

Industry 4.0

Smart operations—
an imperative for the
future of manufacturing

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Foreword CII



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COVID-19 has created an unprecedented situation for the manufacturing sector, resulting from mandated lockdowns across the global ecosystem. With supply chains disrupted, the flow of materials, intermediate parts, and finished goods have come to a halt.

While the immediate impact has been challenging, manufacturers are taking steps to ensure their survival and relative prosperity as conditions improve. In that direction, leaders are already moving forward and effecting changes.

Technology will play a vital role in business continuity. With a strong digital ecosystem and an abundance of talent, India is in a unique position to recast the framework of manufacturing. However, this will require a quantum shift in our mindset and also our approach.

Companies with strong digital capabilities have demonstrated greater resilience, and the pandemic has provided further evidence of that resilience, particularly in employee engagement and supply-chain operations.

Moving forward, a number of smart and connected technologies will become embedded within organisations, people, and assets. The most impactful will be robotics, analytics, AI and cognitive technologies, nanotechnology, quantum computing, wearables, the Internet of Things, additive manufacturing, and advanced materials.

Technology adoption will become a norm for success as we emerge from this pandemic. We will need to upskill our talent, even as we learn to intelligently integrate technology into our businesses to move up the manufacturing value chain.





Introduction

Manufacturing is emerging as one of the high-growth sectors and India aims to be a global manufacturing hub. Led by the Department of Industrial Policy and Promotion and through initiatives like “Make in India,” “Skill India,” and “National Manufacturing Policy,” India aims to raise the contribution of the manufacturing sector to 25 percent of the Gross

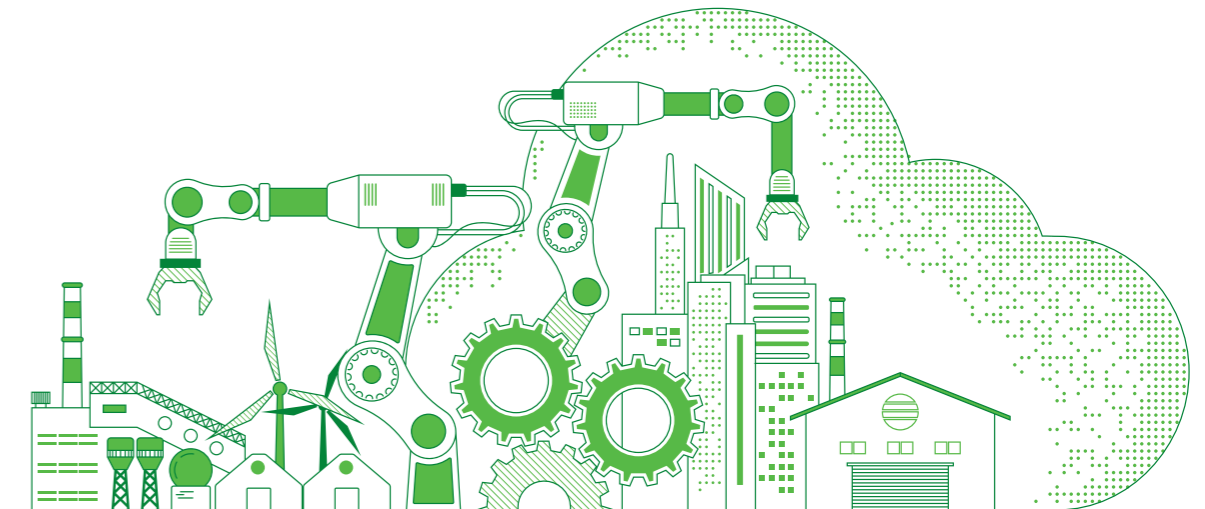
Domestic Product (GDP) by 2025¹. These efforts have already shown some results with India being ranked 30th on the WEF global manufacturing Index in 2018². In H1 of 2019–2020, the Gross Fixed Capital Formation (GFCF) in the Manufacturing sector in India stood at US\$ 405.88 billion³.

Despite these initiatives, manufacturing organisations are facing numerous challenges and undergoing unprecedented changes. Growing competitive pressures, increasing costs, lack of skilled manpower, increasing supply chain complexity, global fragmentation of production and demand, etc., are seen to have forced organisations to relook at ways of doing things.

The present pandemic has a multiplier effect on existing challenges. It has elevated the demand, supply, and workforce complexities in many ways. With swinging customer sentiments come increased demand volatility. Organisations must start focusing on a well-connected, transparent, and agile supply chain network that is highly responsive to these changing needs. To achieve this level of flexibility, manufacturing organisations need to consider changing their operating models and embracing new technologies with efficient ways of working. Certain Industry 4.0 concepts around smart factories and digital supply chains can aid in aggressively implementing such measures. On the supply side, the need for a connected network between the organisation’s and the supplier’s manufacturing units is expected to be felt significantly in the near future than in pre-COVID-19 times.

Manufacturing organisations would also have to explore virtualisation solutions for supplanting tasks to be executed in-person, such as process-parameter monitoring, quality inspection and controls, and asset health monitoring. To ensure a safe and controlled workspace, solutions around virtual connectivity and monitoring may need to be explored in the shortest time possible due to social distancing prerequisites. In this process, organisations are likely to do away with excessive dependency on people for routine processes, which could also result in improved accuracy of data across the value chain.

We envisage that organisations are likely to accelerate technology adoption and move away from human-enabled data gathering, tracking, and post-facto analysis to predictive modelling, based on real-time information generated from the connected ecosystem. This has the potential to enable them to foresee possible failures of a manufacturing asset, an anticipated fluctuation in consumer demand or supply, or a security issue and hence, be better prepared to address the uncertainties in the current business environment. Overall, access to reliable, real-time data is expected to become a strategic resource across multiple facets of business and society. Hence, a “virtual shift” is expected to be on the cards, which will help accelerate digital adoption and transform the ways in which the organisations of the future are likely to operate.



What is Industry 4.0?

Industry 4.0 signifies the promise of a new industrial revolution—one that marries advanced production and operations techniques with smart digital technologies to create a digital enterprise that is not only interconnected and autonomous, but also able to communicate, analyse, and use data to further drive intelligent actions back into the physical world. It represents the ways in which smart, connected technology becomes embedded within organisations, people, and assets, and is marked by the emergence of capabilities such as robotics, analytics, AI and cognitive technologies, nanotechnology, quantum computing, wearables, the Internet of Things, additive manufacturing, and advanced materials.

While its roots are in manufacturing, Industry 4.0 is about more than just production. Smart, connected technologies could transform how parts and products are designed, made, used, and maintained. They could also transform organisations themselves—

how they make sense of information and act upon it to achieve operational excellence and continuously improve the consumer/partner experience⁴.

In short, Industry 4.0 is ushering in a digital reality that may alter the rules of production, operations, workforce, and even society. The three key cyber-physical transformations that will be ushered in by industry 4.0 are⁵:

- **Physical to digital:** Capturing information from the physical world and creating a digital record from the physical data
- **Digital to digital:** Sharing information and uncovering meaningful insights using advanced analytics, scenario analysis, and artificial intelligence
- **Digital to physical:** Applying algorithms to translate digital-world decisions into effective data, spurring action and change in the physical world

Fully connected cyber-physical processes present huge opportunities. Rather than

monitoring processes in a linear fashion, companies can take learnings along the way and feed them back into processes, learn from what they are seeing, and adjust accordingly in real or near real time. This should lead to smarter decisions, better-designed products, service and systems, potentially more efficient use of resources, and a greater ability to predict future needs.

The amalgamation of digital and physical technologies is likely to affect how customers, employees, and other parts of the business landscape experience and interact with an organisation. Industry 4.0 has the potential to create smarter products and services that could connect and engage customers in newer ways and accelerate innovation and revamp design cycles. From a business operations perspective, Industry 4.0 could create the factory of tomorrow by linking operational technology (OT) with information technology (IT)—capable of predicting changes and responding in real time to make production planning more efficient.



How is Industry 4.0 impacting the manufacturing sector?

Industry 4.0 ushers in the concept of “**smart factory**,” which promotes machine-to-machine communications and integrated systems that can drive greater collaboration amongst producers, suppliers, and other stakeholders along the manufacturing value chain⁶.

In its most mature form, a smart factory is a flexible system of production that can self-optimize performance across a

broader network of factories, suppliers, and partners; self-adapt to and learn from new conditions in near-to-real time; and autonomously run production processes. Today, manufacturers across the spectrum have increasingly started to realise the importance of smart factory initiatives. Table 1 lists down important use cases deployed by several manufacturers to realise benefits.

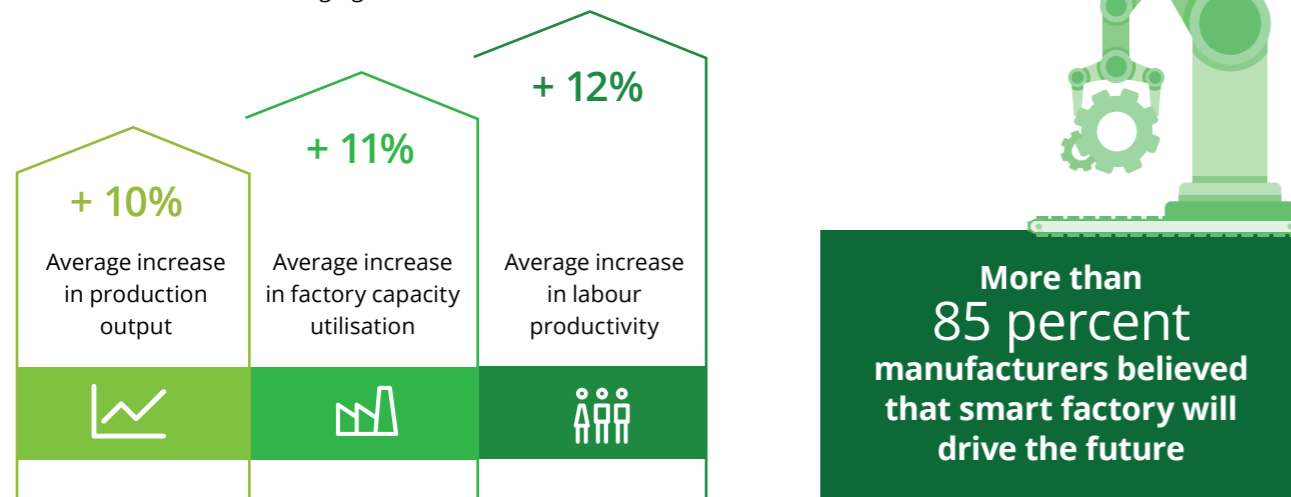
Area	Description
Command centres	Using data, analytics and visualisation, and user-based insights
Quality sensing and detecting	Real-time equipment monitoring, visual analytics, in-line quality testing
Factory asset intelligence and performance management	Predictive maintenance, Augmented Reality (AR) to assist maintenance personnel, sensor-enabled asset monitoring
Plant consumption and energy management	Sensor-based waste, scrap, and utility consumption tracking; energy, water, and waste optimisation platform
Advanced manufacturing	3D printing and prototyping
Engineering collaboration and digital twin	Fast prototyping, virtual reality production cell configuration, digital product modelling
Robotic and cognitive process automation	Robotic process automation, Machine Learning (ML), natural language processing, AI
Factory synchronisation and real-time asset tracking	Using active/passive asset-tracking sensors to dynamically adjust schedules
Smart conveyance	Automated guided vehicles, automated conveyance to enable continuous material flow
Augmented efficiency and safety solutions	AR to support pick-by-vision and training; cobots and robotic arms in work cells; exoskeletons; digital signage and wayfinding; biometric health and safety monitoring
Smart work-in-process warehousing solutions	AR picking, automated conveyance, real-time process visibility
Risk-adjusted material requirement planning	Stochastic algorithms

Table 1 - Typical use cases deployed by manufacturers leveraging Industry 4.0 solutions

Research conducted in 2019 by Deloitte in collaboration with the Manufacturer's Alliance for Productivity and Innovation for US-based manufacturing firms revealed the following:

The adoption of smart factory initiatives triggered double-digit growth in key performance indicators:

Over the past three years*, companies running smart factory initiatives have seen encouraging results.



*Period of analysis for US-headquartered firms with global footprint from 2015 to 2018

Way forward: What should companies do next?

Technology adoption is expected to rise across manufacturing organisations. Organizations need to set a digital mindset of **Think Big, Start Small, and Scale Fast** while deploying Industry 4.0 solutions. Organisations would also need to focus on building capability using agile principles, and collaborating with external partners. They should also focus on developing seven core attributes in their organisation, culture, and workforce.

- **Agility:** The ability to quickly adapt and effectively respond to changes
- **Experimental:** The willingness to try something new in an unusual way and accept failure as a learning process
- **Open-mindset:** The ability to consent to different views and ideas and challenge the status quo
- **Anticipatory:** The ability to come up with effective contingency plans while dealing with both foreseeable and unforeseeable circumstances
- **Creativity:** The ability to think out of the box and generate ideas
- **Innovation:** The ability to bring creative ideas into action through experiments that ultimately provide value for the business
- **Networking:** A cooperative way of working through effective communication and fostering mutual trust and respect.

Organisations would also need to build an ecosystem of partners to enable them to gain expertise, scale more quickly,

and realise value. Typically, solutions are evaluated along the dimensions of scalability, relevance, flexibility, reliability, and technology before selecting it for proof of concept. Due to the pandemic, organisations may need to re-evaluate/reprioritise their digital roadmap, and also consider working on those initiatives that can deliver great leap-forward benefits. They could look towards leveraging Industry 4.0 solutions for redefining SOPs, redeploying manpower, multiskilling resources, reconfiguring the workplace, and re-engineering business processes to create a safe work environment.

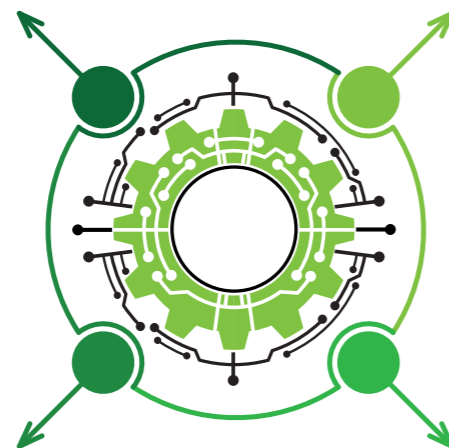
Organisations also need to consider driving behavioural change and would need to focus on the following:

- Identifying a “what will drive” value and aligning it with the organisation's strategy
- Defining clear measurable outcomes
- Committing internal resources and investments
- Deploying executive sponsorships to drive change in behaviour and tool adoptions
- Conducting user training on tools, revised ways of working, and process changes.

A “virtual shift” is expected to be on the cards, which will transform how organisations will operate in the future. To better succeed, businesses would need to consider embracing this shift and taking necessary steps to leverage Industry 4.0 solutions to improve efficiencies, reduce cost, and be future ready.

86%
manufacturers believed that smart factory initiatives will be the **main drivers of manufacturing competitiveness in 5 years.**

30%
share of the global factory budget earmarked for **smart factory initiatives.**



83%
manufacturers believed smart factory initiatives will transform the way products are made in 5 years.

58%
share of manufacturers expect the **smart factory budget to increase** in 2020.

Source: Deloitte analysis of the 2019 Deloitte and MAPI Smart Factory Study data.

Key features of smart factories such as connectivity, optimisation, transparency, proactivity, and agility play an important role in enabling informed decisions for processes improvement and efficiency. Embarking on a journey of smart factory generally results in improved asset efficiency, lower quality-based rejections,

cost reductions, safety improvements, and sustainable results. In addition, it could assist organisations in increased speed to market, improved ability to capture market share, better profitability, product quality, and labour force stability.

Appendix

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4. **Forces of change:** Industry 4.0: A Deloitte Series on Industry 4.0
5. **Forces of change:** Industry 4.0: A Deloitte Series on Industry 4.0
6. **Towards the next horizon of Industry 4.0:** Accelerating transformation through collaborations and start-ups

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1. **2019 Deloitte and MAPI Smart Factory study:** Capturing value through the digital journey. A report from Deloitte's research centre for the energy and industrials group
2. **A Deloitte series on Industry 4.0, Digital Manufacturing Enterprises and Digital Supply Networks:** Deloitte University Press
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4. **Towards the next horizon of Industry 4.0:** Accelerating transformation through collaborations and start-ups

About CII

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government and civil society, through advisory and consultative processes.

For 125 years, CII has been working on shaping India's development journey and, this year, more than ever before, it will continue to proactively transform Indian industry's engagement in national development.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, with about 9100 members from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 300,000 enterprises from 288 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship

programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, livelihoods, diversity management, skill development, empowerment of women, and sustainable development, to name a few.

With the Theme for 2020-21 as Building India for a New World: Lives, Livelihood, Growth, CII will work with Government and industry to bring back growth to the economy and mitigate the enormous human cost of the pandemic by protecting jobs and livelihoods.

With 68 offices, including 9 Centres of Excellence, in India, and 10 overseas offices in Australia, China, Egypt, France, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with 394 counterpart organizations in 133 countries, CII serves as a reference point for Indian industry and the international business community.

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Confederation of Indian Industry
125 Years - Since 1895

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