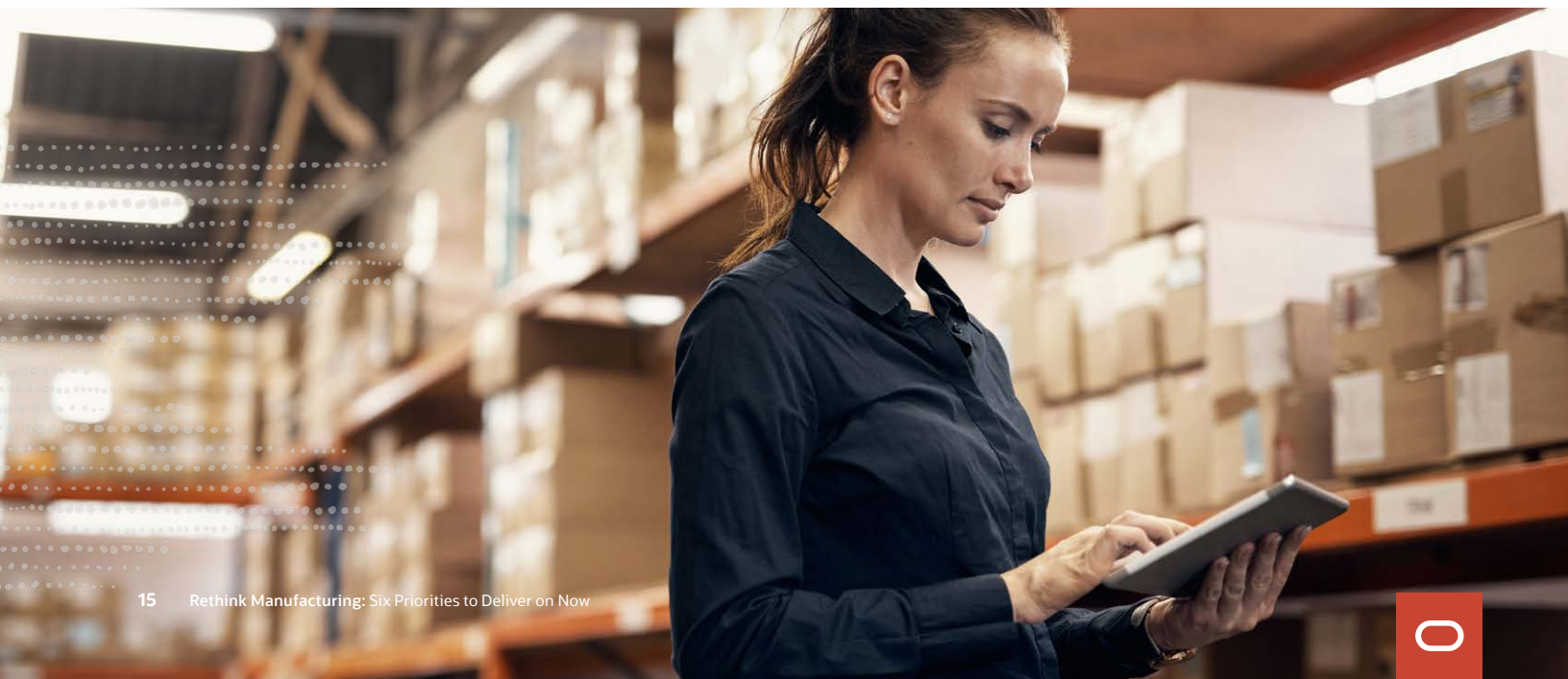


5 Offer anything as a service

If Spotify can sell access to music and Uber access to car rides, manufacturers can sell access to capabilities, not just products. In recent years, makers of automobiles, aircraft engines, software, lighting fixtures, razors, and, well, virtually anything are offering some form of their products or ongoing maintenance of them as a service, charging fixed or usage-based prices, often as a subscription. The global market for this anything-as-a-service model across industries will grow to more than US\$2.3 trillion by 2029, compared with US\$545.35 billion in 2022, Fortune Business Insights projects. Accenture estimates that manufacturers can add 15% to 20% to their services income each year by adopting anything as a service.

For example, the likes of General Motors, Volvo, and Hyundai let customers subscribe to vehicles instead of buying or even leasing them, leaving the maintenance and service to the automaker or dealer. In such a model, automakers or dealers are typically responsible for registration, taxes, driver insurance, roadside assistance, and maintenance as part of the arrangement, and customers can switch to a new car once or twice a month, depending on the service agreement. A 2022 study by Global Market Insights estimates that the global vehicle-as-a-service market will reach US\$30 billion by 2030.

This model gives automakers a more predictable revenue stream (compared to revenues from new car sales), plus additional cross-selling and upselling opportunities. Automakers



US\$30B

**Projected size of the
global vehicle-as-a-service
market by 2030.**

also collect valuable information on customer usage, which helps them improve car models and develop new ones. Such connected relationships can boost customer retention through personalized interactions that lead to greater convenience—for example, proactive maintenance alerts.

At the heart of this business model is the ability to leverage IoT technologies and advanced analytics to collect and analyze data. One major aerospace manufacturer no longer just sells engines to its military and corporate customers; instead, it bills them on an hourly basis for the power the engines produce, offering “thrust as a service.” Such a service wouldn’t be possible without IoT sensors on the engines feeding that thrust data to the manufacturer, which then analyzes it for billing purposes. As for the manufacturer’s airline customers, they no longer need to monitor, maintain, and repair their aircraft engines. The manufacturer handles it all, freeing the airlines to focus on flying and serving customers.

In other manufacturing sectors, anything as a service can include product installation as well as monitoring and maintenance. A manufacturer of welding robots might offer customers a certain number of welds for a set price rather than sell the bot itself.

Moving toward an outcomes-based product portfolio, heavy equipment manufacturer Komatsu offers a Smart Solutions package of mining services. With equipment that can stream more than 60,000 data points per second, the company lets customers remotely pinpoint the location of that equipment, view what operators see, and predict maintenance needs. Johnson Controls offers value as a service by using cloud applications to speed up HVAC service calls. In the medical technology sector, GE’s TruPay offerings include complete care of certain medical equipment, with performance commitments such as 95% uptime.



6 Focus on sustainability

22% of respondents across various industries to a 2021 McKinsey survey said they generated value from sustainability initiatives over the previous five years. “Value” was roughly defined as making business contributions—for example, meeting consumer, investor, or employee expectations. “Sustainability” was defined as practices such as using less water and energy to help sustain ecological balance. Nearly double that percentage (40%) said they expected their companies to generate value from such programs in the five years ahead. In a 2022 Harris Poll survey, 56% of respondents among manufacturers said their companies were taking steps to operate more sustainably, the highest percentage of any industry.

Perhaps more than any other industry, manufacturers need to become more environmentally sustainable. Manufacturing processes use roughly one-quarter to one-third of the world’s energy, according to various estimates. Besides seeking to reduce energy usage, manufacturers are focused on lessening their overall impact on the environment, conserving valuable resources, and balancing the need to remain competitive with the goal of slashing carbon emissions.

Increasingly, manufacturers hold their suppliers to a higher sustainability standard. For example, many automakers now insist that suppliers provide proof of environmental certifications, most commonly ISO 14001, the international standard of effective environmental management. Suppliers lacking this seal of approval are at a competitive disadvantage. In other industries, companies are dangling rewards for suppliers to be sustainable. Grocery retailer Tesco and financial services company Santander offer preferential financing rates to suppliers that meet sustainability goals.

Consumers and activists also expect companies to be sustainable, and the pressure doesn’t just come from climate activists. Millennials and Generation Zers in the workforce are speaking out: Witness the more than 1,100 McKinsey employees, many of them young, who signed an open letter in 2021 urging the company to dial back their work for fossil fuel clients.

Manufacturers are also finding that a greener marketplace is ripe for new products and revenue streams. Comar, a plastic packaging provider, developed a bottle that requires less resin, reducing product cost in the process. Another industry innovation is environmentally friendly pallets, which are used in storage and shipping, then repurposed as coffee tables, seating, and even beds.

Besides boosting productivity, lowering costs, and making the workplace safer, digital automation provides greater visibility into production processes, supply chain activities, and energy usage. For example, underperforming factory machines tend to gobble up energy. By using sensors to monitor production lines, manufacturers are finding ways to reduce energy loads as well as material and water waste.



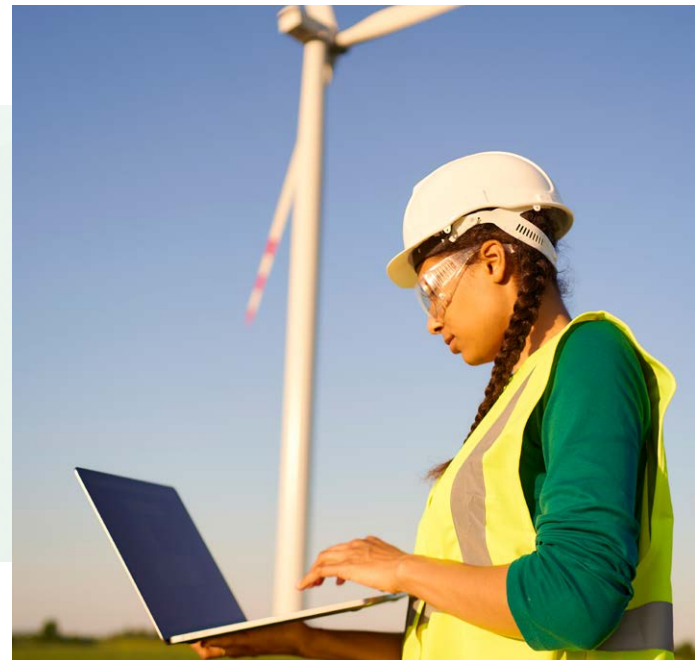
It's no secret that manufacturers' supply chains—including the mining, production, transport, and warehousing of raw materials and components—account for most of their environmental impact. To track and trace materials and goods, companies are starting to use blockchain, which creates a digital ledger of supply chain transactions, shared by companies and suppliers and updated in real time. The ledger becomes a virtual path that partners can use to easily trace environmental practices and labor conditions. Companies can let consumers and other end customers access the same information via QR codes on product labels.



Some companies have even started to explore DNA testing. A cosmetics industry consortium, including L'Oréal Research & Innovation, Laboratoires Clarins, and CODIF Technologie Naturelle, is using a scientific method based on DNA analysis to verify the authenticity and safety of plant raw materials. As it moves forward, the consortium is building the first reliable database of plant resources used in cosmetics, allowing for better control of natural resources.

The shift toward sustainability is a change that companies, dealing with pressures to cut costs in a slower economy, may be tempted to dial down until market conditions improve. But industry insiders agree: Manufacturers that act now to prepare for a greener, highly digitalized, and automated future can have a competitive advantage over those that don't. They can reduce long-term costs, thanks to more efficient technologies and business processes that also support design innovation and new product development. They can manage supply chains that balance labor costs and acceptable levels of risk. These manufacturers can look back and know they made the right decisions, instead of tabling the future and taking the easy way out.

Manufacturing processes use roughly one-quarter to one-third of the world's energy.



How can Oracle help?

Oracle Cloud Applications

More than 2,400 companies choose [Oracle Cloud Supply Chain & Manufacturing](#), an integrated suite of cloud applications, to improve efficiency, reduce risk, and boost quality by digitalizing and automating key activities. Quarterly updates and new releases let manufacturers keep up with the latest technology.

The suite includes the following:

- [Oracle Supply Chain Planning](#) lets manufacturers plan demand, supply, order fulfillment, and production intelligently across their supply chains, collaborating to improve service, reduce disruptions, and minimize costs.
- [Oracle Smart Manufacturing](#) lets companies connect shop floor data with manufacturing, maintenance, and business planning systems. The application uses AI and machine learning to analyze productivity and efficiency, enhance quality, predict machine failure, and respond instantly to trends. It also lets manufacturers manage scheduling and track production, costs, quality control, and maintenance.
- [Oracle Logistics](#) lets manufacturers easily manage sustainable transportation, global trade, and distribution processes to maximize perfect order fulfillment, minimize logistics costs, and adapt to business disruptions and changes in the supply chain. IoT applications enable production monitoring, asset monitoring, and supply chain track and trace.
- [Oracle Cloud Enterprise Resource Planning](#) and [Enterprise Performance Management](#), two integrated suites of financial applications, let companies manage finance, accounting, planning, and budgeting from a single platform, resulting in a faster financial close and smarter use of enterprise resources.



- [**Oracle Advertising and Customer Experience**](#), an integrated suite of customer experience applications, helps manufacturers manage sales, marketing, customer service, and field service. Oracle's [**anything-as-a-service**](#) and [**asset-based service**](#) offerings help manufacturers transition to service-based business models.
- The [**talent management**](#) application in the [**Oracle Cloud Human Capital Management**](#) suite helps manufacturers recruit, hire, train, and retain a high-tech workforce to run the factories of the future.

Oracle Cloud Infrastructure

Manufacturers choose [**Oracle Cloud Infrastructure**](#) (OCI) to vastly improve the performance of applications that boost efficiency, save money, reduce risk, and enhance quality. Companies use OCI to accelerate digitalization, automate supply chains, support smart manufacturing, and move product development workloads to the cloud. According to a study by advisory firm IDC, 53% of OCI customers reduced their total cost of operations while 87% reduced unplanned downtime.

[**Oracle Modern Data Platform**](#) lets manufacturers simplify the end-to-end data lifecycle and gain insights faster. Companies gain greater control over their data with a single platform to collect, curate, and manage all transactional, analytical, and AI and machine learning assets.

- **[Oracle Autonomous Database](#)** lets companies automate database management and make it easy to develop and deploy application workloads, no matter how large, complex, or critical. With machine learning–driven automated tuning, scaling, and patching, Autonomous Database delivers the highest performance, availability, and scalability for OLTP, analytics, batch, and IoT workloads.
- The **[Oracle Analytics platform](#)** supports the entire analytics process—data ingestion and modeling, data preparation and enrichment, and visualization and collaboration—without compromising security and governance. Embedded machine learning and natural language processing technologies help boost productivity and build an analytics-driven culture. Manufacturers also rely on Oracle Fusion Analytics, a suite of prebuilt, cloud native **[analytics applications](#)**.
- **[OCI high performance computing](#)** (HPC) lets companies solve complex mathematical and scientific problems. HPC matches or exceeds the performance of on-premises solutions with the elasticity and consumption-based costs of the cloud.
- The OCI **[DevOps](#)** service lets developers simplify and automate their software development lifecycle. Low-code/no-code tools and cloud environments help DevOps teams and operators collaborate to develop, test, and deploy software.





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