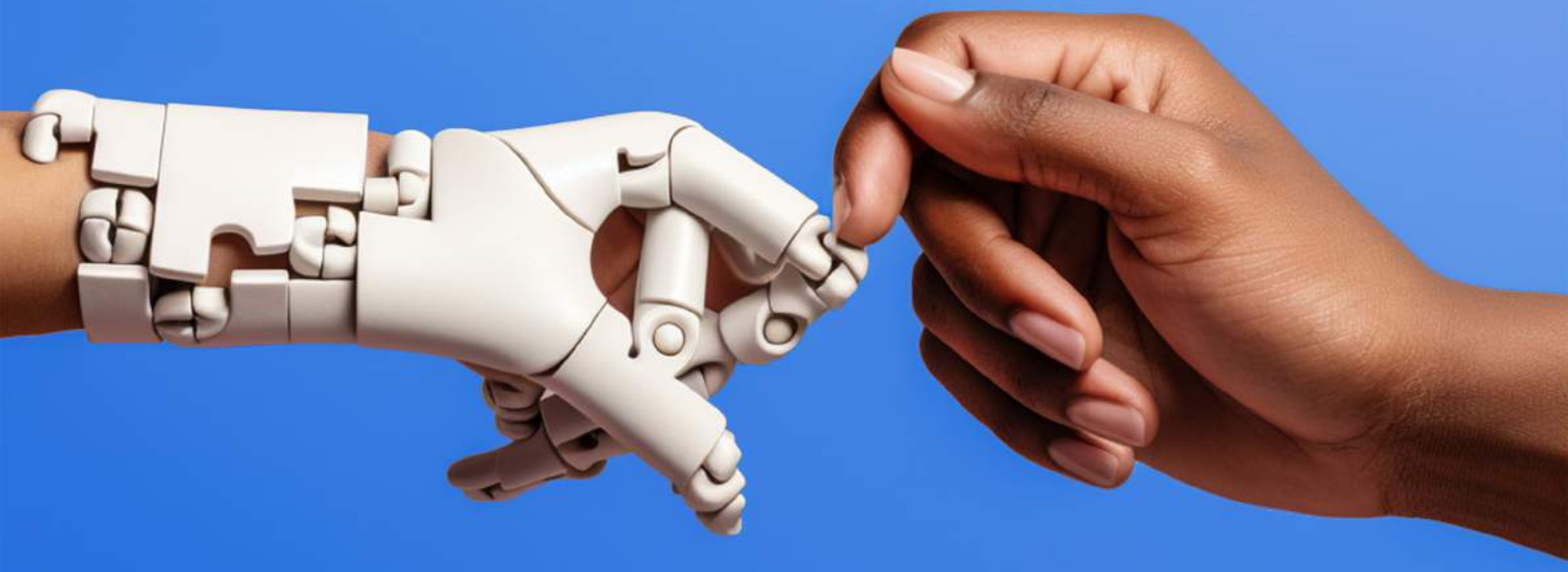
WORLD ECONOMIC FORUM

Advanced Manufacturing: A New Narrative

BRIEFING PAPER

SEPTEMBER 2023



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Introduction

Global megatrends are creating increasingly frequent disruptions to economies and organizations, which in turn are reshaping global value chains and pushing industries and manufacturing to transform themselves. These megatrends include geopolitical tensions and economic instabilities, climate change, technology integration and changing people dynamics.

While these trends are not new, the magnitude and complexity are increasing the urgency for the advanced manufacturing industry to respond and collaborate to change perceptions on the potential of advanced manufacturing solutions in driving impact.

The World Economic Forum's Advanced Manufacturing Industry community is focused on enabling an innovative, inclusive and sustainable industry transformation and growth. To facilitate this, the community has committed to the following five key principles:

1. **Make advanced manufacturing technologies and solutions openly available** across sectors and countries, as well as large companies and small and medium-sized enterprises (SMEs).
2. **Put advanced manufacturing at the service of people** by enabling upskilling and reskilling of workers through new investments and programmes.
3. **Leverage advanced manufacturing to make any production environment a more attractive space** for new generations and help address the current talent gap in manufacturing.
4. **Prioritize advanced manufacturing technologies and solutions** that enable the transition towards more sustainable and circular production process and value chains.
5. **Build new response mechanisms to help navigate future crisis and build resilience**, and do so in collaboration and coordination with all stakeholders, including governments and civil society organizations.

Advanced manufacturing solutions, once perceived as tools for increasing efficiency and productivity, can drive lasting improvements for people, planet and prosperity, and are at core of wealth creation and economic development. Advanced manufacturing technologies and solutions have been shown to drive impact across the following five categories:

Resiliency: Improving supply chain control, flexibility and responsiveness to shocks

Efficiency: Maximizing value from scarce resources

Sustainability: Reducing environmental footprints and delivering net-zero goals

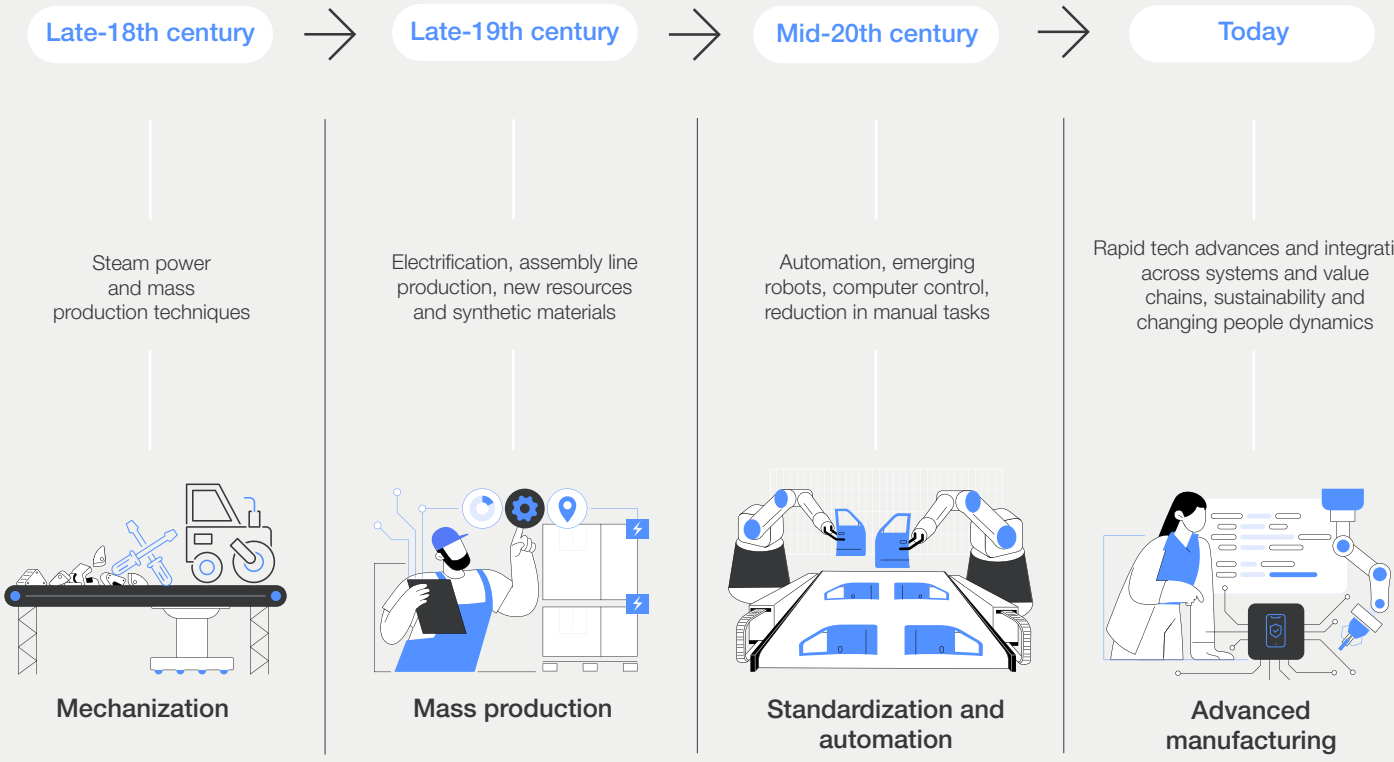
People: Empowering workers and society for a just transition

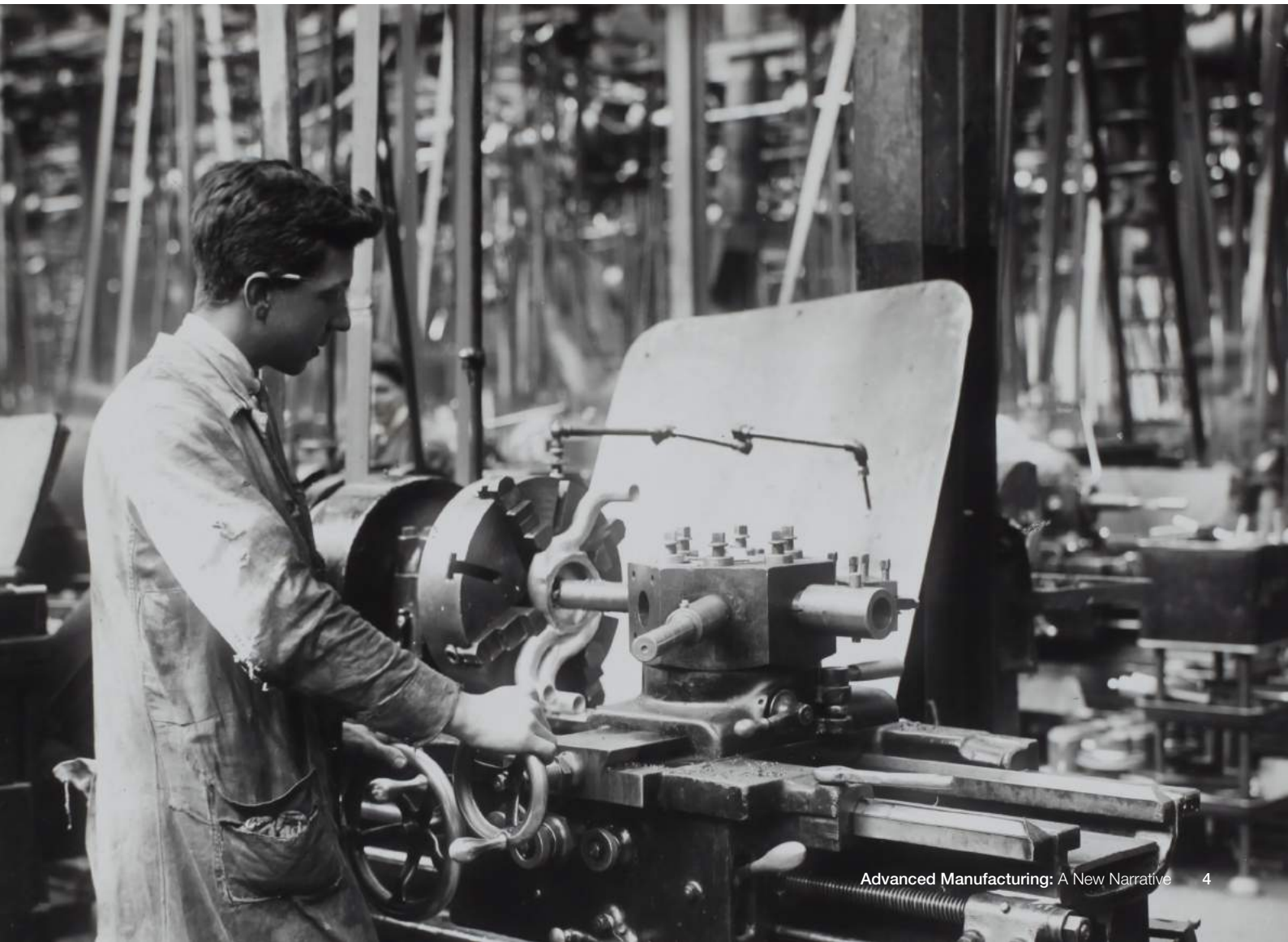
Innovation: Adapting what is produced and how

It is important to note that these impact areas are closely interconnected; with the aim of addressing a single impact area often multiple are impacted. In addition, holistic advanced manufacturing transformation approaches that consider the end-to-end strategic value chain are required to drive the biggest impact for industries and organizations.

The New Narrative was developed by the World Economic Forum's Advanced Manufacturing Industry community to catalyse the opportunity for advanced manufacturing solutions to unlock real value across various sectors. The New Narrative acts as a powerful tool for engaging, changing mindsets and increasing collaboration with various stakeholders through consistent, concise and compelling messaging supported by concrete examples.

FIGURE 1 | **The evolution of advanced manufacturing**





1 Driving industry trends

The dynamic shifts and advancements in industries worldwide are propelled by a convergence of four key megatrends – geopolitical tensions and economic instability, climate change, technology integration and changing people dynamics – which are creating new opportunities and challenges for the manufacturing sector. Understanding these megatrends helps in strategizing how the opportunity for advanced manufacturing solutions to unlock real value across various sectors is articulated.

Geopolitical tensions and economic instability

Shifting political landscapes and evolving regulatory environments, coupled with rising protectionism and the ongoing war in Ukraine, social distrust and erosion of social cohesion are unmasking vulnerabilities for companies and governments. The COVID-19 pandemic-induced disruptions in global supply chains and economic instability further exacerbated these challenges, including slow economic growth, escalating living costs, energy price hikes, global scarcities, production limitations, and logistical delays in obtaining vital components.

Governments, industries and organizations have responded by adopting smarter strategies to enhance supply chain resilience, favouring short, agile and just-in-case supply chains. This approach yields positive outcomes, including improved predictions and responsiveness to dynamic customer demands and reduced environmental footprints.

Climate change

Climate change poses a longstanding threat that is compelling companies and governments to adopt new commitments, adapt in the short term and undergo transformative changes in the long term. Historical data reveals a 54% surge in global net anthropogenic CO_2-equivalent emissions from approximately 38 billion tonnes in 1990 to nearly 59 billion tonnes in 2019. If this trajectory persists, temperatures could rise by 4.1°C to 4.8°C by 2100.[1] Under the Paris Agreement, all economic sectors must align with the 2°C or 1.5°C carbon reduction pathway, necessitating a transition to net-zero carbon-equivalent emissions for over 50 billion tonnes.[2]

Achieving net zero has become a top priority for companies and a central theme in public discourse, representing a synonymous term for climate action.[3]

Technology integration

The world is experiencing an unprecedented pace and scale of technological change, where staying ahead is crucial for economic success. However, rapid technological advancements are breeding intense competition, escalating cybercrime and a widening divide between technology frontrunners and laggards.[4]

Technology adoption, such as the internet of things (IoT), artificial intelligence (AI), robotics and the metaverse, and fostering innovation are paramount for maintaining business competitiveness. The UNIDO Industrial Development Report 2020 highlights economic benefits of adopting advanced manufacturing technologies, including enhanced productivity and improved access to international markets and value chains.[5] Studies indicate, the world is approaching tipping points for mass adoption of advanced manufacturing technologies, with half of companies recently adopting AI.[6]

Changing people dynamics

The green transition, technological advancements, supply chain transformations, and changing demographics and societal values are driving transformation and creating new jobs across industries and regions. However, these positive drivers are offset by growing geoeconomic fragmentation and tensions, societal polarization and distrust, slow economic growth and a cost-of-living crisis.[7]

Industries and organizations must proactively build future skills and adapt to people's changing priorities, both within the workforce and broader society. The largest job creation and destruction effects are expected to come from environmental, technology and economic trends. Recent studies found that employers estimate that 44% of workers' skills will be disrupted in the next five years with a shift from manual skills to cognitive and technology focused.[8] In addition, studies indicate that there is a shift in employees' priorities and an increasing willingness to change organization driven by many factors, including salary, job security, work-life balance, burnout, social and diversity, equity and inclusion (DEI) values.[9]

Based on evolving trends, the World Economic Forum's Advanced Manufacturing Industry community committed to five principles at the Annual Meeting 2023 in Davos-Klosters, Switzerland:

1 **Make advanced manufacturing technologies and solutions openly available** across sectors and countries, as well as large companies and small and medium-sized enterprises (SMEs).

2 **Put advanced manufacturing at the service of people** by enabling upskilling and reskilling of workers through new investments and programmes.

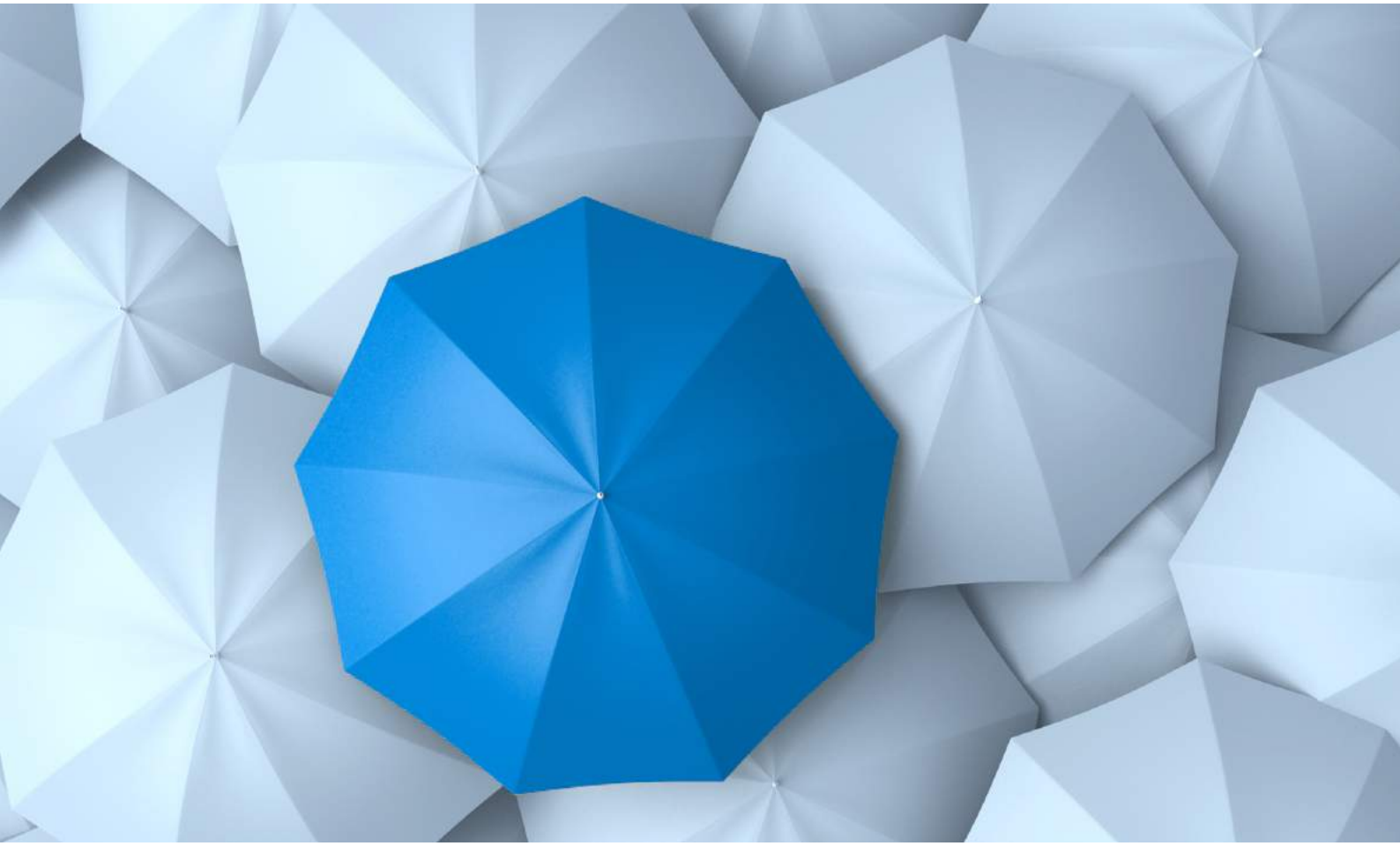
3 **Leverage advanced manufacturing to make any production environment a more attractive space** for new generations and help address the current talent gap in manufacturing.

4 **Prioritize advanced manufacturing technologies and solutions** that enable the transition towards more sustainable and circular production process and value chains.

5 **Build new response mechanisms to help navigate future crisis and build resilience**, and do so in collaboration and coordination with all stakeholders, including governments and civil society organizations.

2 Key impact areas

Advanced manufacturing solutions, once perceived as tools for increasing productivity, have proven to benefit five pivotal impact areas – resiliency, efficiency, sustainability, people and innovation.



To stay competitive and navigate the new global context, companies and governments must closely collaborate to embrace advanced manufacturing to catalyse change that delivers true impact.

The impact areas are closely interconnected; when addressing a single area often multiple are impacted. For example, the efficiency realized by improving the accuracy of demand forecasts also leads to reduced inventory, waste and environmental production footprints. Furthermore, by training and empowering people through advanced manufacturing tools such as augmented reality (AR)/virtual reality (VR), fewer repetitive and physically demanding tasks are required, providing more time for higher value work as well as collaborating with a broader diverse workforce and ecosystem.

Holistic solutions that consider the end-to-end strategic value chain are required to drive the biggest impact for industries and organizations. These solutions must first consider the broader global environment impacting advanced manufacturing, but be tailored to address the needs of the local environment (e.g. politics, regulation, workforce skills and resource availability).

The purpose of this section is to articulate the strength of advanced manufacturing solutions to solve for real-life and global challenges. For each of the five impact areas, the opportunity for impact is defined and illustrated with concrete examples from leading organizations.

Resiliency: Improving supply chain control, flexibility and responsiveness to shocks

The global economy is confronting a perfect storm of disruptions, including the climate crisis, geopolitical tensions and emerging technologies. These disruptions have demonstrated the fragility and challenged the very foundations of global value chains, creating a future characterized by unpredictability and instability. However, the recent pandemic response has also demonstrated the ability for advanced manufacturing to rapidly adapt, leveraging local production capabilities and reconfigurable manufacturing approaches that have been crucial in addressing shortages of essential products, supporting scale-up and responsiveness.[10]

To effectively prepare for and address ongoing challenges, manufacturing value chains must be resilient; there is a pressing need for shared responsibility across sectors and to reposition dynamics from customer to manufacturer and recycler. In response, many organizations are adopting "just-in-case" rather than "just-in-time" supply chains strategies, prioritizing lean manufacturing and best cost over lowest cost thinking to enhance resilience and risk management approaches for supply demand equilibrium.[11,12]

Some of the ways advanced manufacturing can improve resiliency include:

- **Enabling end-to-end visibility across the value chain**, from suppliers to customers, through transparent, scalable and collaborative data-driven approaches that augments data across the value chain and ecosystem, facilitated by such digital technologies as blockchains and open AI.
- **Optimizing supply and demand capabilities and shifting from just-in-time to just-in-case supply chains** through smart warehouses, inventory and logistics systems, diversified, digitalized and short value chains, flexible and technology-driven production processes, and digitally enabled value chain collaboration; ultimately improving the ability to predict "true" end-product demand and link across common components.
- **Embedding "lean" manufacturing** to improve flexibility to adapt or scale, drive efficiency and enable different, robust risk approaches while minimizing waste, optimizing processes and fostering multi-player collaboration, including with suppliers.
- **Improving resilience to disruptions in manufacturing and value chains** through IoT technologies in smart factories, allowing real-time data collection for issue detection, equipment performance evaluation and process improvement identification.

Change is driven by the following key trends:

Transformation is supported by the following key principles:

1 2 3 4 5

A number of initiatives are underway to support industry transformation:

Only 12%

of companies are sufficiently protected against future disruptions in supply chains and operations.[13]

Instability is the new normal. Respondents believe disorder and disturbance will remain, if not become more severe, in the future. Executives expect the impact of disruption on corporate value to increase by

15-25%

over the next five years.[14]

75%

of executives see the pandemic as a dress rehearsal for further disruptions to come, whatever form they may take.[15]

CASE STUDY 1

Foxconn Industrial Internet

City	Shenzen	
Country	People's Republic of China	
Key impact achieved	Resiliency	✓
	Efficiency	✓
	Sustainability	
	People	✓
	Innovation	✓

To address the rapid release of new smartphone products, increasing product complexity, stringent quality standards and labour skill scarcity, Foxconn factory strategically harnessed cutting-edge AI and IoT technologies. The company aimed to achieve worry-free production by implementing agile product introduction, quick capacity ramp-up and smart mass production through the deployment of 37 Fourth Industrial Revolution use cases at scale including AI-enabled new product introduction, next generation lights-out CNC workshop, autonomous anodizing with advanced controls, high-precision automated quality inspection, multi-site benchmarking and capacity optimization. This comprehensive approach yielded significant results: it accelerated new product introduction by 29%; reduced ramp-up time by 50%; decreased quality non-conformance by 56%; and lowered manufacturing costs by 30%.[16]

CASE STUDY 2

Western Digital[17]

City	Prachinburi	
Country	Thailand	
Key impact achieved	Resiliency	✓
	Efficiency	✓
	Sustainability	✓
	People	✓
	Innovation	✓

With rapidly growing demand, rigorous quality requirements and cost pressure for hard disk drives (HDD), Western Digital's Prachinburi site has leveraged connectivity and advanced analytics technologies to transform a capacity-saturated manufacturing site into a digital operation system of Fourth Industrial Revolution use cases, with real-time visibility in suppliers, production, logistics and customers and data-based insights and predictions addressing greenhouse gas (GHG) emissions.

- Predictive risk model detects supply disruptions (e.g. natural disasters), proactive actions mitigate risk of material availability with 83% improvement in reaction time on average and 31.5% material cost avoidance.
- Machine learning model connecting supplier component parameters to production performance optimizes yield with 41% improvement on scrap avoidance.
- SMART maintenance uses machine learning algorithms to predict repair actions accurately keeping 1.3M HDD tester slots running with 6% utilization improvement.
- Analytics algorithm uses customer field log data to predict failure mode to detect emerging issues and the insights is used to improve product design and manage customer fleet resulting in 15% warranty liability reduction.
- An intelligent and automated shipment planning and scheduling system utilizes operational data and IoT and machine learning tools to enable shipment consolidation and logistics optimization. The improves on time delivery by 15%, lowers shipment cost by 41% and reduces GHG emission by 12% from air freight consolidation.

The transformation is done in collaboration with numerous technology partners and in conjunction with customers. The Prachinburi factory also collaborates with local universities and technical institutes to upskill and reskill >60% the workforce.

Efficiency: Maximizing value from scarce resources

In a world of geopolitical disruptions, economic instabilities and rising energy costs, companies face mounting pressure to optimize efficiency and enhance competitiveness. Localized transformations have demonstrated double-digit improvements in throughput, cost reduction and lead time. Universal automation is a new game-changer, allowing seamless integration of hardware and software across brands. This provides opportunity to unlock the full potential of advanced manufacturing, enabling unprecedented productivity levels.[18,19]

Some of the ways advanced manufacturing can improve efficiency include:

- **Enhancing equipment output and effectiveness** to minimize downtime and prolong equipment lifespan, utilizing technologies such as process automation, equipment condition sensors, predictive maintenance systems and unmanned inspection vehicles, as well as implementing real-time production monitoring and machine learning to continuously improve.
- **Reducing operational and production costs** and driving production health through process automation, incorporating innovative, scalable and vendor agnostic technologies approaches such as dark factories, autonomous mobile robots, modular production cells, automation, robotics and additive manufacturing (including 3D printing).
- **Enhancing product quality** to decrease costs, enhance customer experience, and improve customer retention such as through the integration of AI and IoT-enabled safety, inspection and repair systems, as well as digitalized and integrated workflows.
- **Improving supply demand planning** for right-size inventories with flow on impacts to resilience and sustainability through digitalized value chain management.

Change is driven by the following key trends:

Transformation is supported by the following key principles:

1 2 3 4 5

A number of initiatives are underway to support industry transformation:

500%

Research conducted among manufacturing companies across three sectors found that environmental performance between manufacturing plants differed up to 500% between worst and best performing factories that make similar products using similar technology.[20]

CASE STUDY 3

Siemens AG, Electronics Works Amberg (EWA)

City	Amberg	
Country	Germany	
Key impact achieved	Resiliency	✓
	Efficiency	✓
	Sustainability	✓
	People	✓
	Innovation	✓

Siemens AG's electronic factory in Amberg, Bavaria, has undergone a transformative journey into a smart factory that has embraced advanced manufacturing, optimizing production and supply chain management.

One of the prominent solutions implemented was the creation of a "digital twin" of its electronics factory. This digital replica allowed for enhanced automation and data analytics, facilitating optimized operations.

By deploying smart robotics, AI-powered process controls and predictive maintenance algorithms, the factory achieved a 140% increase in output without increasing electricity consumption or altering resources. The digitization of the factory floor led to a 1,400% boost in productivity. Previously time-consuming tasks, such as manually adjusting equipment and machinery, were streamlined, reducing set-up time.

In addition, the factory took significant steps towards meeting and improving on its net-zero target. This included through adopting digital process analysis and measurements, reducing its Scope 1 and 2 GHG emissions by 69% normalized to volumes, as well as introducing a holistic '5Ps' sustainability framework (public ecosystem, plant infrastructure, people and culture, process and the product within the supply chain) and associated initiatives.[21,22,23]

Sustainability: Reducing environmental footprints and delivering net-zero goals

The manufacturing industry has a significant role to play in achieving global carbon reduction targets as it encompasses all manufacturing and value chains and represents nearly 30% of global greenhouse gas emissions.

There is a growing business need for no-excuses action in sustainable and responsible production, with recognition that reaching key climate targets will not be possible without a significant reduction in manufacturing and production-related emissions. In addition, the connection between climate action and business performance is becoming more relevant, making sustainability and resilience key drivers for competitive advantage. However, sustainability cannot be achieved by individuals; systemic collaboration across, and between, value chains is fundamental. Advanced manufacturing has a key role to play in this collaboration and provides opportunity meet the growing demand for sustainable products and services.[24,25,26]

Some of the ways advanced manufacturing can enhance sustainability include:

- **Accelerating energy efficiencies, promoting renewable energy sources and focusing on value-added energy** by implementing production equipment enhancements, energy management systems (such as ISO 50001), smart metering and performance management, process control, green energy sourcing, and raising awareness and building critical green skills.
- **Enhancing material and water conservation, and circularity and pollution reductions** by collaborating with suppliers on waste-minimizing material shapes and geometries, leveraging lean management practices and edge-sensing quality control or investing in research and development (R&D) for new manufacturing processes that understand and remove energy intensive processes, reduce yield losses, potentially reducing CO_2 emissions by 25-50% while optimizing water use and reducing pollutions.[27]
- **Reimagining product design and business models** to extend product and performance life, focusing on reliability, durability, repairability, upgradability and recyclability, while also utilizing closed resource production loops to maintain product value.
- **Driving broader ESG change and value chain decarbonization**, particularly in Scope 3 emissions, by optimizing supply chain sourcing and logistics systems and leveraging purchasing power to promote traceability and transparency and using advanced manufacturing solutions to overcome data integrity and integration issues and even automate calculation of product carbon footprints. In addition, supporting suppliers' decarbonization efforts by driving awareness, target setting and training, and influencing consumer behaviours.

Change is driven by the following key trends:

Transformation is supported by the following key principles:

1 2 3 4 5

A number of initiatives are underway to support industry transformation:

98%

Remanufactured products can save upto 98% of CO_2 emissions compared to equivalent new products and significantly support a vision of a zero-waste stream.[28]

CASE STUDY 4

Schneider Electric, Le Vaudreuil Factory

City	Le Vaudreuil	
Country	France	
Key impact achieved	Resiliency	✓
	Efficiency	✓
	Sustainability	✓
	People	✓
	Innovation	✓

Schneider Electric's Le Vaudreuil site leverages industrial IoT sensors and digital platforms, incorporating real-time digital twins of plant installations like heating pumps and lighting systems. This implementation yields significant efficiency gains: energy management is optimized (-25%), material waste reduced (-17%) and CO_2 emissions minimized (-25%). The site aims to achieve net-zero carbon status by 2025, supporting Schneider Electric's global commitment, without relying on offsets. Additionally, the smart factory features a zero-reject water recycling station connected to cloud analytics and AI monitoring, resulting in a 64% reduction in water consumption.[29,30]

People: Empowering workers and society for a just transition

Like other industries, advanced manufacturing is witnessing unprecedented and exponential technological innovation and integration, alongside shifting people dynamics and priorities. This includes both within the workforce and broader society. Paradoxically, as technology becomes more integrated into factories, the role of humans becomes even more crucial.

The industry must address fears of "robots taking our jobs" and attract a diverse talent pool for high-skilled, well-paid manufacturing jobs as well as a reluctance for industrial careers. For a "just transition", these challenges must be recognized and with a human-centric industry transformation approach that leverage technologies to benefit businesses and their workforce, empowering them to thrive, acquire new skills, protect and grow jobs.[31]

Manufacturing also creates strong communities, fostering multi-player collaboration between governments, suppliers, business support services and long-term investment, all while prioritizing people and their needs. Ultimately, manufacturing and value chains need to shape what Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, calls "a future that works for all by putting people first, empowering them and constantly reminding ourselves that all of these new technologies are first and foremost tools made by people for people".[32]

Some of the ways advanced manufacturing can support people include:

- **Enabling accessible and lifelong learning** for developing transferable in-demand skills, such as automation, robotics and AI, through applications like AR and VR training, mobile learning and smart workstations, fostering continuous on-the-job and off-the-job learning.
- **Empowering workers for a just transition** that provides every worker with proportional and bio-directional access to real-time data about the manufacturing operations they are a part of and enabling them to utilize rest time productively.
- **Creating a more accessible and inclusive work environment** that reduces entry barriers to employment, for example, by utilizing eyewear or projection-based AR technologies to expand the range of tasks and jobs available to new employees, promoting flexibility, productivity and equity, and facilitating the integration of individuals with disabilities in shop-floor activities.
- **Improving product safety and people's well-being and safety** by reducing or supporting the need for repetitive and physically demanding tasks, enabling individuals to remain in their preferred jobs for a longer time, regardless of age, for instance, through the use of exoskeletons or collaborative robots (cobots), and through enhanced testing, inspection and certification services.

Change is driven by the following key trends:

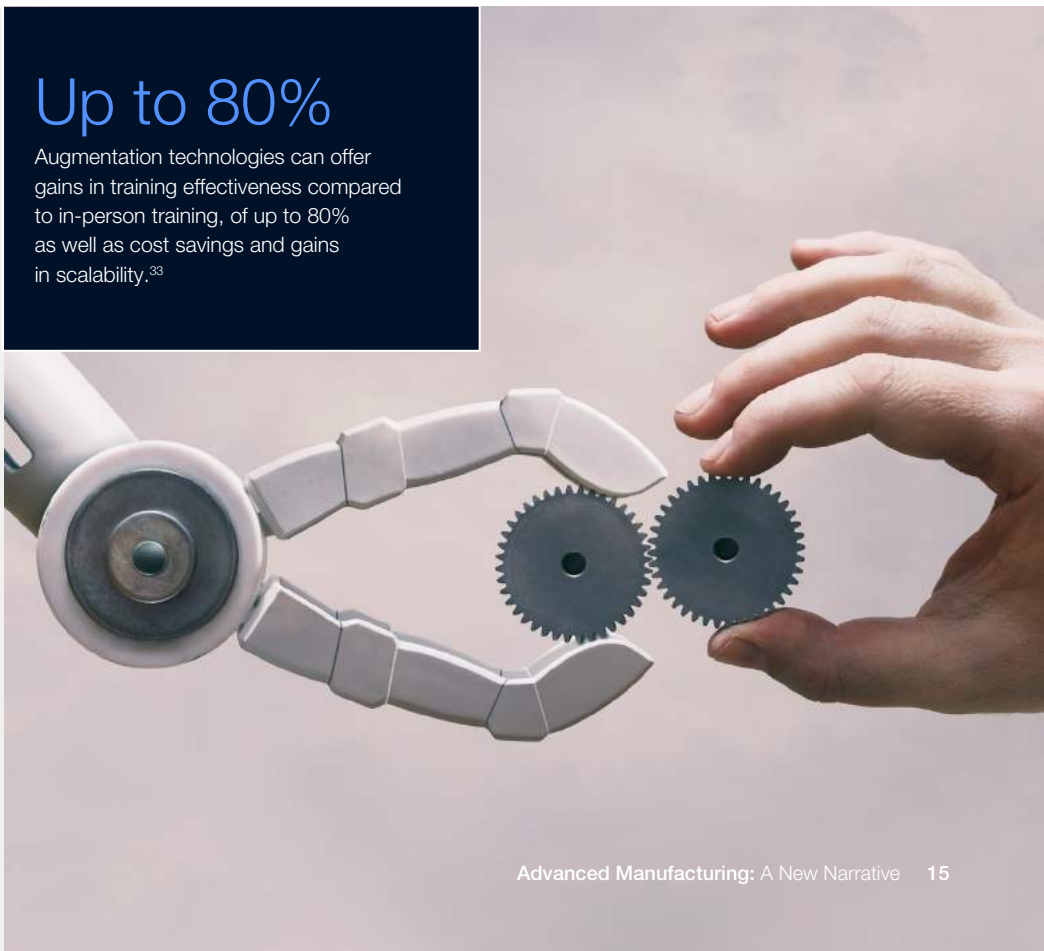
Transformation is supported by the following key principles:

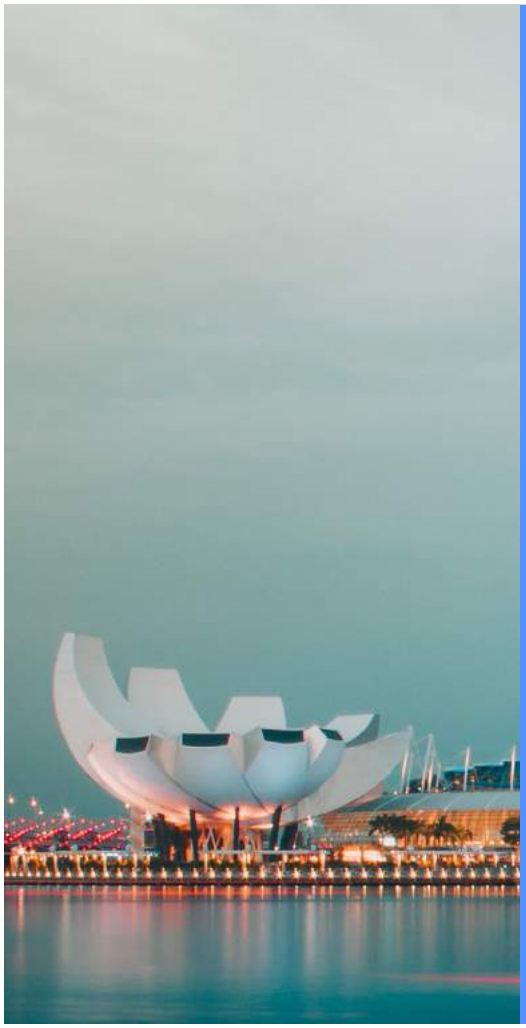
1 2 3 4 5

A number of initiatives are underway to support industry transformation:

Up to 80%

Augmentation technologies can offer gains in training effectiveness compared to in-person training, of up to 80% as well as cost savings and gains in scalability.[33]





CASE STUDY 5

HP Singapore

Country	Singapore	
Key impact achieved	Resiliency	✓
	Efficiency	✓
	Sustainability	
	People	✓
	Innovation	✓

HP Singapore faced challenges of product complexity, labour shortages, quality and cost. To align with the national push for higher-value manufacturing, the company embarked on a Fourth Industrial Revolution journey, which involved transitioning from manual, labour-intensive processes to highly digitized, automated workflows powered by AI.

The impact of this transformation was impressive. HP Singapore achieved a 20% reduction in manufacturing costs and a 70% increase in productivity and quality. The successful shift to a digitized and automated factory equipped with AI garnered recognition for HP. Notable impact included: 20% improvement in manufacturing costs; successful integration of the majority of HP employees into the smart manufacturing journey; and skill development for employees and freeing up to take on more advanced tasks.[34]

Innovation: Adapting what is produced and how

Industries are witnessing exponential technological advancements, from smart devices and apps to analytics and the industrial metaverse, alongside shifting consumer and societal preferences. Advanced manufacturing needs to collaborate with academia and government to drive innovation across industries, transforming what is produced and how, and how value is captured, helping others to stay competitive in a rapidly changing global marketplace. However, these advanced manufacturing solutions and innovations are only powerful if embraced with an innovation or growth mindset, helping drive economic growth and keeping pace with digital natives.[35,36]

Some of the ways advanced manufacturing can drive innovation include:

- **Reimaging product design and enhancing speed-to-market and competitiveness** to expedite product development and drive component commonality by shortening design iteration time, reducing prototyping efforts, improving safety science, aided by digital and AI-supported engineering and prototyping, cobots and additive manufacturing.
- **Enabling business model innovation at scale and customer-centricity** by leveraging technology such as digitally enabled marketplaces and ecosystems that bring buyers, sellers and enablers together and amplify the possibilities for them to interact, learn and participate in a given production and business ecosystem.
- **Facilitating product customization and experimentation** through the exploration of new materials, processes, designs and engineering approaches, with AI unlocking new possibilities for innovation.
- **Fostering collaboration, innovation and growth culture** to deliver on organization mission/strategy and to adopt new technologies (e.g. 5G/AI/Edge computing) through collaborative tools, industrial metaverse and improved manufacturing and operational flexibility.

Change is driven by the following key trends:

Transformation is supported by the following key principles:

1 2 3 4 5

A number of initiatives are underway to support industry transformation:

CASE STUDY 6

Flex, Sorocaba

City	Sorocaba	
Country	Brazil	
Key impact achieved	Resiliency	✓
	Efficiency	✓
	Sustainability	✓
	People	✓
	Innovation	✓

Flex's Sorocaba plant in Brazil developed a comprehensive system using Fourth Industrial Revolution technologies to transform e-waste and reintegrate repurposed materials into the supply chain. The digital transformation journey resulted into a 50% labour cost improvement, 81% material loss reduction, while increasing customer satisfaction (+18%) and employees well-being. In addition, it has led to the creation of over 180 direct and 300 indirect green jobs and significant GHG emissions reduction (41% for Scope 1 and 2, 44 kilotonnes Scope 3) and water consumption reductions (30%). The implementation of circular economy solutions and eco-efficient operations included:

- Cloud-based collaborative reverse logistics system and circular materials lab
- Automatic separation equipment and IoT-based collection bins minimizing material contamination and optimizing waste collection
- Digital e-commerce platform facilitating the commercialization of excess inventory and repaired/refurbished products
- Operational CO_2-emission dashboards providing visibility of environmental savings for customers.[37,38]

3 A call to action

The New Narrative has articulated the opportunity of advanced manufacturing to deliver real impact across industries and offer a path to a more innovative, inclusive and sustainable industry transformation. To support this opportunity for impact, several initiatives are already being delivered in collaboration with the World Economic Forum's Advanced Manufacturing Industry community.

In addition, the Forum will continue to provide a neutral space for leaders from across industries, public sector, civil society and academia to understand and anticipate global trends and their implications, share best practices and knowledge, incubate new private-public collaborations, and inform policy that supports manufacturing industries in navigating ongoing challenges while preparing for the future.

While the New Narrative acts as a powerful tool for engaging, changing mindsets and increasing collaboration with various stakeholders, it is only as powerful when used. As such, the community encourages using the messaging contained within. In addition, the community will facilitate a series of dialogues with various stakeholders to socialize the New Narrative and catalyse change.

Existing, key initiatives underway to support industry transformation

Global Lighthouse Network

The World Economic Forum's Centre of Advanced Manufacturing and Supply Chains has established the Global Lighthouse Network to encourage the adoption of advanced Fourth Industrial Revolution technologies in manufacturing, where the industry is lagging behind. The network consists of a community of manufacturers who exhibit leadership in using Fourth Industrial Revolution technologies to transform factories, value chains and business models, resulting in significant financial and operational benefits.

People as the Future of Manufacturing

The Fourth Industrial Revolution is changing the roles of people and technology in industry, and there is a need to understand and harness the new paradigm of workforce augmentation. To address this, the Forum has launched the Augmented Workforce Initiative in collaboration with the University of Cambridge, aimed at creating a community where industry executives, thought leaders and pioneers can share experiences, exchange knowledge and unlock cross-organizational collaborations on high-impact use cases for scaling the use of technologies to augment, empower and upskill the factory workforce.

Industry Net Zero Accelerator

The IPCC has issued warnings on climate change, and upcoming regulations will require companies to act on their commitments to net zero to maintain their license to operate, competitiveness and market share. To address this, the Forum has launched the Industry Net Zero Accelerator initiative in collaboration with several partners, aimed at creating a cross-industry space for executives in the manufacturing ecosystem to collaborate, share knowledge, and accelerate their journey towards achieving net-zero targets by supporting the incubation and scaling of the Estainium Association.

Circular Transformation of Industries

Success requires systemic change. Without commitments from all stakeholders and global collaborative efforts, circular transformation will continue to stagnate, delivering only slow and incremental change. To inform the global discussion on the circular transformation of industries at the World Economic Forum Annual Meeting 2023 and beyond, the Circular Transformation of Industries initiative outlines key areas for stakeholders to focus on to accelerate the shift and achieve robust and sustainable growth.

Industrial Strategies for the Future of Supply Chains

Recent global developments are prompting a reassessment of global supply chain configurations, driven by new priorities including sustainability, resilience, skilled talent, technology readiness and changing customer demand. To remain competitive and navigate future disruptions, companies and governments must collaborate to rethink the configuration of supply chains and future industrial strategies, to ensure productivity, innovation and economic growth.

Appendix

CASE STUDY 7

Western Digital[39]

City	Shanghai	
Country	People's Republic of China	
Key impact achieved	Resiliency	✓
	Efficiency	✓
	Sustainability	✓
	People	✓
	Innovation	✓

In the context of growing demand, Western Digital's Shanghai site doubled its petabyte (PB) output between 2017 and 2021 while reducing its environmental footprint per PB to achieve corporate ambitions. This result was enabled by multiple, diverse Fourth Industrial Revolution use cases such as intelligence product design assistant systems, machine learning-based virtual testing and E2E automation. The site also pioneered machine learning to dynamically optimize the performance of the water recycling plant and should consumption prediction to detect abnormal energy consumption based on real-time operating data. These measures reduced water consumption by 62% and energy consumption by 51% per PB.

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