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Rethinking the course to manufacturing's future

Hyper-automation and workforce transformation will define tomorrow's most competitive factories

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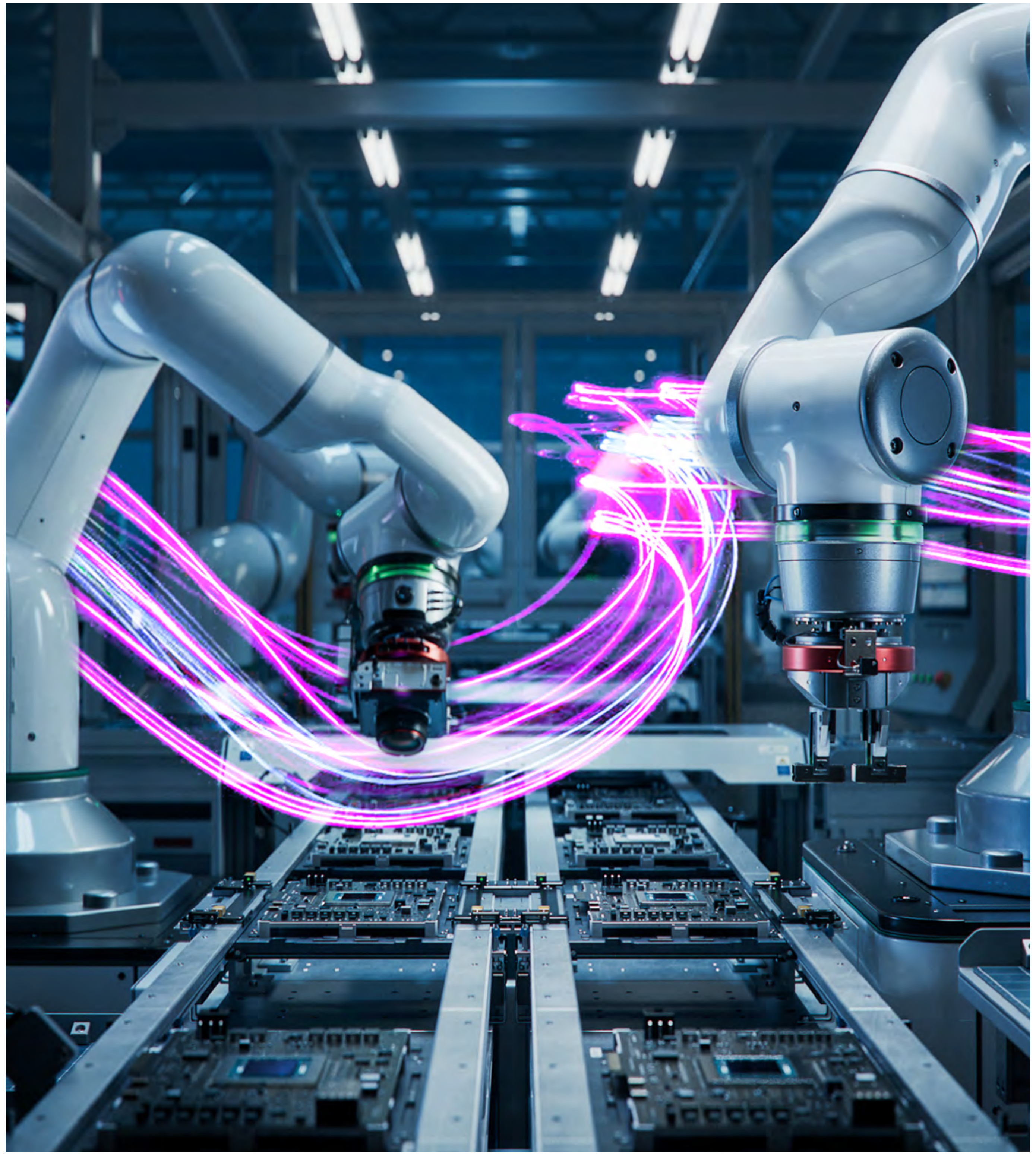
Contents



Today’s opportunity to shape the future of manufacturing

What will the most competitive factories look like in 2040? The answer won’t just be determined by cost efficiency and quality levels; in fact, high marks on both are table stakes. The real differentiators will be flexibility, sustainability and intelligence—qualities that will rest on a factory’s ability to move beyond traditional automation and embrace the seamless convergence of advanced robotics, data, AI and digital tools.

We call that state hyper-automation. It’s a viable goal—in fact, it’s the inevitable competitive path, according to the 552 factory managers who recently participated in Accenture’s in-depth, global survey (see box, “Our Methodology,” for detail). However, getting there won’t be easy, as most factories face a battery of challenges, including workforce shortages, complex brownfield environments and slow adoption of AI-driven processes.

To outline the best path forward, we drew on our survey findings, coupled with our own client experience. Since the usual planning period for factories in our surveyed industries is about five to seven years, anything beyond that is generally thought of as a “vision.” Taking the vision of 2040 articulated by our survey respondents as our starting point, we set out to close the gap between what’s in their sights in the next five to seven years, and what’s beyond in terms of planning and actions.

This report follows that structure. The first major section articulates the 2040 vision—what the factory of the future could look like. Subsequently, it outlines guardrails for the steps that factory managers need to take across four areas: **Workforce**, **Automation**, **AI optimization** and **Digitalization**. In each, the key is balancing near-term efforts with the foundational needs for the factory of the future.

Our Methodology

Accenture surveyed 552 experienced factory managers and engaged 15 heads of production in detailed qualitative interviews between August and December 2024. Those taking part in the survey and research represented automotive manufacturers, automotive suppliers, industrial machinery manufacturers, industrial equipment manufacturers, electrical equipment manufacturers, heavy equipment manufacturers, commercial aerospace manufacturers and commercial aerospace suppliers. The research covered factories ranging in scale from 100 workers to more than 5,000, and from locations in the US, Europe, China, India and Japan.

We focused our research on factory managers because of their vantage point and because they are the ultimate arbiters of whether their vision of the future will become a reality. These individuals are responsible for informing strategic corporate decisions and for translating those decisions into real-world operations.

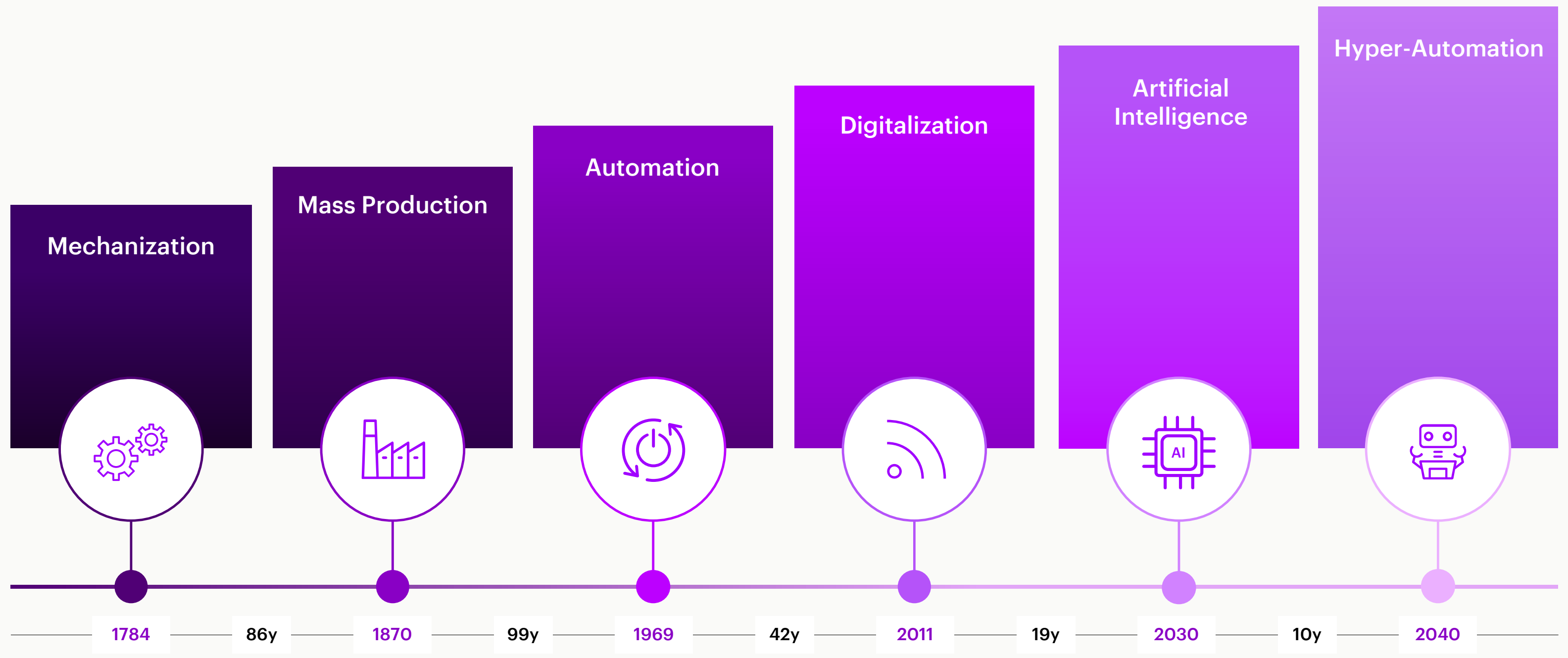
Company examples that are not sourced are based on Accenture client experience.

The 2040 vision: hyper-automated factories

The transformation of the manufacturing landscape began in the era of mechanization more than 200 years ago. The driver? Technological advances. And in that respect, nothing has changed Through mass production, automation (which we now see as limited automation), digitalization and now AI, technology has been the driving force behind revolutionary change.

What's different now is that the speed of change has accelerated. Now, even as companies are adopting AI and figuring out how to deploy it to their advantage in today's factories, they must think ahead to the next revolution, which is already in its nascent stages (see Figure 1). That means planning for and addressing all attendant considerations—including technology and talent investments—and the digital core, the critical technology capability that drives continuous reinvention. This is essential for supporting their factories over the next five years while laying the foundation for the next 15.

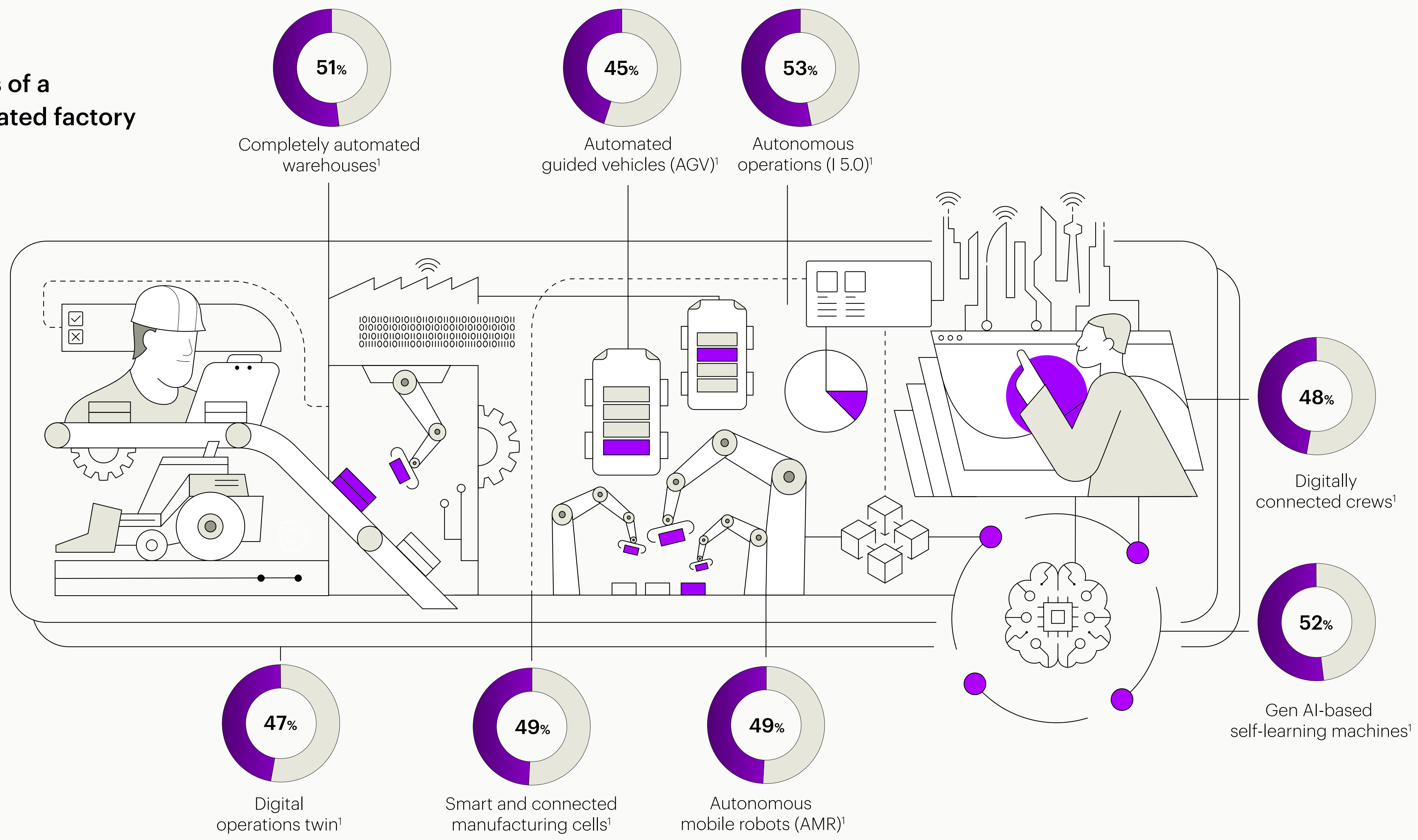
Figure 1:
Even as today's manufacturing revolution takes shape—enabled by early forays into gen AI—the next wave of factory technology adoption is beginning



Source: Accenture

By 2040, if companies do this, their factories will look stunningly different than they do now. They will be self-optimizing and AI-driven, seamlessly integrating robotics, digital twins and human oversight into an intelligent and **hyper-automated** production ecosystem. As such, they will be able to do much more than execute processes at scale. They will also anticipate disruptions, adapt dynamically and optimize production, with near-complete autonomy, in real time (see Figure 2).

Figure 2:
Key elements of a hyper-automated factory



Note 1: Percentage of factory managers who rated these elements as an "8, 9, or 10" on a scale from 1 to 10, with 1 meaning "very unlikely" and 10 meaning "extremely likely' to be implemented by 2040. N=552; the full hypotheses formulation can be found on Page 26.
Source: Accenture Research analysis

Broadly speaking, the enablers of the hyper-automated factory sort into four areas: workforce, automation, AI-driven optimization and digitalization. Factory managers understand these enablers well. The challenge is turning that understanding into actions that serve them well in the current environment and also support their longer-term vision, especially given that volatility and uncertainty will certainly compound by 2040. Doing this will require rethinking how factories operate, how technology is deployed, and how people and machines work together. It will require taking bold steps now to reskill the workforce, scale intelligent automation, embed AI into decision-making, and fully embrace digitalization as the backbone of modern manufacturing.

WHAT'S NEEDED NOW:

Workforce transformation to preserve and augment critical knowledge

A significant majority (70%) of the factory managers that Accenture surveyed consider workforce transformation as the most critical factor for success. They're right. The talent pool for manufacturers is rapidly shrinking. Experienced workers are approaching and entering retirement. And demographic changes, along with younger talent showing less and less inclination to pursue careers in manufacturing, are limiting the supply of new workers. In the US alone, for instance, analysts estimate that by 2033, there will be a manufacturing skills gap equivalent to 3.8 million jobs.[1]

No wonder then that factory managers rate knowledge management, embedding data analytics into daily workflows and enabling data-driven decision-making as their top focus areas.

These activities are already key to AI-driven change, and they will also be critical to realizing the 2040 vision. Yet executing on them is proving extremely challenging. One issue? The cost of training. Almost half (49%) of our survey respondents consider the investment in training as a major hurdle. Yet investing in training people is the only way to realize the full benefits of the technology.

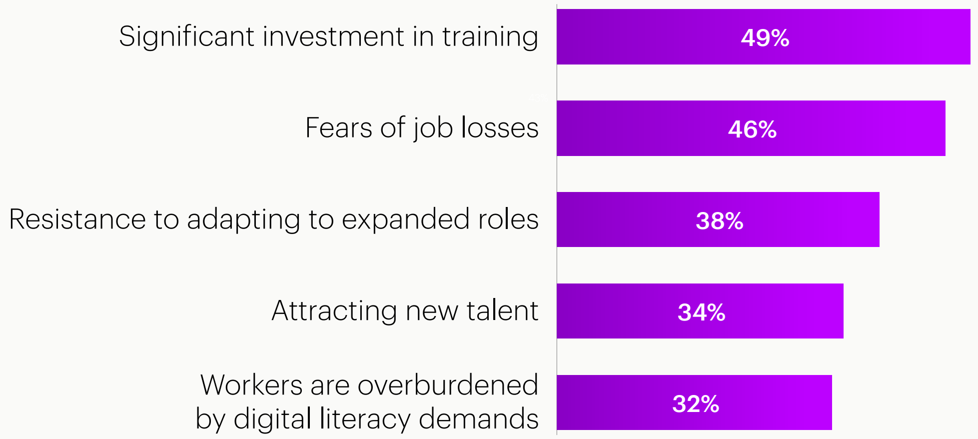
Another issue? Employee engagement. Accenture's global 2024 study on change found, 70% of employees don't feel engaged in organizational change.[2] In part, that's because they lack an understanding of how their work contributes to the future. But it also correlates to the fear that in helping the company implement new technologies, they are working themselves out of a job. Despite the looming skills gap, almost half (46%) of our survey respondents said workers worry that as automation expands, their assembly line roles will become obsolete. Figure 3 shows factory managers' top priorities for success in the near-term (five years out), and their top barriers. It's critical that companies address the barriers now, not only for the near-term but also for the 2040 vision. Factories ***will*** need a highly skilled workforce, albeit skilled differently.

So, companies need to identify and communicate future employment opportunities now, and provide pathways to those opportunities. Moreover, they will need to set up a new model for talent development that supports continuous, real-time training. Most of the factory workforce of the future will move away from working ***in*** production towards working ***for*** production, which means they will move from manual labor to process oversight, decision-making and optimization. These individuals must also engage in a cycle whereby they both learn from and with AI and teach AI, as the nature of the work evolves. They will need to be comfortable collaborating with AI, operating autonomous systems and overseeing complex automation processes.

Figure 3:
Factory managers' near-term priorities and limitations regarding workforce transformation

Top 5 prioritized workforce transformation measures[1]

Top 5 limitations of workforce transformation measures[2]



Note 1: Percentage of factory managers who rated "8, 9 or 10" on a scale from 1 to 10, with (1) standing for "not at all important" and (10) for "extremely important". N=552
Note 2: Percentage of factory managers who selected a specific limitation
Source: Accenture Research analysis

Take production operations. The jobs of the future will likely include hyper-automation system integrators and digital process orchestrators. People will need to oversee de-centralized, AI-driven production networks, optimize real-time processes, and troubleshoot integration issues. Another emerging position: The AI-supported robotics engineer. This person will design and maintain AI-driven robotic machines and assembly lines.

Meanwhile, in quality control and assurance, jobs will likely include quality intelligence specialists, who use AI-driven analytics, Internet of Things (IoT)-sensors and real-time monitoring to ensure product integrity, compliance, and process optimization. Figure 4 shows a variety of jobs and responsibilities as we envision them now across these areas as well as maintenance, repair and overhaul.

Also needed: a range of logistics and supply chain, and strategic management and IT integration roles, calling for skills including strategic planning, AI optimization, blockchain, real-time data analytics, network coordination, cybersecurity and digital transformation. And these roles, too, will evolve.

One company exhibiting the kind of future focus needed to achieve the 2040 vision? UK-based automaker JLR, holding company of Jaguar Land Rover. JLR has committed to investing $25 million annually to help employees in production roles gain the new technology skills and capabilities they'll need to pivot to new roles in the future.[3]

Now is a pivotal time to think differently about the future of work and the workforce.

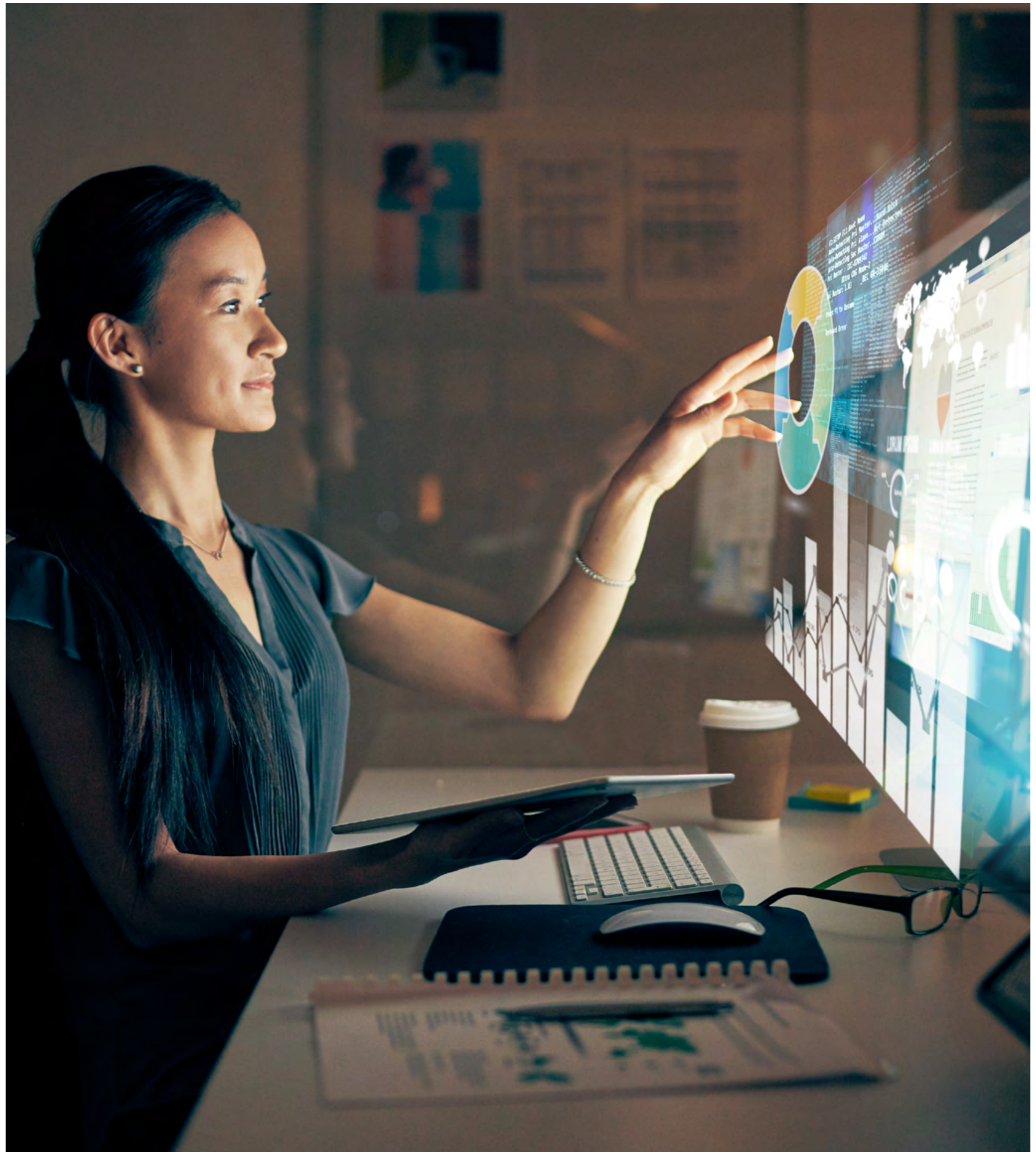


Figure 4:
A sample set of job profiles and key skills needed in the hyper-automated factory

Category	Production Operations	Quality Control & Assurance	Maintenance, Repair, Overhaul	Logistics & Supply Chain	Management & IT Integration
Future job profiles	**Hyper-automation System Integrators & Digital Process Orchestrators:** Oversee decentralized, AI-driven production networks, optimize real-time performance, and troubleshoot integration issues. **AI-powered Robotics Engineer:** Designs and maintains AI-driven robotic machines and assembly lines. **Cyber-Physical Systems Specialist:** Integrates and manages smart factory IoT and digital twins. **Human-Robot Collaboration Manager:** Develops protocols for human and machine co-working environments. **Bionic Enhancement Specialist:** Develops AI-powered exosuits for enhanced worker capabilities. **AI-driven Production Planner:** Ensure seamless coordination of manufacturing processes using AI-driven production scheduling and real-time optimization.	**Quality Intelligence Specialists:** Use AI-driven analytics, IoT sensors, and real-time monitoring to ensure product integrity, compliance, and process optimization. **Cyber-Physical Systems Specialist:** Integrates sensor networks, digital twins, and AI-based decision-making to automate quality control across production lines. **Autonomous Quality Control Inspector:** Manages AI-powered machine vision systems that detect microscopic defects in products at ultra-high speeds. **Predictive Quality Analyst:** Develops and implements predictive analytics models to forecast potential failures before they occur, preventing defective outputs.	**Smart Maintenance Specialists:** Use real-time IoT data and predictive diagnostics to manage system health and prevent issues. **Cyber-Physical Systems Specialist:** Develops predictive maintenance systems for industrial automation. **Augmented Reality (AR) Maintenance Technician:** Conducts virtual troubleshooting and machine learning-based maintenance.	**Digital Logistics Specialists:** Manage autonomous warehousing, AI-driven supply chains, and blockchain-optimized distribution. **Autonomous Logistics Coordinator:** Optimizes self-driving factory logistics and warehouse automation.	**Digital Transformation Executives:** Drive hyper-automation, IT integration, cybersecurity, and continuous innovation. **Factory Cybersecurity Specialist:** Secures factory data networks and implements cybersecurity for automation infrastructure. **Holographic Interface Designer:** Creates holographic dashboards for production monitoring and develops real-time interactive factory control systems. **Real-time Production Optimization Engineer:** Responsible for continuously monitoring and improving automated production processes to maximize efficiency, minimize waste, and enhance Overall Equipment Effectiveness (OEE).
Key Skills & Drivers	• AI-based process optimization • Robotics integration • Real-time monitoring • Systems troubleshooting	• Advanced analytics • IoT sensor integration • Predictive quality control • Audit management	• Predictive MRO analytics • IoT diagnostics • Remote monitoring • Automation troubleshooting	• Autonomous logistics • AI optimization • Blockchain • Real-time data analytics • Network coordination	• Strategic leadership • IT integration • Cybersecurity • Digital transformation • Innovation management

Source: Accenture Research Analysis

WHAT'S NEEDED NOW:

Automation to unlock efficiency and precision

A significant majority (63%) of factory managers are prioritizing automation in the mid-term, which is not surprising given the immediate opportunities that automation offers to improve efficiency and reduce costs. However, only about 60% of the factory managers are ***also*** prioritizing key innovations such as autonomous guided vehicles (AGVs), transforming intralogistics and material handling and autonomous mobile robots (AMRs), which they will need to fulfill their 2040 vision. Indeed, despite their 2040 vision, just 38% are targeting the hyper-automated factory as their preferred concept when building new units. The vast majority are prioritizing lesser goals, such as automated warehouses, synchronized in real time with manufacturing processes. All together, this data reveals a significant conflict between today’s priorities and 2040’s competitive needs.

Figure 5 illustrates this conflict. From left to right, it shows traditional factories, what factory managers can achieve by focusing on near-term gains, and two types of hyper-automated factories: brownfield and greenfield. The higher the degree of advancement, the better the factory will be able to secure resilient, sustainable, and profitable manufacturing in the future. The graphic uses pluses (+) to represent performance levels, from basic (+) to excellent (++++), with excellent representing future-readiness.

Figure 5:
The hyper-automation advantage

KPI	Traditional factory	Optimized human-integrated factory	Hyper-automated brownfield factory	Hyper-automated greenfield factory
Description	A production model relying primarily on human labor with minimal integration of automated systems. Operations are manually driven, with workers performing tasks.	A hybrid approach where automation is integrated into workflows to complement human roles. Automation handles most repetitive tasks, while humans focus on oversight and complex decision-making.	An existing factory upgraded with AI and humanoid robots. Automation is introduced into pre-existing infrastructures, enabling a mix of legacy systems and modern technologies.	A facility/line built specifically for hyper automation, leveraging advanced AI systems. The design incorporates Design for Manufacturing principles, with all processes optimized for autonomous operations.
Automation level	10% - 30%	50% - 70%	up to 100%	up to 100%
Flexibility	++++	++	+++	++++
Productivity	+	++	+++	++++
Quality	+	++	+++	++++
Cost efficiency	+	++	++++	++++
Investment	$	$$	$$$	$$$$

Source: Accenture Research

It's time for companies to align vision with action, beginning by scoping out in more detail their journey to the factory of the future.. To that end, we have identified five key models on which a hyper-automated factory might be based:

The mass factory: Fully automated and fully digitized production lines, which create highly standardized products in mass with little or no variation.

The modular factory: Fixed production line equipped with independent, interchangeable AMR modules that seamlessly adapt to efficiently manufacture partially tailored products with maximum throughput.

The matrix factory: Production takes place in flexible, independent cells, allowing multiple production paths instead of a fixed sequence, which reduces bottlenecks and enables production of customized products without needing to redesign the factory.

The machine-to-product factory: Highly relevant model for large dimensional products—here, specialized AMRs and humanoid robots converge to work on the assembly of a single product on site.

The workshop factory: Produces highly customized products in small batches or even lot-size one; characterized by flexible, workshop-style production processes accelerated through advanced automation and humanoid robots.

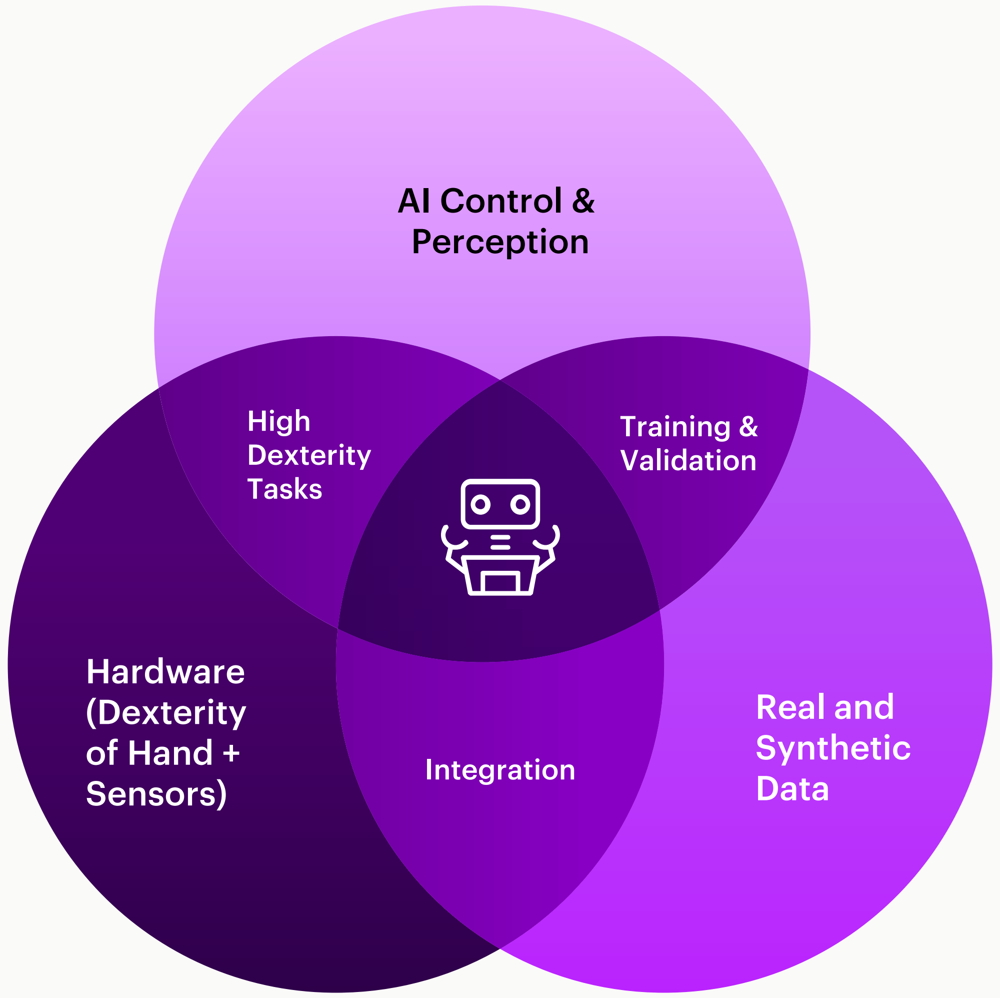
Ultimately, the nature and variability of products and the extent of customization will drive a company's choice of model. In any case though, selecting the right path means first determining whether transforming existing facilities (brownfield approach) or investing in new factories (greenfield approach) will offer the most economically viable approach. And in all cases, while a factory floor could be fully automated, people will continue to play critical roles (just now emerging) in orchestrating, overseeing, supporting and maintaining its operations.

Consider: It will likely prove more cost-effective to upgrade and retrofit established infrastructures with well-maintained facilities using AI and humanoid robots, rather than building entirely new production lines from scratch. In fact, early adopters in the automotive industry are already testing humanoid robots' potential, with positive results. Several automotive OEMs in China have achieved near-100% automation in their body shops using humanoid robots. NIO[4] has 300 robots—operated by only a dozen workers—and is able to produce 20 vehicles per hour. Xpeng[5] Motors has 264 intelligent industrial robots working fully autonomously across its stamping, welding, painting, assembly and battery-pack production workshops.

Meanwhile BMW[6] deployed a humanoid robot called "Figure 02" at its Spartanburg plant, after which the company reported a 400% boost in efficiency. And Schaeffler[7] has invested in Agility Robotics and sees the potential to deploy its Digit humanoid robots across its global manufacturing network of 100 plants by 2030 to automate tasks physically demanding, repetitive or hazardous. (Figure 6 illustrates the growing capabilities of humanoid robots.)

Challenges such as speed, cost, and integration complexity remain, and currently, fewer than half of our survey respondents (43%) overall, see humanoid robots becoming a cost-efficient standard in assembly. However, among respondents in large factories, that figure jumps to 58%. And it's interesting to note that these views vary geographically, with 63% managers in India, 65% in China and 72% in Japan considering humanoid robots valuable for manufacturing assembly lines, compared to 35% in US and 21% in Europe. Ultimately, humanoid robots have significant potential to become a staple of mainstream manufacturing.

Figure 6:
Humanoid robots' growing capabilities



Source: Accenture

WHAT'S NEEDED NOW:

AI-driven optimization to advance from assistance to autonomy

A sizeable number (62%) of factory managers consider AI as a key enabler for all aspects of factory operations. In the near term, however, most are prioritizing maintenance, repair and overhaul (MRO) processes, logistics optimization and production efficiencies (see Figure 7). This makes sense—if they only needed to prepare their factories to thrive in the next few years. AI-powered predictive maintenance can eliminate machine defects before they occur, optimize MRO scheduling to minimize production disruptions and extend the lifespan of equipment. AI-driven logistics solutions can help manufacturers anticipate demand fluctuations, prevent supply chain disruptions and optimize inventory management.

But soon, factory operations will be all about flexibility, agility and speed of adaptability, alongside efficiency and will require AI to link machines autonomously and prioritize tasks to distribute workloads and create optimal work sequences. The factory operation´s predictive analytics-based processes will monitor sensor and visual data, thereby automating maintenance schedules and quality checks by pre-emptively detecting / forecasting equipment malfunctions and product defects.

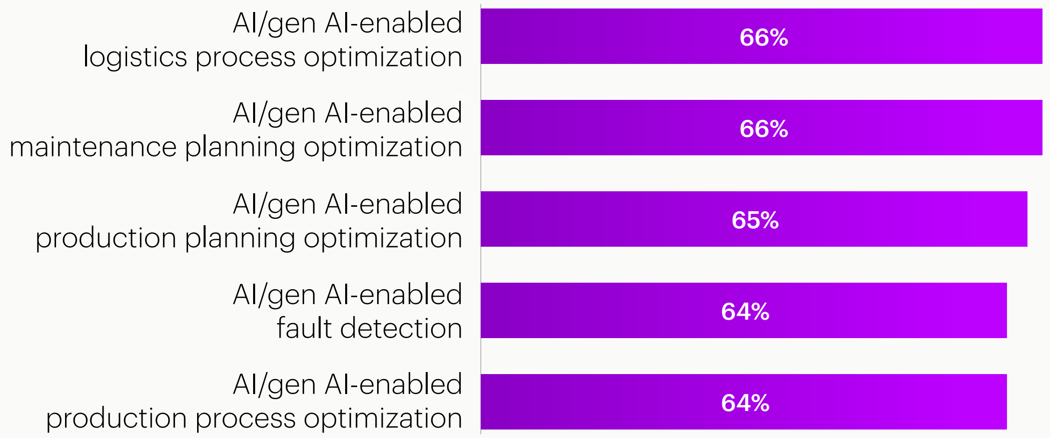
To make that shift, factory managers will need to ramp up their AI use. And yet, 38% of factory managers are still hesitant about applying gen AI in their factories. What's driving their reluctance? Lingering mistrust and the need for more awareness about how effective this technology can be in manufacturing are a few of the reasons. But poor and inconsistent data quality is the main cause.

Factory managers need reliable data to drive real-time analytics and AI-driven insights; without it, factories can't be proactive. So to build the factory of 2040, factory managers need to focus on data now. They need to strengthen the company's digital core so that it can support better data gathering, integration and use. For example, they need to be sure they can deploy edge computing and industrial IoT (IIoT) to process data directly on the factory floor, enabling immediate process adjustments to prevent quality defects, optimize workflows and improve cycle times.

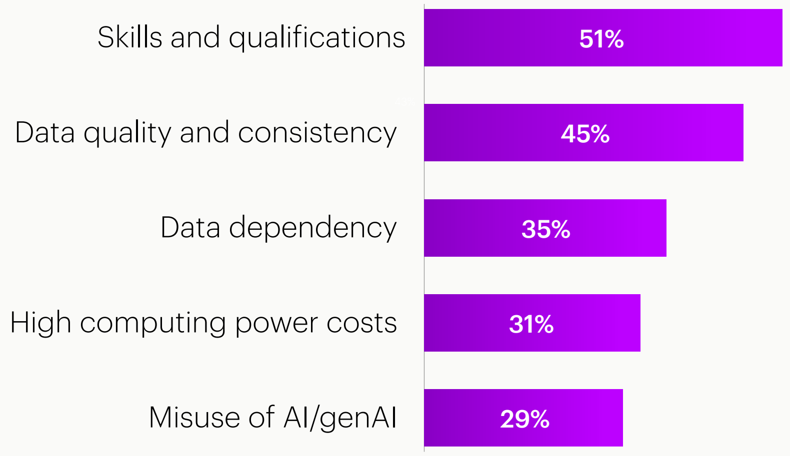
Figure 7:

Factory managers' AI/Gen AI near-term priorities and limitations

Top 5 prioritized AI/gen AI transformation measures[1]



Top 5 limitations of AI/gen AI transformation measures[2]



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Note 2: Percentage of factory managers who selected a specific limitation

Source: Accenture Research analysis

The impact: AI-driven simulation models that predict demand fluctuations and risks such as bottlenecks or delays, enabling companies to adjust production capacities and synchronize supply chains accordingly. More than half (53%) of factory managers have already predicted this will happen; now it's a matter of making it so.

Leading names in the manufacturing space have already embarked on the journey. KION[9], for example, is collaborating with Accenture and NVIDIA to optimize supply chain efficiency by integrating advanced AI, robotics, and digital twin technologies—allowing companies both define ideal set-ups for new warehouses and continuously enhance existing facilities. At the center of this shift is physical AI, which simulates real-world behaviors to improve the performance of intelligent warehouses that operate with automated forklifts, smart cameras and the latest automation and robotics solutions. Using Mega, an NVIDIA Omniverse blueprint for large-scale industrial digital twins, KION can create virtual warehouse models to experiment with fleet configurations, automation strategies and workflow optimizations before making physical changes.

And this system is more than just a simulation tool. It is also training warehouse robots to handle fluctuating demand, shifting inventory and evolving layouts. The next phase will integrate vision-language AI, allowing cameras and sensors to provide real-time insights—reducing bottlenecks, improving safety, and enhancing overall efficiency.

In doing so, this system signals a broader shift: AI is no longer just supporting automation; it is becoming the intelligence layer that governs industrial operations. For each factory function, companies will need to rely on specialized co-pilots—intelligent agents which will be responsible for specific tasks of the factory. Some will focus on quality control, instantly flagging defects. Others will manage supply chain coordination, ensuring that materials arrive just in time.

These AI agents will pull insights from industrial "brains"—knowledge hubs that combine internal factory data with real-time external insights, such as market demand or supplier disruptions—embodying the concept of 'cognitive digital brains' outlined in Accenture´s Technology Vision 2025, where AI-driven intelligence transforms decision-making and operations.[10]

And as factories adopt this multi-agent approach, factory managers will need to manage and integrate diverse groups of different agents; in fact, doing so will be a critical skill for factory managers and workers alike. Concurrently, companies will also need to develop a multi-agent AI architecture where different AI agents, such as utility agents (which perform routine and high-frequency tasks) and super agents (which combine multiple functions), work together on specific factory operations.[11] They will also need to develop AI orchestration models that enable these co-pilots to collaborate and share insights.

For this, they'll have to train their AI models to absorb both internal data and external insights—one way of doing this would be by redefining work roles where workers would be upskilled to enable them to shift from manual operations to supervising AI agents, troubleshooting system inefficiencies and optimizing AI-driven workflows.

Ultimately, it will boil down to ensuring that AI, digital infrastructure and a skilled workforce operate as a unified system—where real-time data flows seamlessly across machines, AI co-pilots and human supervisors.

WHAT'S NEEDED NOW:

Digitalization to set the foundation for the factory of the future

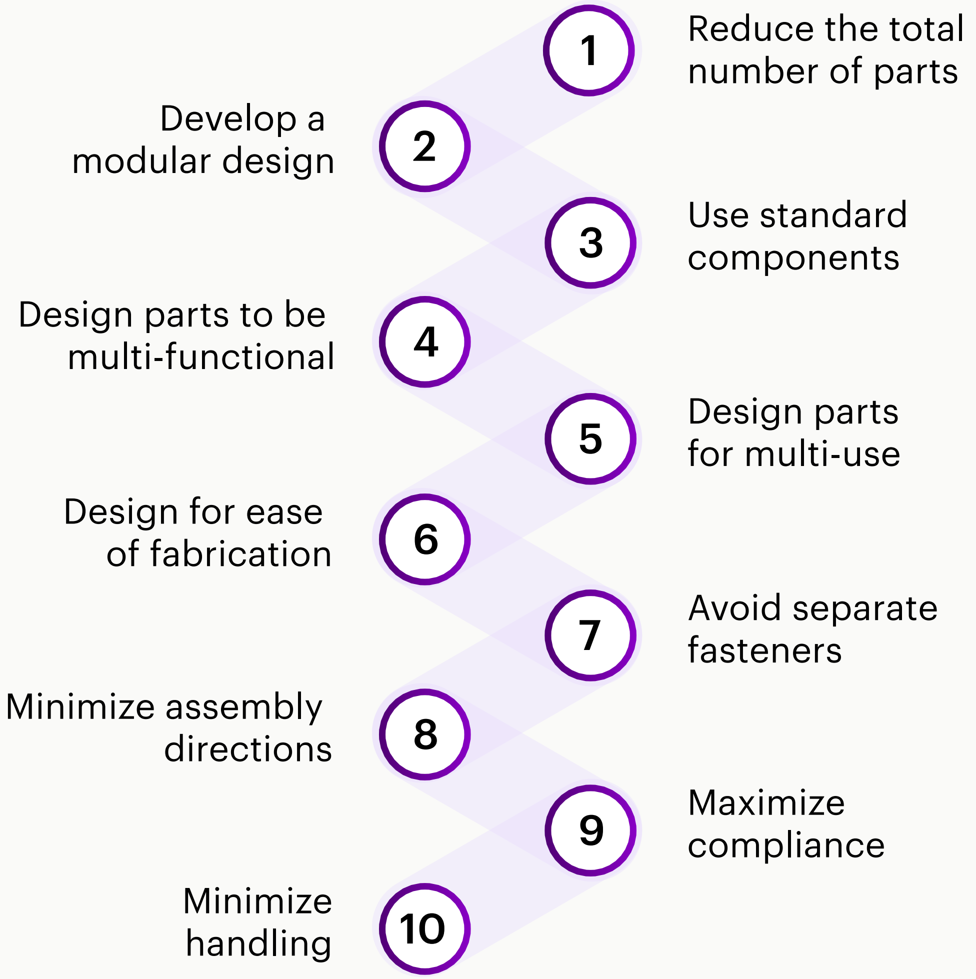
Digitalization is the foundation for the hyper-automated factory. And yet, our survey found that a majority of factory managers are still focusing on digitalization measures that should, arguably, already be in place. By far their highest priorities are cybersecurity measures (77%), followed by the implementation of manufacturing execution systems (70%) and cloud platforms, an indication that the manufacturing landscape features very low in terms of digital maturity.

What's worrisome is that critical capabilities of the factory of the future such as digital twins of machines and products, IIoT or even edge computing are not key priorities for nearly half of the factory managers surveyed. Yet these technologies are the digital foundations of the modern factory due to their ability to simulate, analyze and optimize production systems in a virtual environment. Their absence creates siloes, keeping design from production, and limiting simulation-driven decision-making and agility.

In the first instance, then, factory managers need to focus on developing a strong digital core that supports digital twins, IIoT, edge computing and the like. Only on an improved core can a company successfully dissolve those silos and enable advanced Design for Manufacturing (DfM) capabilities that integrate manufacturing considerations more fully at the design phase of a product, thereby reducing complexity, waste and production costs. (See Figure 8).

Additionally, transitioning from forecast-based production planning to demand-driven manufacturing will be crucial for factories to adapt dynamically to demand fluctuations, supply chain disruptions, and operational constraints. Factory managers know this—over half of our respondents said they believe demand-driven manufacturing will replace traditional, forecast-based production planning, a figure that increased to 62% among respondents representing larger factories. The transition to dynamic, event-driven systems that can continuously optimize operations will be a boon. But attention to the digital core needs to come first.

Figure 8:
DfM guidelines



Source: Accenture

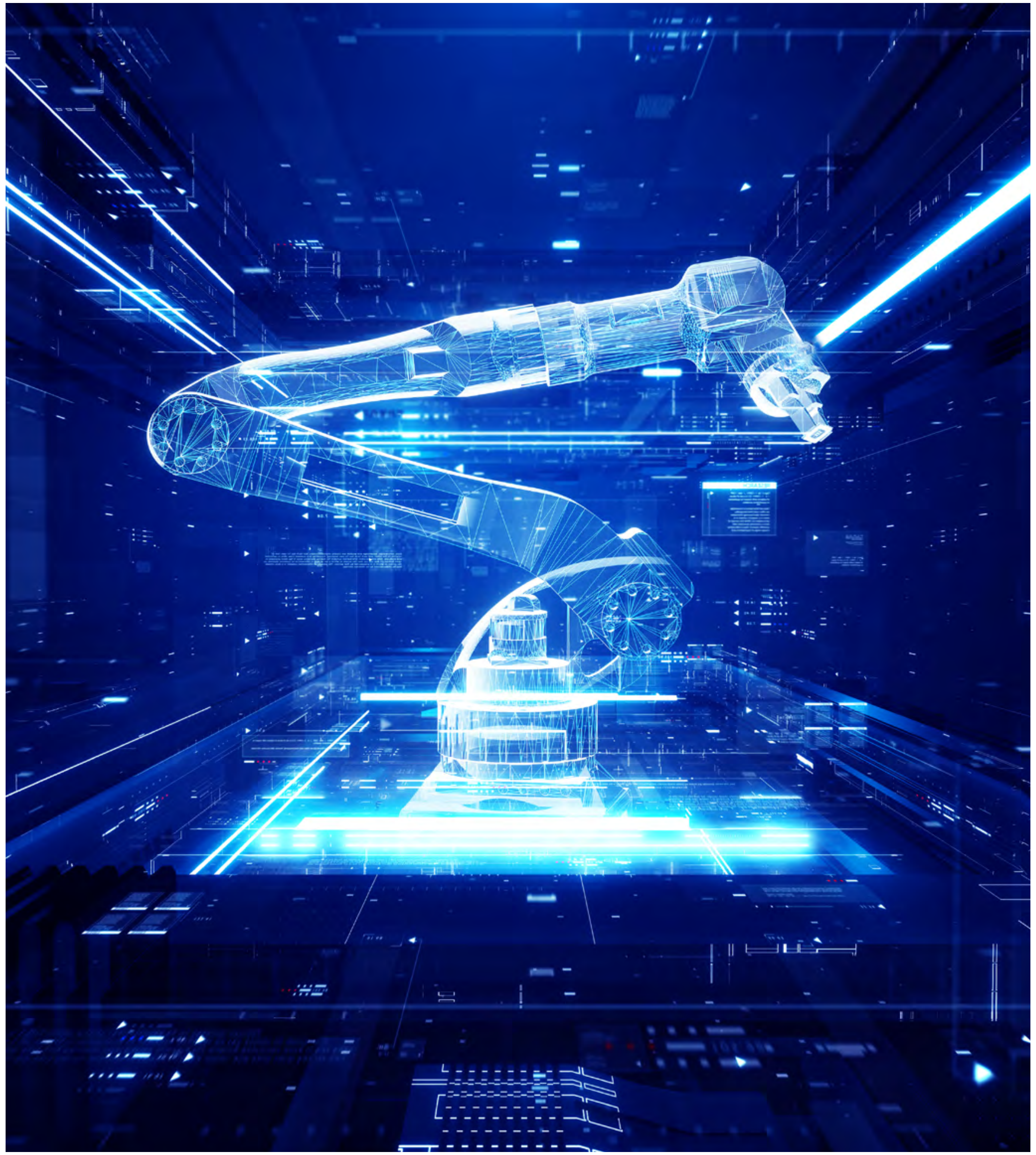
Ultimately, achieving this level of real-time adaptability demands a fundamental rethink of how manufacturing systems are structured and integrated. And the current traditional monolithic Manufacturing Execution Systems (MES) are struggling to keep up with this high-speed, high-variability environment. These legacy systems were built for linear production models—not for factories that need to reconfigure on the fly.

And because demand-driven manufacturing is only as powerful as the systems that support it, companies will need to move toward event-sourcing microservices—a more modular, scalable software architecture where manufacturing operations are broken down into small, independent services that communicate and function together. This allows production lines to adapt instantly to changes in demand, and supply chain conditions.

Another critical element: 3D models that enable precise automation, real-time adaptability and seamless human-robot collaboration. They allow robots to execute tasks with exact dimensions, optimize movements and simulate workflows before deployment—reducing errors and manual reprogramming. These models also enhance quality control, adaptive production planning and scalability, ensuring consistent execution across multiple facilities with minimal adjustments.

The next step: scaling digital twins beyond isolated pilots and integrating them across factory ecosystems. By creating real-time digital replicas of manufacturing environments, digital twins take DfM principles beyond the design phase and into active production. They allow manufacturers to simulate, monitor, and optimize factory operations—continuously adjusting production workflows based on live data. Companies like BMW[12] (with its 'iFactory') and Mercedes-Benz[13] (with its 'Digital First' initiative) are already leveraging digital twins to ensure production agility, reduce downtime and optimize energy efficiency.

In the AI-powered factories of 2040, these technologies won't be separate steps—they will function as a seamless, interconnected ecosystem, where design, simulation and production operate as a continuous feedback loop.



Three “next steps” to enable a fully digital, adaptive ecosystem

A structured approach can help managers transform their factory operations. It should start with orchestrating technologies and teams, move through virtualization to enable real-time simulation, and end with closing the loop—where data continuously refines and optimizes production.

Orchestration

Orchestration will be key as factories integrate a growing mix of software, chips and hardware. Managing this complexity requires not just advanced systems but seamless collaboration across engineering, IT and production teams. Investing in cross-functional data platforms is a good way to do that as these platforms help ensure smooth communication between digital and physical operations.

Virtualization

Virtualization will drive the next level of flexibility. Digital twins of parts, systems and entire production lines will allow manufacturers to simulate, test and refine operations before making real-world changes.

Closing the loop

Closing the loop is the final step. Future-ready factories won’t just collect data—they’ll act on it. By continuously feeding real-time insights back into design, production and aftersales, manufacturers can eliminate inefficiencies, improve quality and accelerate innovation. Breaking down silos and ensuring full-cycle data flow will be critical to achieving self-optimizing, hyper-efficient production ecosystems.

Renault's move to re-engineer manufacturing for the future

Renault offers an example of a company that is taking purposeful steps now to thrive in the future. Faced with rising competition from manufacturers in Asia-Pacific and ongoing cost volatility, Renault set an ambitious goal: cut production costs by 30-50%,[14] reduce energy consumption per vehicle produced by 40%[15] and transition from legacy systems to fully data-driven manufacturing. The company also aimed to achieve approximately €300+ million in savings by 2026.[16]

To achieve this, the company developed and implemented a manufacturing efficiency program. The plan was to deploy industrial digital twins across its factories, creating a real-time virtual replica of its entire production ecosystem—including workflows, machinery, and logistics operations. The initiative also introduced AI-driven operations control, carbon traceability and predictive quality management.

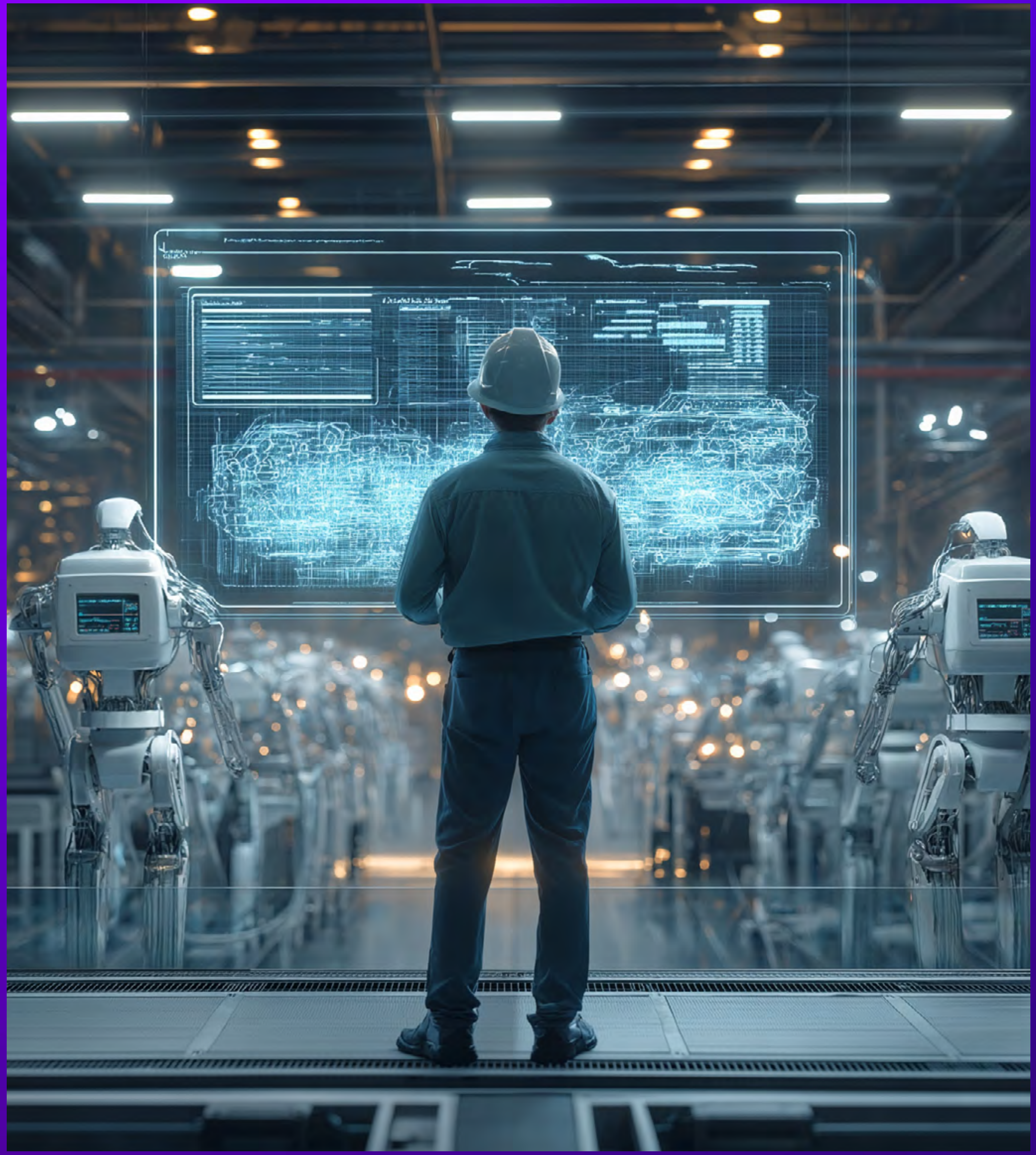
The impact has been immediate. Renault has already reduced energy consumption per vehicle produced by 20%.[15] At the same time, production time has dropped by 40%, marking a major leap in efficiency and responsiveness.[17]

Conclusion:
From managing to orchestrating

By 2040, the most advanced factories won't be managed—they will be orchestrated. AI will govern production in real time, digital twins will model every decision before execution and humanoid robots will adapt without human intervention. Manufacturing will shift from forecast-driven to fully autonomous, demand-responsive ecosystems.

Static production lines will be a thing of the past. Factories will self-optimize, self-correct and self-learn, ensuring seamless coordination across supply chains, production networks and customer demands. The manufacturers of 2040 won't be debating automation, AI or digitalization—those will be the baseline. The real competitive edge will come from how seamlessly companies integrate and scale these technologies into a unified, intelligent system.

This future isn't speculative—it's already emerging. The factories of tomorrow won't wait for decisions. They will make them. The only choice left for manufacturers today is whether they will design this future—or be forced to adapt to it.



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About the Research

Accenture employed a focused two-phase research approach for this study. First, from August to September 2024, we conducted 15 in-depth interviews with heads of production from leading automotive, industrial, and aerospace companies. These conversations explored how executives define their company-specific manufacturing target picture and the strategic pillars that support it.

Building on those insights, we launched a quantitative questionnaire-based survey between October and December 2024, reaching 552 factory managers across core manufacturing hubs in Asia (China, Japan, India), Europe (Germany, Italy, France, Austria, Sweden, Denmark, Finland and Switzerland), and the U.S. The survey captured their views on key manufacturing principles, transformation enablers, planned implementation measures, envisioned limitations, and a hypothesis-driven outlook for manufacturing's future through 2040 (see sample hypotheses below). Participants represented a wide spectrum of factories—from 100 to over 5,000 workers—spanning industries such as automotive, industrial machinery, electrical and heavy equipment, and commercial aerospace.

By engaging both, manufacturing executives and factory managers, we gained a dual perspective—combining long-term vision with operational reality—on how the future of manufacturing is being shaped.

Full hypotheses formulation of Figure 2 (rated on a scale from 1 to 10):

By 2040, Industry 5.0 will mark the new phase in which Digital Manufacturing is progressing toward autonomous operations based on the foundation of contextualized end-to-end information, simulation, AI optimization and GenAI.

By 2040, our company will have replaced all worker-operated material handling equipment by Automated Guided Vehicles (AGVs), enabling intelligent and autonomously operated inbound-logistics.

By 2040, our company will leverage industrial robots and autonomous mobile robots (AMRs) grouped in intelligent and smart robot shops which will handle the majority of our manufacturing processes autonomously.

By 2040, our workforce will work in digitally Connected Crews which seamlessly collaborate between different functions in the industrial metaverse.

By 2040, GenAI will see large-scale adoption in our company's factories, enabling self-learning machines, intelligent human-machine interactions, and real-time optimization of operational efficiency and workforce utilization.

By 2040, our company will have implemented the Digital Operations Twin to integrate virtual and physical manufacturing and merging product, process, and real-time data to provide actionable insights.

By 2040, smart and connected Manufacturing Cells will have replaced the majority in linear manufacturing processes, enabling industrialized production of hyper-customized products in a highly flexible and efficient manner.

By 2040, our company's warehouses will be fully automated and digitized Dark Warehouses, synchronized with our manufacturing processes in real-time and seamlessly integrated into our factories.

About us

About Accenture

Accenture is a leading global professional services company that helps the world's leading businesses, governments and other organizations build their digital core, optimize their operations, accelerate revenue growth and enhance citizen services—creating tangible value at speed and scale. We are a talent- and innovation-led company with approximately 799,000 people serving clients in more than 120 countries. Technology is at the core of change today, and we are one of the world's leaders in helping drive that change, with strong ecosystem relationships. We combine our strength in technology and leadership in cloud, data and AI with unmatched industry experience, functional expertise and global delivery capability. Our broad range of services, solutions and assets across Strategy & Consulting, Technology, Operations, Industry X and Song, together with our culture of shared success and commitment to creating 360° value, enable us to help our clients reinvent and build trusted, lasting relationships. We measure our success by the 360° value we create for our clients, each other, our shareholders, partners and communities.

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