

# Will the next transformation in manufacturing be led by digital?

Status of digitization and smart factory in India

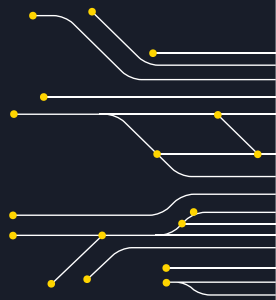
March 2020



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# Foreword



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### Smart Factory: way forward

Technology plays a critical role in today's world and companies are gaining competitive advantage by leveraging on emerging technologies to improve their cost, quality and speed to market. Internet and smartphones dominate people's decision-making skills, as they base their routines, and big decisions on the information they access on the web.

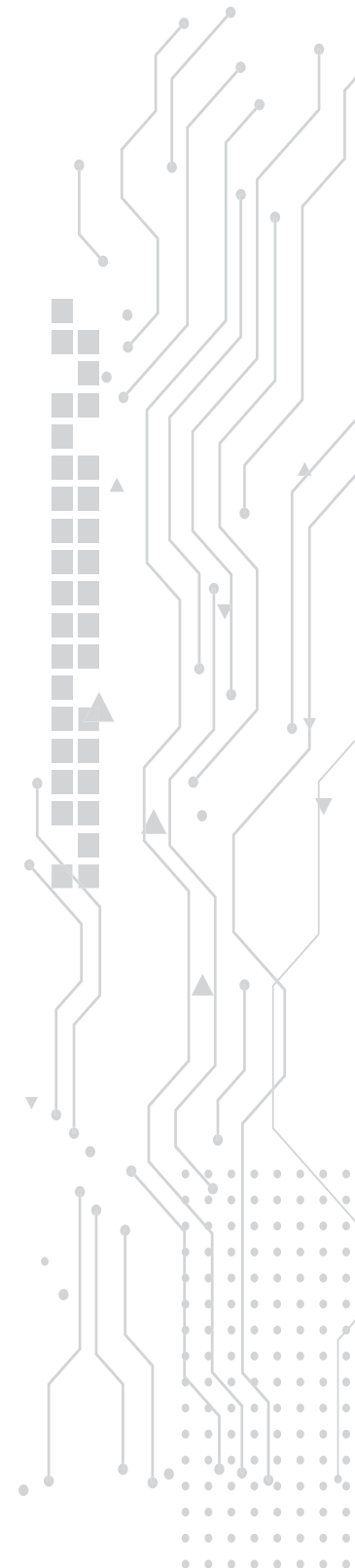
While our personal life is changing rapidly, the same has not permeated into our workspace. The shop floor is lagging tremendously in the adoption of automation and new technologies for recording, analyzing and managing work processes. In general, paper-based log sheets, memos and approvals are still prevalent on the shop floor. Processes such as data gathering, analysis and actioning are also largely paper- and judgment-based, devoid of smart technologies.

At the micro or shop floor level, manufacturing systems are a complex lot with a vast footprint of machines and people. To remain cost-competitive where world-class quality products are available on the click of a button, there is a need to radically improve operations in large, medium and small organizations. According to EY's Digital Manufacturing Survey 2019, a fair number of manufacturing companies believe in the concept of Smart Factory but seem to be uncertain about the investments and benefits they can reap in the short- and the medium-term.

While many companies have ongoing proofs of concept, a full-fledged Smart Factory requires a clear-cut strategy and a well-defined roadmap to be successful in the marketplace. Currently, factories are characterized by fragmented systems, such as, planning and scheduling, point solutions, and disjointed enterprise resource planning (ERPs) solutions. They, in turn, create islands of data with little alignment between operational excellence and IT applications, and involve the use of lots of spreadsheets and manual data entries with no real-time information visualization for operators. In addition, they mostly have manual paper-based quality management systems (QMS). In such a set-up, it becomes difficult to develop insights into operations and take the right decisions to improve performance.

We are now at a point where reliable data is available on the back of the advances in machine technology and integration of information technology (IT) and operations technology (OT). The advancements in analytical techniques based on statistical modelling and Machine Learning algorithms can help in analyzing the large amount of data and develop actionable insights to target higher levels of performance on the shop floor. With all these advances the future of a factory is likely to change drastically.

Therefore, companies need to understand the power of Digital Manufacturing and work with the right set of partners to create an infrastructure that lasts in long term to reap the benefits. There is a need for top managements across all manufacturing organizations to act quickly and start their digital journeys by adapting the changing trends. This would help them match their steps with their competitors who are a part of the technological revolution that is taking place across the world.





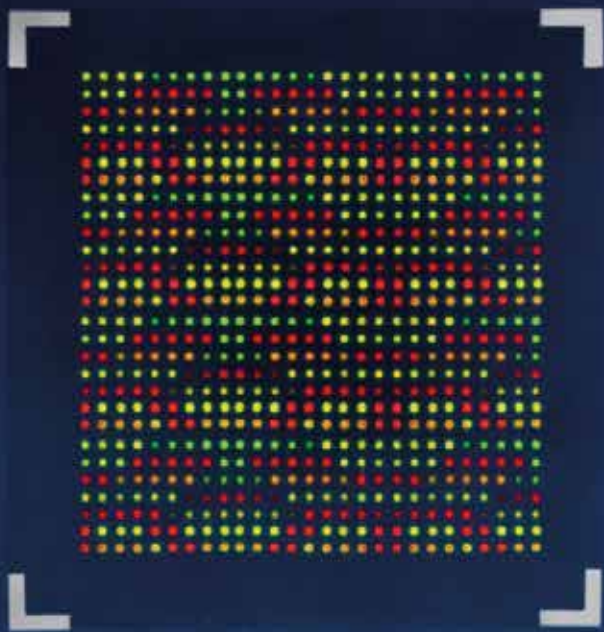
# Survey methodology

The report, **Will the next transformation in manufacturing be led by digital?**, studies the evolution of the manufacturing industry in India and gauges how government initiatives and technologies are helping reshape the manufacturing setup in the country. The report also tries to capture the points of view of industry leaders in the manufacturing sector, analyzes their key investment priorities, challenges and technological readiness. It outlines how digital manufacturing can enable the creation of sustainable and digitally-empowered organizations. The report incorporates first-hand perspective of the leaders of major manufacturing firms in India as part of a primary survey conducted by EY India. The findings are combined with extensive secondary research and analysis for a comprehensive perspective.

**Respondents' profiles:** During the primary research, EY interacted with approximately 50 leaders of large manufacturing organizations, including the COOs, CTOs/CIOs, and chiefs of manufacturing, quality and operational excellence, in the pharmaceutical and healthcare, automotive, consumer goods, industrial manufacturing and chemical sectors.



**Executive  
summary**



01



The global manufacturing industry is at the cusp of a paradigm shift led by advanced technologies in manufacturing processes. Firms in developed nations are increasingly focusing on becoming more digital with the deployment of intelligent technologies to concentrate on producing smart products. In emerging markets too, companies have also started leveraging advanced technologies by using operational excellence techniques to remain competitive.

The Indian manufacturing industry is beginning to explore new advancements in technology, such as data and analytics, Internet of Things (IoT), Robotics, and three-dimensional (3D) printing to drive changes for the benefit of their businesses. The merger of the physical and the digital world has enabled real-time visibility and control of manufacturing units across the value chain and has opened a new set of opportunities and challenges.

Within India, many medium and large companies have initiated proofs of concept (PoCs) across multiple domains including, energy, maintenance, dash-boarding, optimization, and analytics. However, these developments are still in their nascent stages and there is a lot to achieve. The Indian manufacturing sector continues to remain apprehensive about the benefits of embarking on an end-to-end digital journey.

The industry is uncertain about what constitutes a Smart Factory. Leaders in the manufacturing space have varied interpretations and concepts on what the future holds for them. For Smart Factory to be a widespread success, there is a need for entities to have a consistent vision on the concept and for the ongoing PoCs to deliver promised results.

## Manufacturing in India: miles to meet its potential

According to World Bank, India emerged as the world's sixth-largest<sup>1</sup> economy in 2017. India's manufacturing sector only accounts for 18.3% of the country's GDP as compared to 29% in China, 21% in Germany, 28% in South Korea and 20% in Indonesia. However, the sector has come a long way since independence<sup>2</sup>. The government has tried to develop manufacturing through Industrial Policy Resolutions (1956, 1977, 1980, 1991) and Five-Year Plans. The National Manufacturing Policy outlines a vision to make India a manufacturing hub and is supported by other flagship schemes such as Make in India', Skill India and Startup India. The Government of India (GoI) has also recognized the unmet potential of India's manufacturing prowess and has set an ambitious target of increasing contribution of the manufacturing sector from the current level of 16% to 25% of GDP by 2022<sup>3</sup>.

## State of Digital Manufacturing in India

Digitization continues to transform manufacturing processes around the world through transformational technologies such as IoT, Artificial Intelligence, Additive Manufacturing and Advanced Robotics. These technologies help companies achieve efficiency and productivity gains and drive quality improvement and customizations. The adoption of digital technologies in India is still in its infancy, considering manufacturers have started leveraging these technological advancements recently.

EY's Digital Manufacturing - India survey reflects the views of industry leaders from the country's manufacturing sector on recent technological advancements and their adoption. These views refer to digital manufacturing strategy, its readiness, key challenges and benefits.

The survey highlights that a significant proportion of manufacturing organizations in India do not have a well-defined strategy or a prescribed budget on digitization and have a limited understanding on the subject. These organizations also face various challenges including a lack of integration of hardware, software and data infrastructure, digital systems and decision intelligence capabilities. Due to their limited awareness, most firms are still unclear about the economic benefits and impact that they can achieve through targeted investments.

<sup>1</sup> Bloomberg Quint, <https://www.bloomberquint.com/global-economics/india-overtakes-france-as-worlds-sixth-largest-economy-world-bank#gs.2hazuc>, 11th June 2018

<sup>2</sup> The World Bank report, <https://data.worldbank.org/indicator/nv.ind.manf.zs?end=2017&start=2017&view=map>

<sup>3</sup> India Brand Equity Foundation, <https://www.ibef.org/industry/manufacturing-sector-india.aspx>, December 2018

Recognizing the importance of digital manufacturing, some Indian firms have started enhancing their digital infrastructure and have upskilled their workforce. According to EY's survey, organizations feel that digital manufacturing would provide benefits such as improvement in overall monitoring and measuring of key performance indicators (KPIs). It would also allow tracking and tracing of products across the value chain and lead to better quality products. However, the Indian industry has taken baby steps in transforming the shop floor. Digital manufacturing presents a huge opportunity for firms to adopt innovative and emerging technologies, and leap frog to a different level of maturity and enable them to be recognized amongst the best in the world.

Some Indian industries in the past have leveraged technological innovations to catch up and even surpass similar industries in the developed world. Digital manufacturing may well be that lever that can propel Indian manufacturers into a higher orbit of operational performance.







# Manufacturing landscape in India

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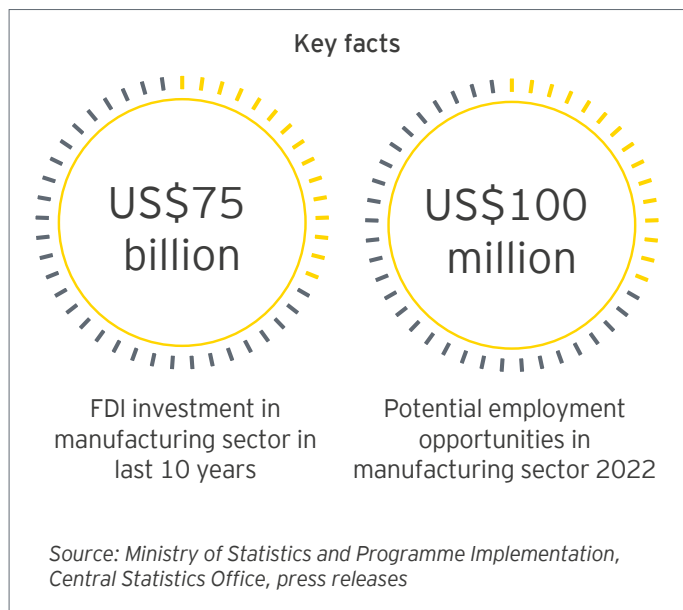
## The current state and road ahead

The manufacturing sector in India has come a long way since independence and has been instrumental in driving economic growth through productive employment, reduction of import bills, and contribution to the country's GDP. Adoption of Five-Year Plans, abolition of industrial licensing, price controls and the virtual elimination of monopoly law has led to the gradual evolution of the manufacturing sector in India over the past decades.

Keeping in mind the manufacturing sector's potential, the Government of India has envisioned its prominent role in the coming years as outlined in the National Manufacturing Policy (NMP).

### National Manufacturing Policy revolves around six key objectives<sup>4</sup>:

- ▶ Increase growth of the manufacturing sector to 12%-14% over the medium term to make it the engine of growth for the economy.
- ▶ Increase the rate of job creation in manufacturing to create 100 million additional jobs by 2022.
- ▶ Create appropriate skill sets among rural migrants and urban poor for inclusive growth.
- ▶ Increase domestic value addition and technological depth of manufacturing.
- ▶ Enhance global competitiveness of the Indian manufacturing sector through appropriate policy support.
- ▶ Ensure sustainability of growth, particularly with regards to the environment, including energy efficiency, optimal utilization of natural resources and restoration of damaged/degraded ecosystems.



In line with the goals outlined under the NMP, the Government of India has also introduced initiatives such as 1) Make in India 2) Startup India 3) Skill India.

### Key initiatives by Government of India



Launched in 2014; focusses on 25 sectors in Indian economy. Development of five industrial corridors. The government plans to build 8 smart cities, 5 power projects, 2 airports, 2 Mass Rapid Transportation Systems (MRTS) and 2 logistics hubs in the corridor. Creation of special cells, i.e., "Japan Plus" and "Korea Plus" for fast-track processing of proposals and investment facilitation.

Launched in 2015 to train ~400 million people in various vocational and technical training. Set up of National Skill Development Agency (NSDA), National Skill Development Corporation (NSDC), National Skill Development Fund (NSDF) and 38 Sector Skill Councils. As of November 2018, ~36.22 lakhs candidates have been enrolled under Pradhan Mantri Kausal Vikas Yojana.



Campaign launched in January 16 with an intent to build a strong ecosystem for start-up businesses in India directed at new start-ups to avail regulatory and tax benefits, capital gains tax exemption and access to government funding. Government has set aside an economic stimulus in the form of a INR 10,000 crore fund of funds managed by Small Industries Development Bank of India (SIDBI), with the goal of increasing funding opportunities.

Source: MakeinIndia webpage, Skill India webpage, Hindu business line, Jan'19, Startup India webpage

<sup>4</sup> Department of Industrial Policy and Promotion website, <http://dipp.nic.in/sites/default/files/po-ann4.pdf> accessed on 4 November 2011



# Evolution of Digital Manufacturing



03

## The global shift: an industry perspective

### Smart factories can add US\$500 billion<sup>5</sup> in value in the next three years

Historically, the shop floor has been changing through the introduction of new technologies to speed up manufacturing of products. Most companies have been leveraging automation, workflow, transactional systems (ERP) and bespoke applications to run various processes. These companies have also been pursuing operational excellence programs to continually improve their shop floor practices and performance. However, these efforts are no longer delivering the expected changes at the required scale. To remain competitive, manufacturing companies need to accelerate the pace of innovation and change their smart technology toolkits. Manufacturers, today, need accurate and timely data to manage their performance effectively. An integration of real-time operational data of operations, machines, materials, and operators plays an important role in gathering required insights and taking the right decisions to improve performance. This integration also results in the better use of production capacity, ensure on-time delivery, tighter cost control and optimized labor productivity.

Globally, manufacturing is undergoing a transformation due to the promise of Industry 4.0-related innovations. As the fourth industrial revolution gathers momentum across the globe, industry leaders across the public and private sectors are confronted with a new set of opportunities and challenges. These efficiencies and challenges are around production, growth and sustainability. Rising competition, increasing cost pressures and the need for eliminating losses are forcing manufacturers to explore advanced computing capabilities. There is a need to have an environment that facilitates interconnectivity between critical components, monitoring of the entire ecosystem and optimization of decisions based on data from the monitoring system. The adoption of emerging technologies from Industry 4.0 promises the linkage of end-to-end value chains (including those of suppliers and customers) and unlocking new data-driven business models.

This convergence of digital technologies and cognitive computing techniques are key enablers of the fourth industrial revolution, which is characterized by digitally-enabled smart factories. It is expected that smart factories will potentially add US\$500 billion<sup>5</sup> in value to the global economy by 2022. Global automakers, manufacturing conglomerates and others have already started ramping up their manufacturing functions by deploying advanced technologies. A Smart Factory is defined by the co-existence of cyber-physical systems that enable ease of monitoring, experimentation, automation, and faster/accurate decision-making.

## Readiness of Indian manufacturing sector

As per the World Economic Forum's report on "Readiness for the Future of Production 2018", India ranked 30th among 100 countries on readiness, thereby indicating a strong structure of production. However, the country was clustered in a legacy group, which is a group of countries considered weak in performance across drivers of production. India benefits from the growing domestic market supported by a large middle class, increasing global demand for domestic products, increasing foreign direct investment and non-restrictive trade policies. However, there is scope for improvement in implementing transformative emerging technologies. Manufacturing in India also needs an interconnected ecosystem by developing a skilled workforce that can operate in a digital world.

## What is Smart Factory?

**Smart Factory** is an interconnected shop-floor ecosystem that runs the plant by optimizing machine, materials, manpower, process, ambient and transactional data to achieve flawless performance on a real-time basis. It is powered by emerging technologies - IoT, Artificial Intelligence, 3D printing, Robotics, Advanced Analytics, Machine Vision, and Augmented Reality.

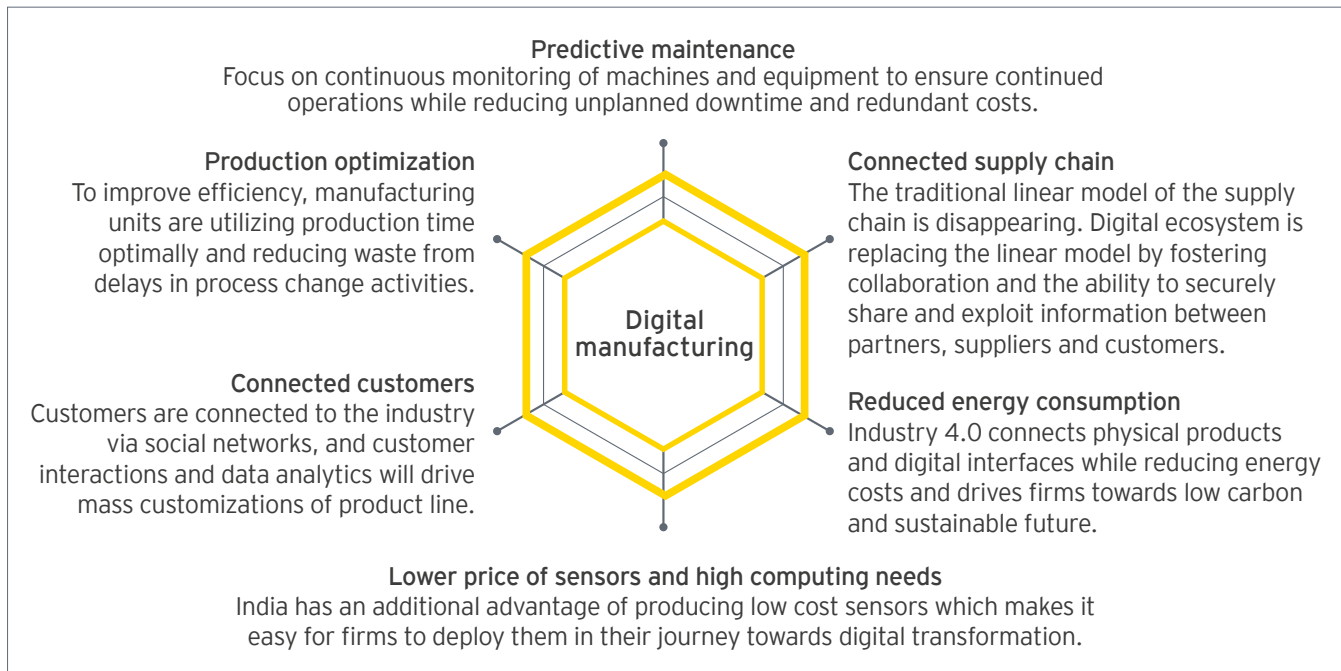
## Shaping the future of digital technologies in India

Cost economics and competitiveness in manufacturing are fundamentally changing the way business is done. With an empowered consumer base now dictating supply and demand, increasing level of product customization, accelerated time to market pressures, rising global competition and the continual rise of the internet and mobile economies, manufacturers are able to make real-time decisions by leveraging data and information.

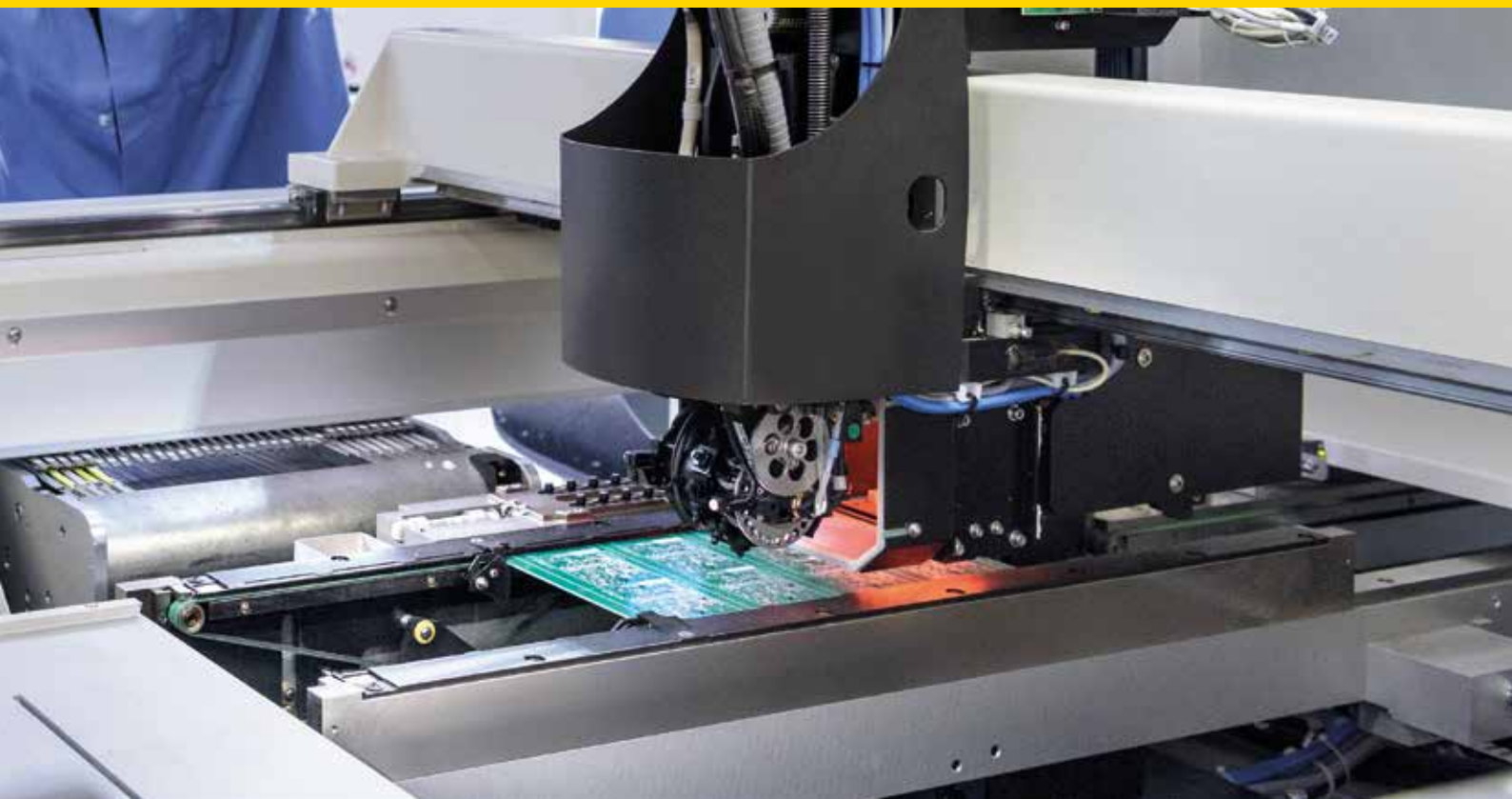




## Factors driving digital manufacturing in India



Source: EY analysis





# Digital Manufacturing Survey results



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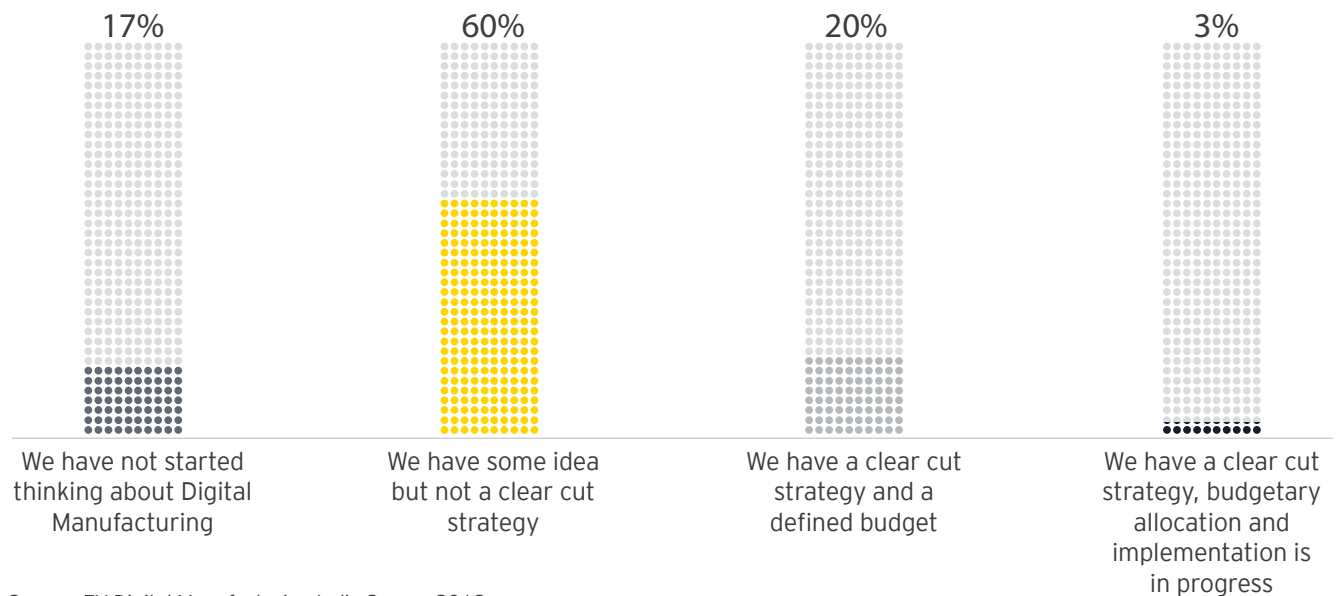
EY conducted a comprehensive survey of industry leaders and this section presents its findings. The findings highlight the understanding, preparedness, status, expectations on benefits, and key technologies from a Smart Factory initiative. We present the findings that may be useful for manufacturing companies to model their digital manufacturing strategy and implementation.

### 4.1 Digital strategy

Indian firms in the manufacturing sector are gradually starting their digital transformation journey. Companies are implementing various PoCs for achieving a more agile, flexible and interconnected manufacturing process. However, businesses are facing challenges while scaling up the PoCs and in some cases, it has not yielded desired results. A principal reason for this inability lies in the absence of a well-thought-out digital manufacturing strategy with a holistic view on business needs, digital maturity, long-term infrastructure creation, interconnectivity, feasibility of sensor installations, workforce capabilities, financial benefits, cyber risks, and change management.

An analysis based on the responses of representatives from companies presents a mixed picture regarding adoption of Digital Manufacturing in the industry. Very few of our survey respondents highlighted that they have well-defined strategy and a specific budget for digital manufacturing.

#### Does your company have a Digital Manufacturing strategy?



Source: EY Digital Manufacturing India Survey 2019.

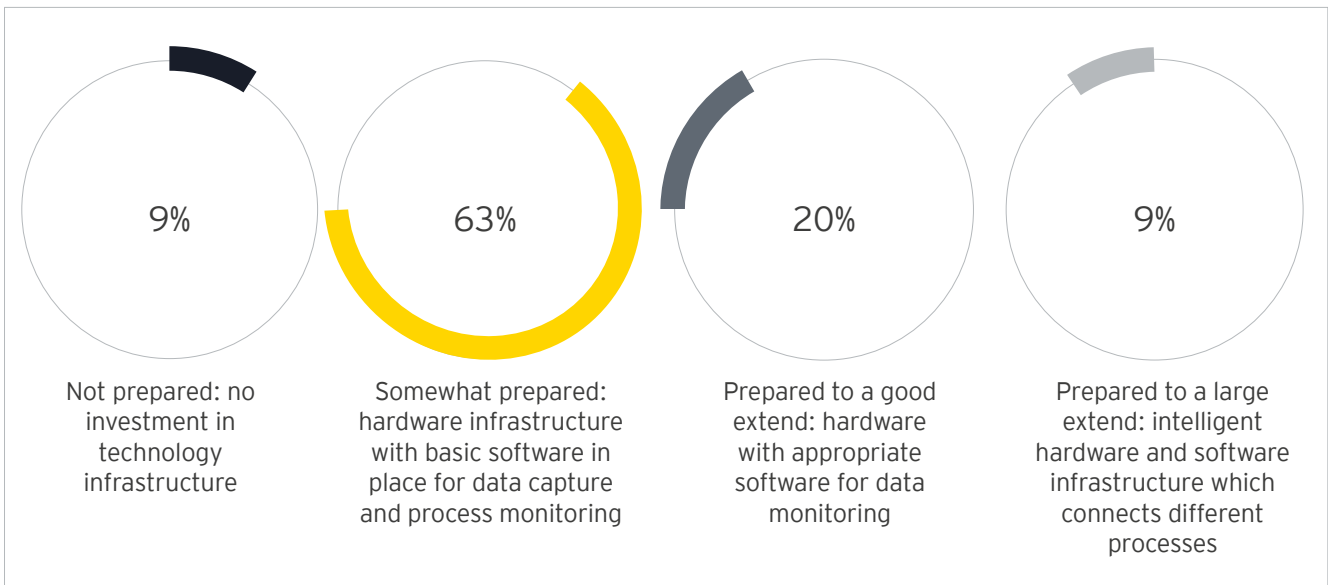
To successfully implement a Smart Factory initiative and address the issues that businesses face today, it is necessary to have an integrated strategy that identifies key functions, specific areas and technologies. Companies often start with a comprehensive assessment of its digital maturity across the manufacturing value chain. The outcome of this exercise is a clearly defined roadmap for various initiatives. It also lays down the phasing of initiatives depending upon the possible benefits, complexity of solutions, probability of success, and opportunities for scaling-up. The roadmap also defines key strategic elements related to technology such as, platforms, inter-connectivity, solutions, and protocols which form the basis of a successful Digital Manufacturing initiative.

## 4.2 Augmentation of technology

For Digital Manufacturing to be effective, it is important for companies to augment their infrastructure (hardware, software, connectivity, analytics). These companies also require an appetite for multi-disciplinary transformation programs. While technology is the backbone of Digital Manufacturing, its integration with operations is critical to achieve the desired improvements in performance. Adoption of advanced manufacturing techniques are likely to enable Indian manufacturers to remain cost competitive and gain a competitive edge globally. The changing global and Indian scenario is making it crucial for the industry players to consider leapfrogging technological levels.

Our survey results show that most Indian manufacturing firms still lack advancements in their hardware and software capabilities. Only 29% of firms indicate that they have appropriate hardware and software infrastructure with data capture and monitoring capabilities. Most firms surveyed did not have an intelligent hardware and software in place.

### Digital Manufacturing requires significant augmentation of technology infrastructure in terms of hardware and software, how prepared is your company in this aspect?



Source: EY Digital Manufacturing India Survey 2019.

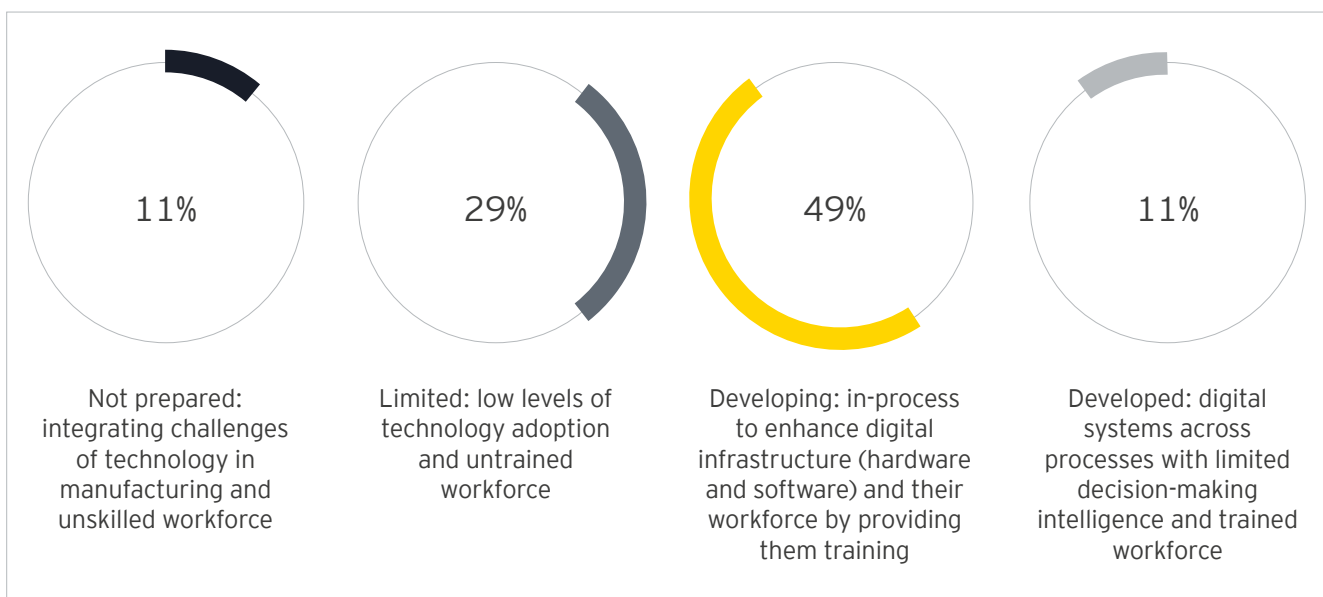
Despite the lack of technological advancements, Indian firms showcase a strong willingness to adapt and manage the change for technology infusion. Based on the survey results, only 29% of organizations are in the process of enhancing their digital infrastructure and upskilling their workforce. Some firms have already taken a lead in Digital Manufacturing adoption.

### 4.3 Changes in ways of working

While the focus during a transformation is largely on technology, companies need to address change management related aspects as well. Usually, technology interventions alter the ways of working and create a truly digital environment focusing on the shop floor and making it a transformational experience within factory premises.

The survey also indicates that companies realize that digital would alter the ways of working in the future. Therefore, most of the industry players are starting to augment their technology infrastructure and preparing their workforce for the digital world.

**Successful Digital Manufacturing would require altered ways of working in the near future. What is the state of your organization's ability to adapt and manage the change for a big technology intervention?**



Source: EY Digital Manufacturing India Survey 2019.

Digital Manufacturing promises to substantially alter the shop floor by creating a paper-less environment. It has the ability to take vast amount of information and can work on smart device. They can help decision-makers engage in faster decision-making by understanding advanced analytics and IT systems.

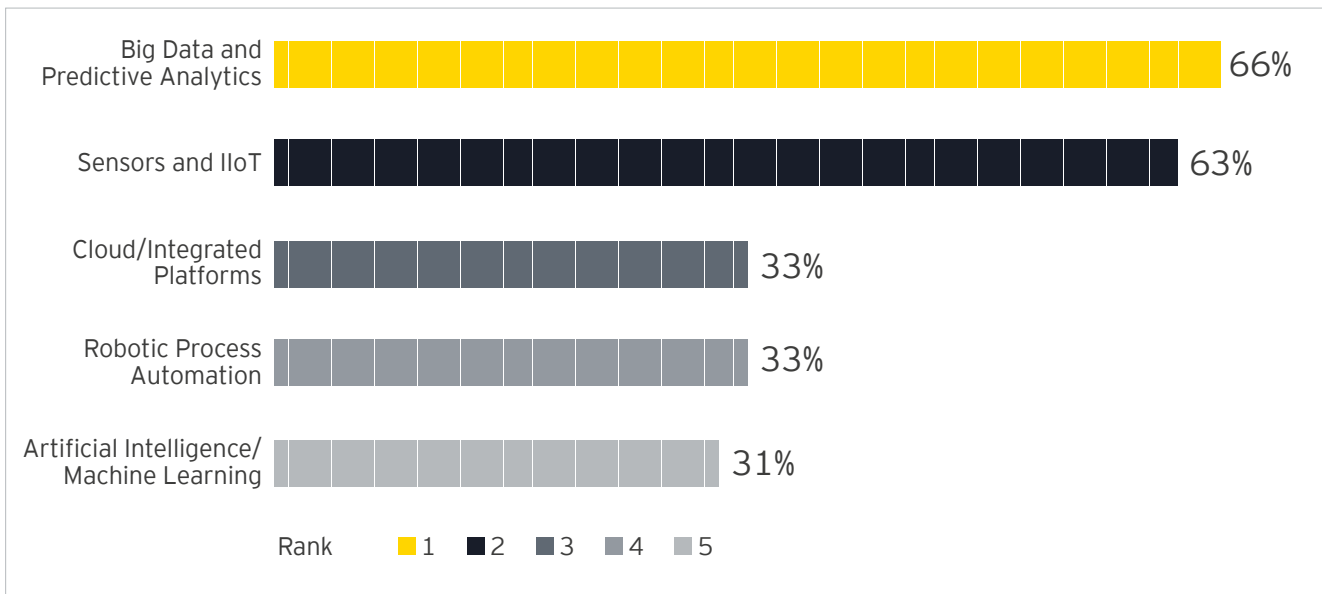
In a Digital Manufacturing environment, companies would need to define what information is available to whom and corresponding actions required from recipients of information. In a Digital Manufacturing environment, there will be distinction between machine-specific tasks and analytical tasks, such as collection of data, analysis developing insights and taking decisions. Normally analytical tasks would be done by supervisors, shift in-charge and sectional heads. Therefore, white-collared workers would become adept at analysis and optimization whereas blue-collared workers would be more focused on the execution.

### 4.4 Technologies that would help the companies in digital manufacturing

In the digital world, there is an abundance of new and emerging technologies that companies are adopting. Different functions within an enterprise devote efforts to understanding which technology or combination of technologies are best suited to bring about the desired changes. With the advent of IoT and the promise it holds, there is a higher adoption of sensors and connected devices in machine to machine communication. This has resulted in a massive increase of data generation in a manufacturing plant.

Our survey indicates that a combination of IoT, Big Data and Predictive Analytics are capturing the attention of manufacturers. There is a belief that collecting the right data through additional sensors and using advanced analytics would help in improving performance.

#### In what technologies would you like to invest in in the next one or two years (based on the ranking, with rank 1 being the most important) to transform your current manufacturing process?



Source: EY Digital Manufacturing India Survey 2019.

\*Kindly note, the ranking is based on weighted response rate. IIoT refers to Industrial Internet of Things

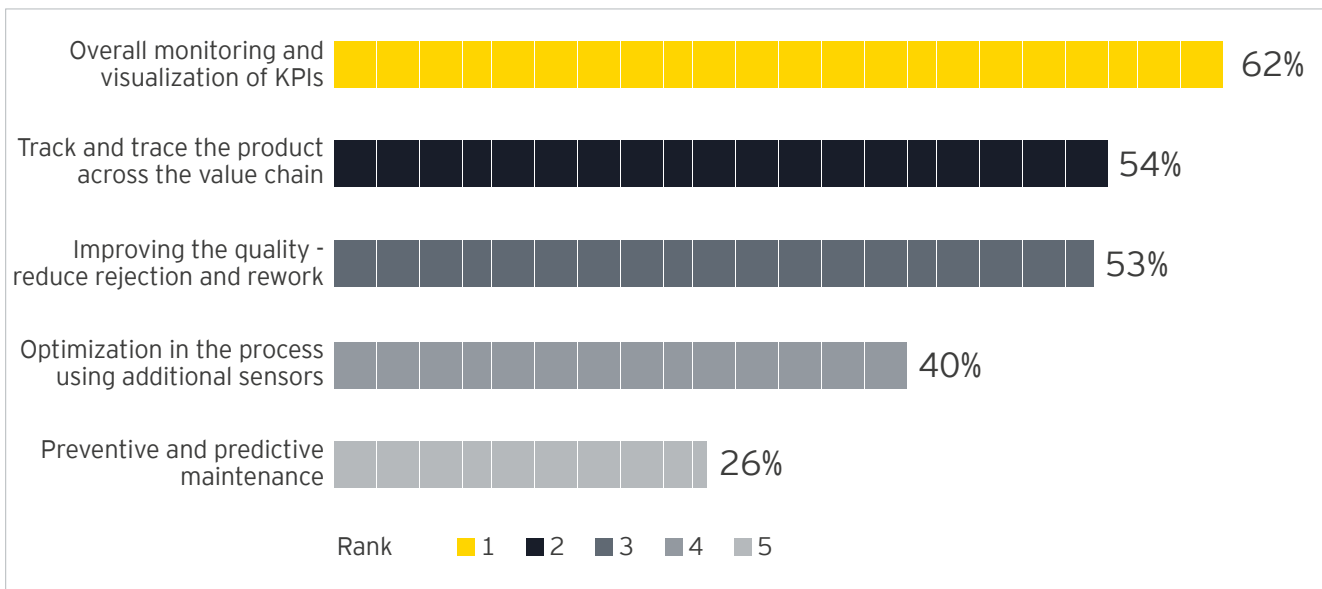
There are plenty of use cases in different industries that have used advanced sensors for additional data collection and Big Data Analytics to achieve multiple objectives. They include, yield and quality improvement, condition based predictive maintenance, throughput enhancement, analyzing product failures, and product design. Auto, auto-components, consumer goods, life sciences, oil and gas, industrial products, chemicals and heavy engineering are some industries that are taking the lead in Digital Manufacturing.

## 4.5 Factors driving Digital Manufacturing

The concept of connected factories and digital technologies help in addressing some of the fundamental challenges associated with a legacy factory. These include lower than potential output leading to lost revenues, higher capital and operating costs, higher inventories, lower utilization of manpower, and lower yields and quality. The reasons for these inefficiencies are rooted in frequent breakdown of equipment, unaccounted minor/micro stoppages, lower running speed due to asset deterioration, forecasting inaccuracy, smaller batch sizes leading to numerous changeovers, and archaic processes. Digital Manufacturing holds huge potential to uplift operational efficiencies in all aspects of the manufacturing function be it traditional (automotive, electrical, industrial goods) or high-end (miniaturization, printed electronics, precision engineering, aviation, aerospace) industries.

As per our survey findings, companies indicate that the largest benefits of the digital revolution would be through overall monitoring and measuring KPIs, track and trace and quality improvement. Optimization of processes and predictive maintenance are perhaps at the early stages of evolution.

### What areas do you think would your company benefit the most while adopting Digital Manufacturing (based on the ranking\*)?



Source: EY Digital Manufacturing India Survey 2019.

\*Kindly note, the ranking is based on weighted response rate.

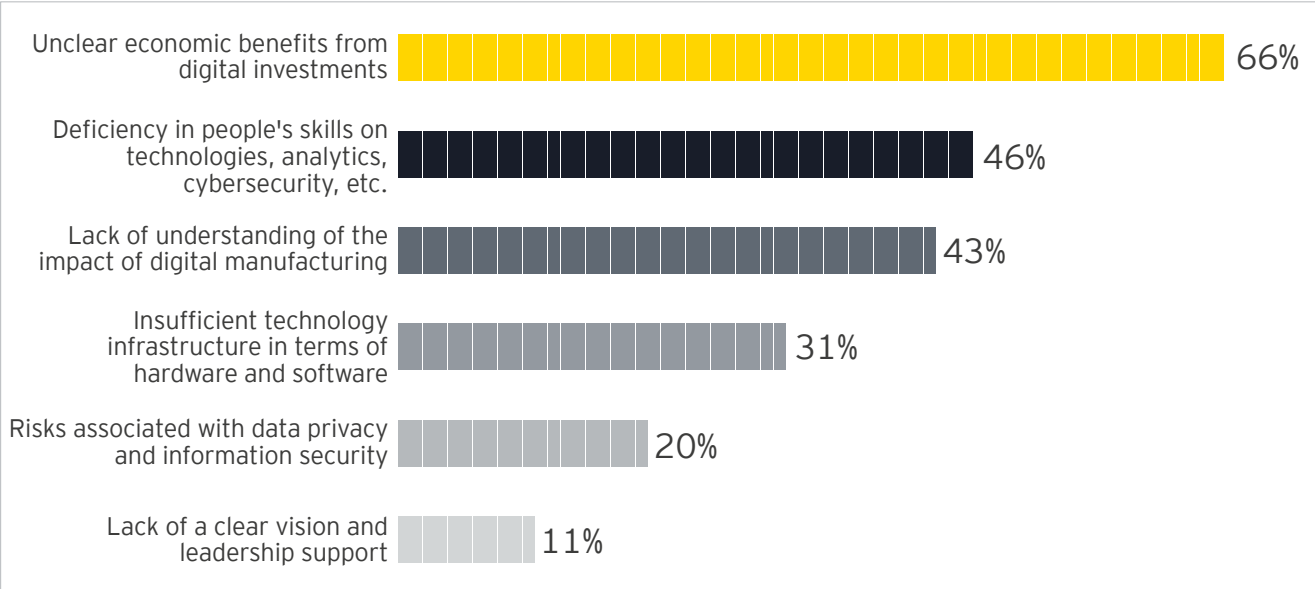
Globally, the manufacturing industry is at the center of a digital transformation and is seeking to exploit, disruptive information technologies, such as Cloud, Big Data, Artificial Intelligence and Internet of Things. While the most popular manufacturing technologies focus on monitoring, visualization, track and trace, and easy implementation, there are bigger potential benefits with process optimization and preventive and predictive maintenance. Although the technology is tough to implement, International Data Corporation (IDC) data highlights that 62% of global manufacturing businesses are looking to digitally transform through process optimization.

### 4.6 Roadblocks in adopting digital on the shop floor

Digital is transforming the work environment rapidly and the levels of performance that were unimaginable before. Fully-connected factories are set to make a mark across sectors in the near future. However, widespread adoption of Digital Manufacturing would pose a multitude of challenges.

Our survey reinforces the tough task ahead and the numerous challenges that the industry perceives will likely hinder adoption of Digital Manufacturing. While unclear, economic benefits and cybersecurity concerns appear as primary reasons behind low adoption. There seems to be a clear co-relation between the success of digital initiatives and top management’s understanding and commitment to these initiatives.

#### Identify the key challenges and risks associated in adopting Digital Manufacturing.



Source: EY Digital Manufacturing India Survey 2019

A typical shop floor in India is beset with lot of archaic practices and old ways of performing work. The intricacies associated with manufacturing, highest number of employees, a vast number of contractual workers, and low academic qualifications of workers makes the environment of an Indian shop floor challenging. Besides that, multiple plants spread geographically in remote areas, ageing machines and lack of basic automation pose challenges. In such an environment, transforming the shop floor using digital technologies may be challenging. Most manufacturing companies in India have adopted a wait-and-watch approach. Only a few are convinced about taking up a holistic Smart Factory initiative.

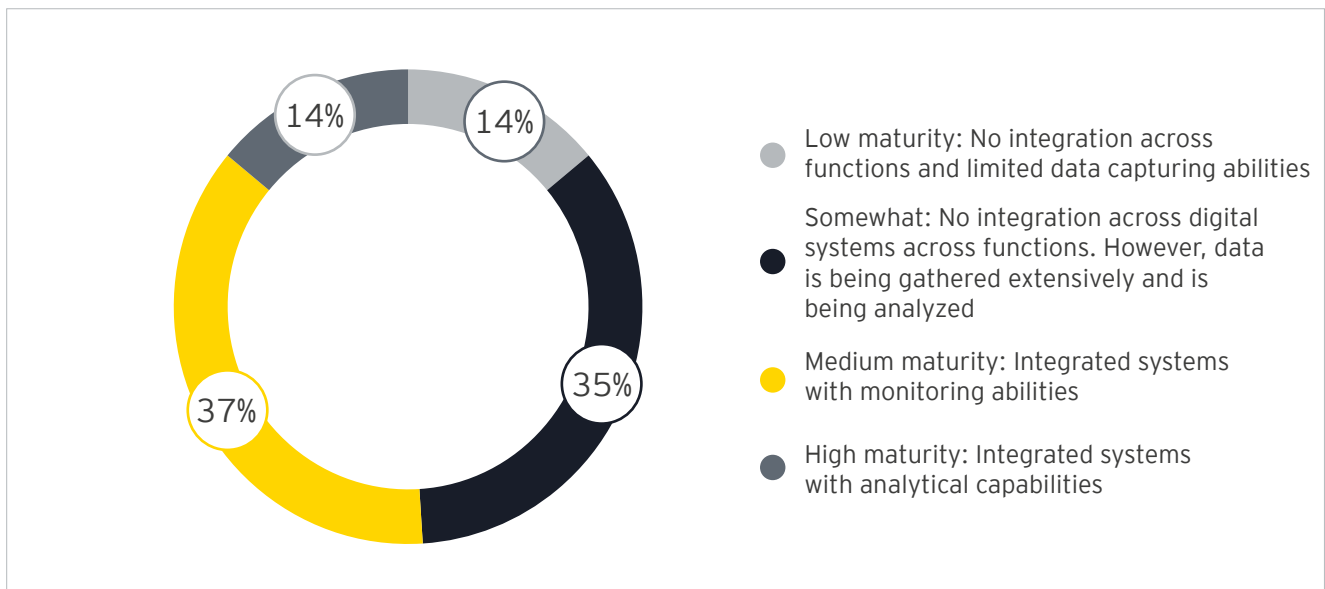


## 4.7 Technology integration

The manufacturing function is usually complex within an organization. In such a scenario, even technology integration poses a huge challenge with a multitude of systems and protocols. Decision makers in a factory find it difficult to visualize relevant metrics in one place.

Not surprisingly, most organizations in our survey have asserted that they have either somewhat or low maturity around integration of digital systems across functions. This emerges as a challenge for the adoption of Digital Manufacturing.

### What is the level of integration available for IT hardware, software and data architecture in your organization to realize gains from Digital Manufacturing?



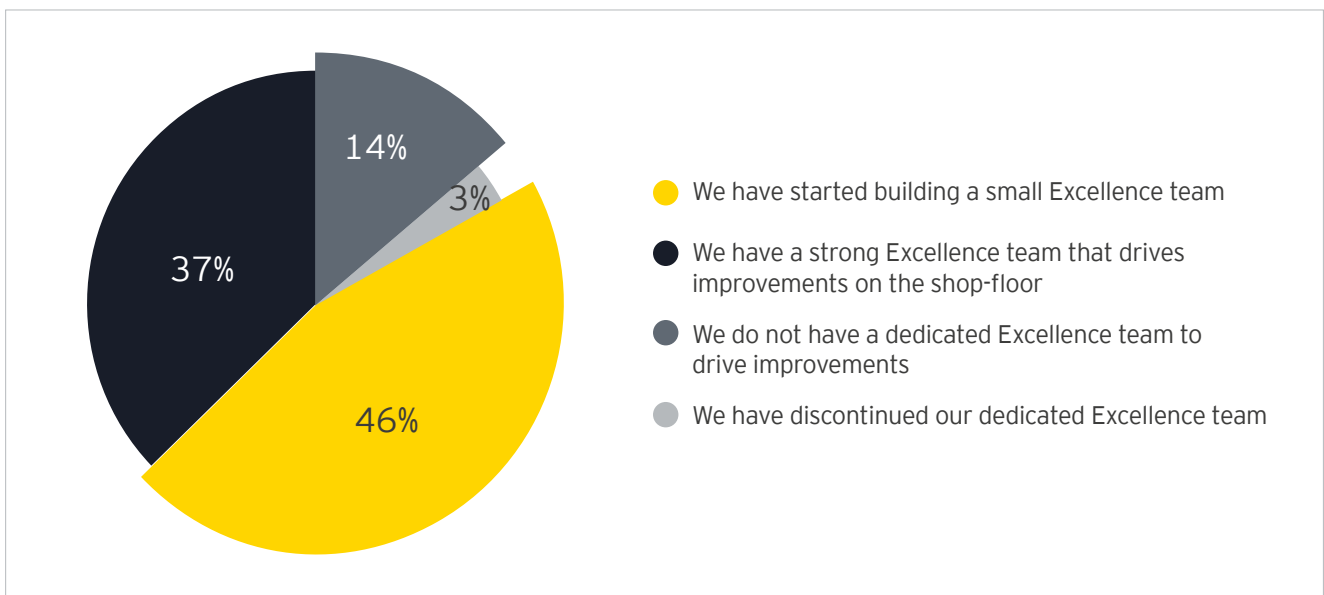
Integration between OT and IT is clearly low in a typical Indian factory environment. This integration is likely to be foundational for Digital Manufacturing to succeed. Usually, machines from varied manufacturers and eras would have very different protocols. As a result, accessing, collecting and analyzing data, would require huge efforts for system integration. In an environment where economic returns from Digital Manufacturing are not well-established, companies are reluctant to spend for technology integration.

## 4.8 Operational Excellence

Operational Excellence (Opex) is a dependable and reliable execution of business strategy that enhances performance. It is characterized by a culture of continuous improvement in every sphere of operations, and integrates various frameworks - Lean, Six Sigma, Total Productive Maintenance (TPM), Kaizen, 5S, and Total Quality Management (TQM). A strong Operational Excellence initiative ensures stable, repeatable and consistent processes. Analyzing collected data leads to actionable insights only if processes are inherently stable. This, digital initiatives would be successful only if an organization has mastered execution. While many organizations understand the significance of adopting these, very few of them have succeeded in the long-term implementation of operational excellence practices.

Leaders in our survey have indicated that either they have a strong Operational Excellence team or have started building the same. Thirty seven percent of the organizations are leveraging a dedicated excellence team to drive Operational Excellence programs in their organizations.

### Digital manufacturing is built on a sound culture of Operational Excellence (OE)/ Continuous Improvement (CI)/World-Class Manufacturing (WCM). Does your company use structured problem-solving frameworks?



Source: EY Digital Manufacturing India Survey 2019.

Having a strong excellence program would be vital for success in Digital Manufacturing. Analytical models need stability of inputs and processes to predict outcomes. Autonomous systems can only work in a precise and predictable world. Companies need to give sufficient attention to Operational Excellence initiatives while embarking on a digital journey.

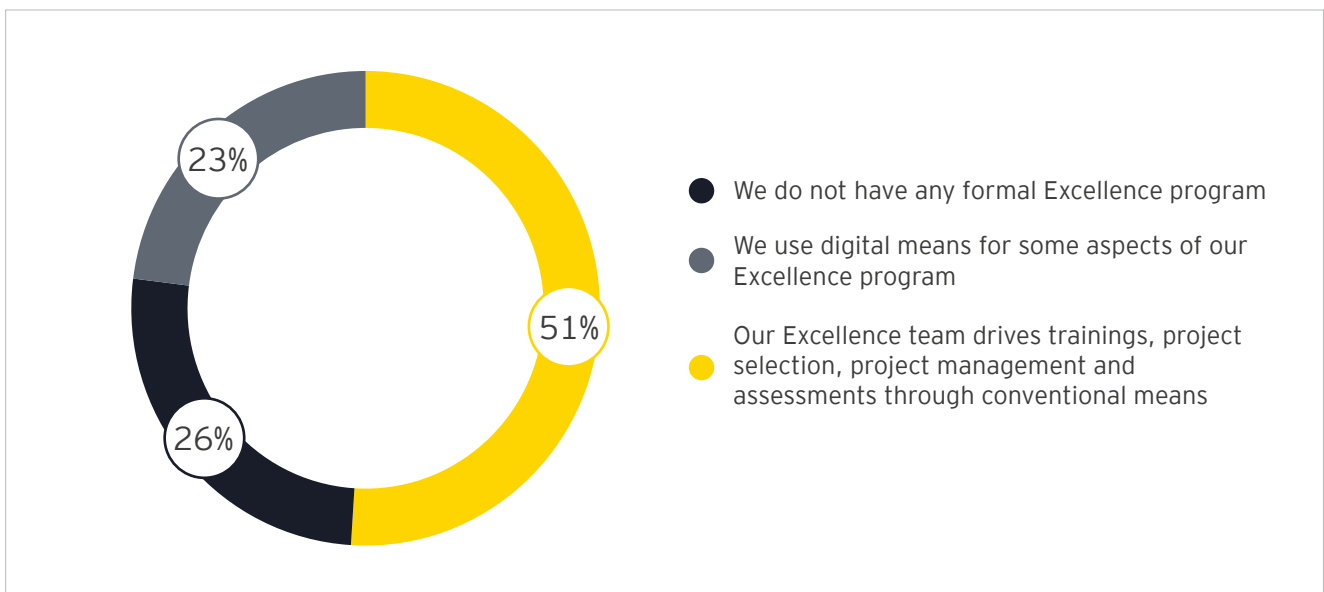
## 4.9 Digitizing Operational Excellence programs

Building and retaining a sound culture of improvement and transformation requires a rigorous approach using structured problem-solving frameworks. Opex programs, over the years, have suffered due to lack of skills. It is due to the dependence on inadequate skills that has led to an inability to standardize, scale up and sustain benefits. Often the Operational Excellence team comprises of people with different capabilities and varied work experiences. While the toolkit is vast, the knowledge for application of these skills usually lies with people in the Operational Excellence team. Improvement journeys are mostly driven by a few members of the team resulting in slower implementation and inability to replicate them in other parts of the business.

Manufacturing organizations realize this and have struggled to leverage technology to enhance their Operational Excellence programs.

The survey responses show that manufacturing entities are beginning to embrace digital applications for some aspects of Operations Excellence programs. These applications mainly drive trainings and project management.

### Does your organization have any digitized means to support, manage and run Operational Excellence programs?



Source: EY Digital Manufacturing India Survey 2019.

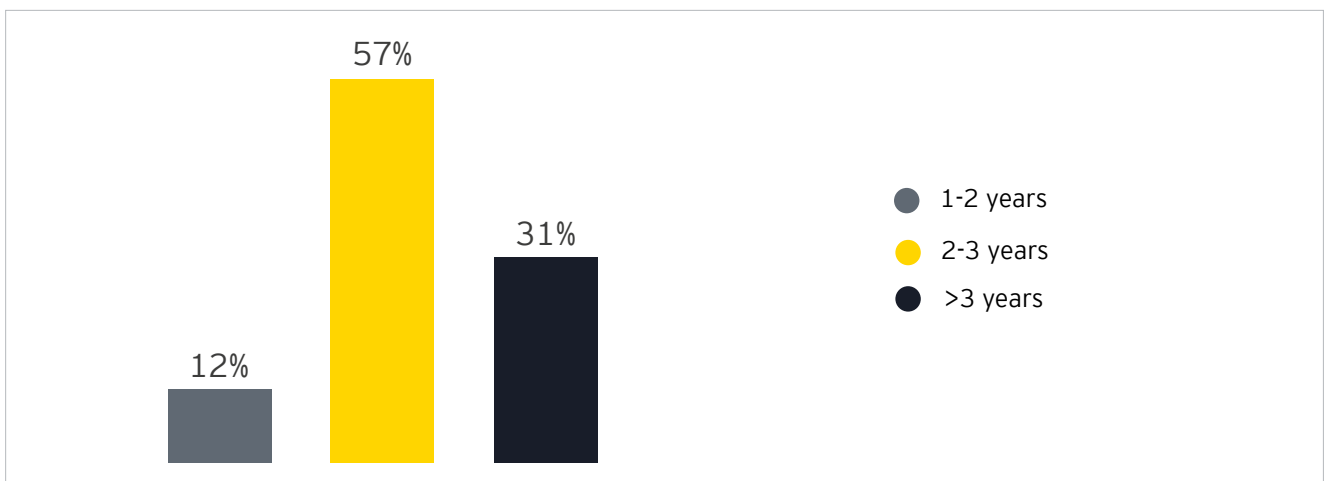
It is essential to have integrated digital applications to assist Operational Excellence teams. Within Operational Excellence, companies have tried to enable technology for only some aspects, such as, trainings and program management. Of late, digitized cloud-based intelligent tools to organize various Operational Excellence techniques and practices through maturity-based models are available. These tools also assess current state on various parameters, guide improvement journeys, quantify practice maturity and track KPIs. Digital platforms are likely to simplify and enhance the improvement journey through standardization and categorize the vast toolkit as per needs and stages of an improvement journey. A good digital platform may help significantly reduce dependence on a central team of experts and may act as a “virtual coach” to enable employees to adopt a continuous improvement culture.

### 4.10 Potential benefits of Digital Manufacturing

It becomes imperative for companies to adopt digital solutions which are relevant to their context, are scalable, and deliver value. Companies need to understand how the technology will evolve and how they can integrate it with their current operations to stay competitive. More than half of the organizations surveyed indicate that they are open to investing in Smart Factory/Digital Manufacturing technologies. They are interested in technologies that are relevant in the near future, as they are easy to integrate and can be implemented while ensuring that they break-even on their investment in a short-term.

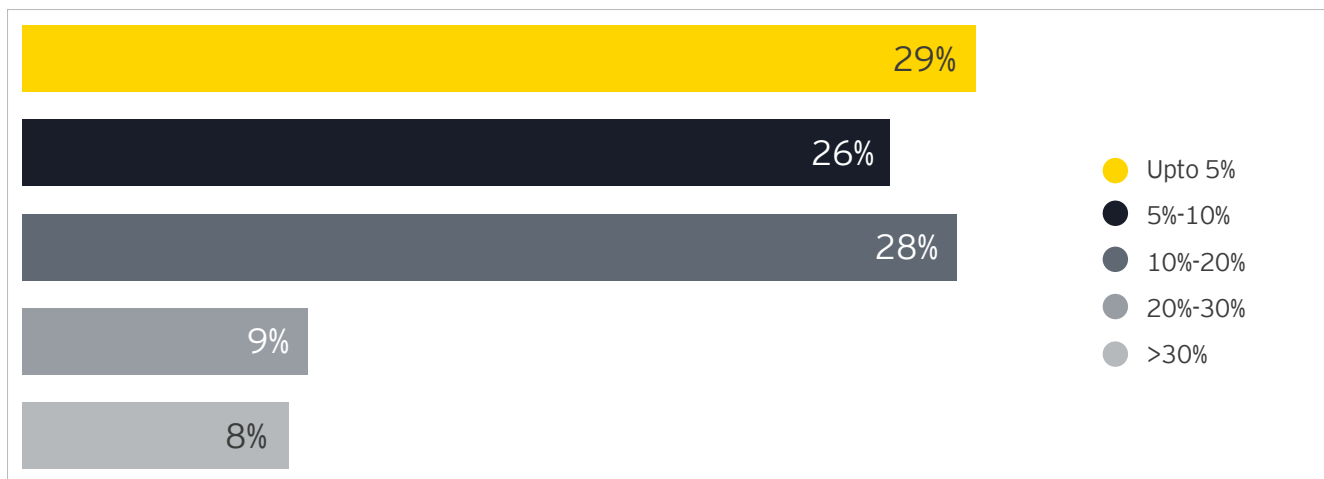
There is cautious optimism within the manufacturing community on the benefits of the implementation of Smart Factory. Most manufacturers believe that break-even on investments would take about two to three years and almost half of the organizations (45%) surveyed forecast the benefits to be above 10%.

#### What timeline do you foresee to break-even on Smart Factory/Digital Manufacturing investment?



Source: EY Digital Manufacturing India Survey 2019.

#### What benefits can Digital Manufacturing bring to your operations set up within a horizon of two to three years in terms of cost rationalization (COGS)?



Source: EY Digital Manufacturing India Survey 2019.

In our view, Digital Manufacturing is a big lever to improve efficiency and effectiveness within the shop floor. Globally, companies who have implemented full-scale digital solutions within manufacturing have reaped returns between 20%-30%. However, there is a need to implement such solutions prudently after understanding the pros and cons. While there are quantifiable benefits to be achieved from the implementation of Smart Factory, there are plenty of qualitative benefits that could boost the operations indirectly. These benefits include reduction in wait time, improved visibility across the chain, capability building across the hierarchy and functions, and faster decision-making.

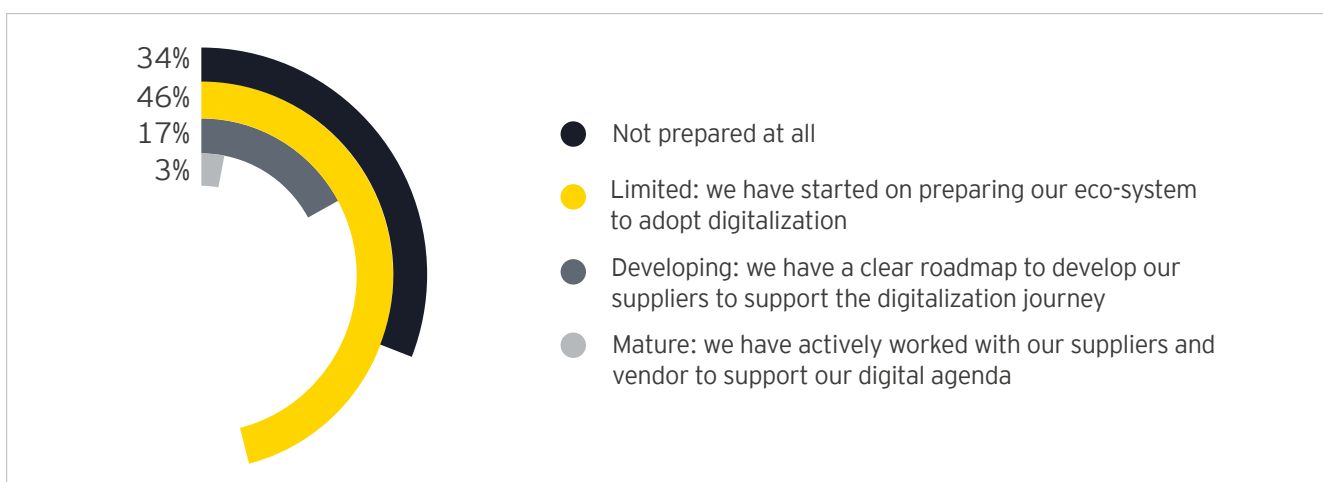
Though Digital Manufacturing is in its early days of implementation, it is expected that once Smart Factory gets embedded within the industry, data collected would enable stakeholders to make the right decisions and enable improvements in performance significantly.

### 4.1.1 Focus on building a cohesive ecosystem

Digital interventions work best with end-to-end visibility of data across the entire chain as there may be inefficiencies in-between various handovers. While lack of visibility and communication break-downs are common, duplications of activities between vendors and customers also exist.

Our survey shows concern among industry leaders over the maturity of the ecosystems that these industry leaders are operating. As many as 46% of the executives surveyed have highlighted that their ecosystem either has very limited maturity. 34% are not prepared for a Digital Manufacturing journey. Traditional suppliers of raw material, machines and others may face challenges in keeping up with ever-shifting trends. This may be due to their unpreparedness to adopt new technological advancements and scale of investments.

### Digital Manufacturing would also require maturity of the entire ecosystem including suppliers (raw material, machines, spares, technology, etc.). How prepared is your organization's ecosystem to adopt Digital Manufacturing?

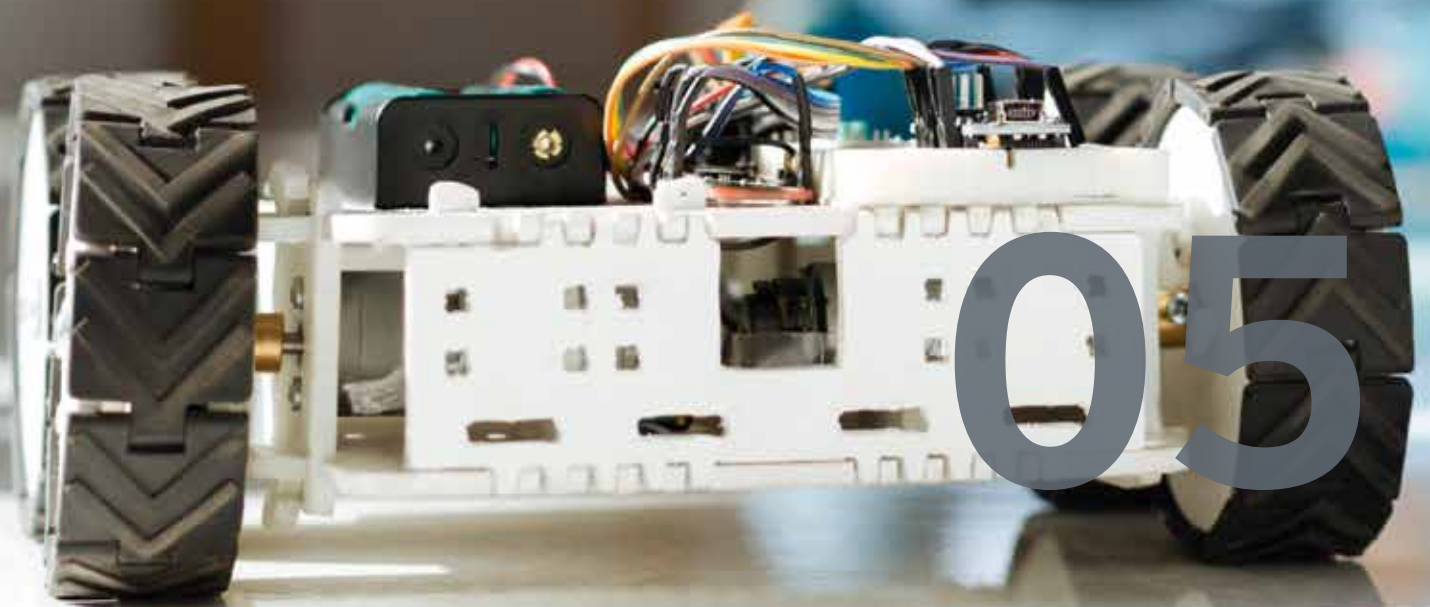


Source: EY Digital Manufacturing India Survey 2019.

Digital systems, with their improved computing capabilities, are able to process large amounts of data and show real-time status of raw materials, work in process and finished goods. This provides better forecasting, planning and execution. All this is leading to a collaborative environment. Apart from a supplier-customer interlinking, even vendors associated with capital goods and other accessories are accessing real-time data of their equipment installed at customer premises and giving vital insights on the performance of machines. This, in turn, aids them to optimize the next set of machines and provide information to manufacturers on how to operate and maintain their machines for maximum efficiency.



# View from the industry



This section presents views from senior leaders in the Indian manufacturing industry on how Digital Manufacturing will shape the future.



Digital Manufacturing is going to be the future for all manufacturing-oriented businesses due to increased customer centricity and personalized experience delivery ecosystems. These have been shaping rapidly owing to a robust integration of plants with the front-end and back-end value chains to drive competitiveness in both niche and large-scale manufacturing. This has become possible due to the advent of fully-automated plants such as, robotic workforce, three-dimensional and smart printing, smart shop-floor management, and process automation via Machine Learning. Further, promising developments in digitization such as, Machine Learning, Augmented Reality, and Virtual Reality will take the future of manufacturing to the next level.

**V Ram, COO, V-Guard Industries**



Today Digital Manufacturing technologies are being used for just dash-boarding and improving controls for the top management. Bigger benefits can be achieved if we use these technologies for simplifying and de-stressing life at the shop floor. Judicious use of emerging technologies to make a day in the life of an operator simpler would enable them to focus on value-added activities. While you must have a Ferrari if you want to win Formula 1, having a Ferrari alone will not ensure that you win the race. To obtain the right impact, it is therefore imperative to integrate operator experience with the best automation and digital solutions.

**Prashant Sharma, President, Group Manufacturing and Operations, Zydus Cadila**



Publishing a newspaper and delivering at the customers' doorstep is a complex process requiring integration of creative and scientific aspects. Today's reader gets a 100 pages full-color, highest quality paper without fail every morning. Pages are processed within minutes and multiple variants are printed in thousands of copies with micro-level precision. Such consistency is possible only by leveraging automation and emerging digital techniques to optimize every link in the manufacturing value chain.

**Snehasis Roy, Vice President (Technical), Times Group**



Digitizing the value chain is one of the top priorities of the operations-strategy agenda in manufacturing companies. The key is to ensure seamless integration of connectivity, intelligence and automation along with skill-building to achieve impact and cultural transformation to sustain it. Progressive organizations are moving from piloting of point solutions to delivering sustainable impact.

**Jason Gonsalves, Senior VP, Corporate Planning, IT, Materials and HR, Kansai Nerolac Paints Ltd.**



Digital Manufacturing is helping in improving productivity and reducing cost by shortening life cycles, increasing energy efficiency, and in utilization of resources.

**COO, Large Biotech Company**



While Smart Factory seems to be focusing on backend operations, in reality, it seems to be focused on customer centricity as it improves the reliability of processes and systems.

**Practice Lead, Digital Manufacturing - Metals and Mining at a large IT company**



A company needs to work on technologies to empower its people, who work at the shop floors, with tools to enable them to avoid human errors.

**President, Manufacturing at a large life sciences company**







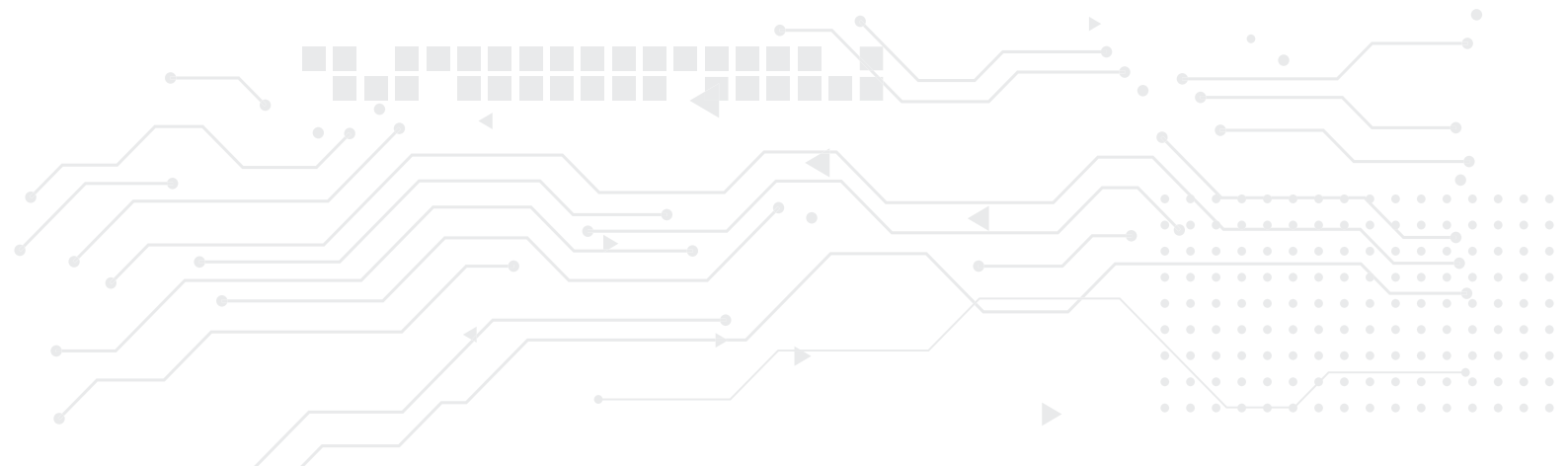
Smart manufacturing, Artificial Intelligence and Machine Learning are expected to improve processes and in future, they may lead to personalized treatment for patients.

**Industry leader at a large industrial automation company**



The fundamental problem lies in the lack of availability of expertise across emerging technologies along with the fear of implementing a system based on these technologies that manufacturing entities do not understand fully.

**Vice President, Global Industry Federation**



# Adopting Industry 4.0



**Vishnu Bhavaraju**

Director - Industry Solutions,  
Manufacturing, Microsoft India

06

## **Q.1 How can businesses in India capitalize on the factory of the future? How can the workforce be ready for it?**

Factory-of-the-future brings end-to-end visibility within reach. By connecting existing assets and equipment across global locations, manufactures can generate live performance data without disrupting their productions. With this information, a business can gain insights into what is contributing to performance variation among factories, that can be used to optimize performance across all sites. Today shop floor data is all over the place - manufacturing execution system (MES) may push some data into enterprise resource planning (ERP); production, quality and utilization data is in shift logs (mostly papers) and so on. Monitoring key metrics and decision-making suffers in such situations. Factory-of-the-future creates a real-time feedback loop empowering plant personnel to manage and optimize operations in real-time.

This kind of insights-based real-time operations management requires a very new data culture. We are talking about data and insights which were not considered to be the real-world scenario earlier. This requires awareness and imagination. Whether someone is in production operations or maintenance operations, or is a plant head or an operator, everyone should be made aware about the new possibilities with such insights. Roadshows and envisioning sessions like Microsoft Future Decoded provide the opportunity for the workforce to see the factory-of-the-future technologies in live action.

## **Q.2 What are the key steps that a manufacturing organization must take in its digital transformation journey?**

Earlier, data was generated only when a business did a transaction with a customer or a supplier. Today data is generated from every dimension. When someone posts a picture of their car on their Facebook, data is generated. When someone starts driving their car, data is generated. Even when a robotic arm on an assembly line consumes energy, data gets generated. The data from customers, products, people, and equipment creates the intelligence required to build transformed experiences and it is those experiences that further provide data to refine interactions. We call this the digital feedback loop. The digital transformation journey of a manufacturing company starts with discovering digital interventions required in their customer life cycle, production cycle, and supply chain cycle. Once digital interventions are identified, the organization must leverage digital technologies to implement those interventions, integrate data from these digital applications and leverage the insights to further refine the digital interventions in a continuous process.

## **Q.3 What role can emerging technologies like Artificial Intelligence (AI), analytics and Industrial Internet of Things (IIoT) play to transform manufacturing in an organization?**

Technologies like Internet of Things (IoT) and Edge Computing enable data gathering in the physical world, close to the customers, people, products and equipment. Blockchain helps companies create seamless supply chains. Digital technologies, like these, help manufacturing companies quickly deploy digital interventions for enhancing their customer experiences, optimizing operations, empowering employees and transforming their products.

Analytics and Artificial Intelligence (AI), combined with customer relationship management (CRM), help complete the digital feedback loop. AI and Analytics can monitor and predict product quality and performance, customer experience, reliability and efficiency of equipment, and safety of people.

## **Q.4 Can you share some insights on ways to accelerate innovation in Digital Manufacturing?**

Rapidly changing customer behavior, dynamic markets and evolving industry structures make the future uncertain. Today we cannot just extrapolate the past into the future. The future today is discontinuous, disruptive and different. Today's winning strategy is about creating the future. It requires rapid innovation that is not simply about technology, but requires business leaders to reinvent their core, re-imagine their future and embrace a different way of bringing together people, data and processes to create the future. This requires organizations to advance from running businesses on systems-of-record to innovating businesses using the systems of intelligence. By embracing the systems of intelligence, organizations can squeeze the concept-to-commercialization lifecycle.

### Q.5 In your view, how successful are Indian manufacturing firms in adopting Digital Manufacturing viz.-à-viz. companies in the developed and emerging markets. And what challenges do you see can the Indian manufacturing industry face while adopting Industry 4.0?

The adoption of Industry 4.0 in India is still in early stages. There are a few companies who have tasted its success. Others are either taking a wait-and-watch approach or are approaching this concept very cautiously by taking low-risk small-scale steps. Those who have adopted Industry 4.0 at scale are already moving ahead and have adopted advanced technologies like AI in their manufacturing operations. These companies have seen significant improvements in efficiencies and are now on the path towards innovating their business models.

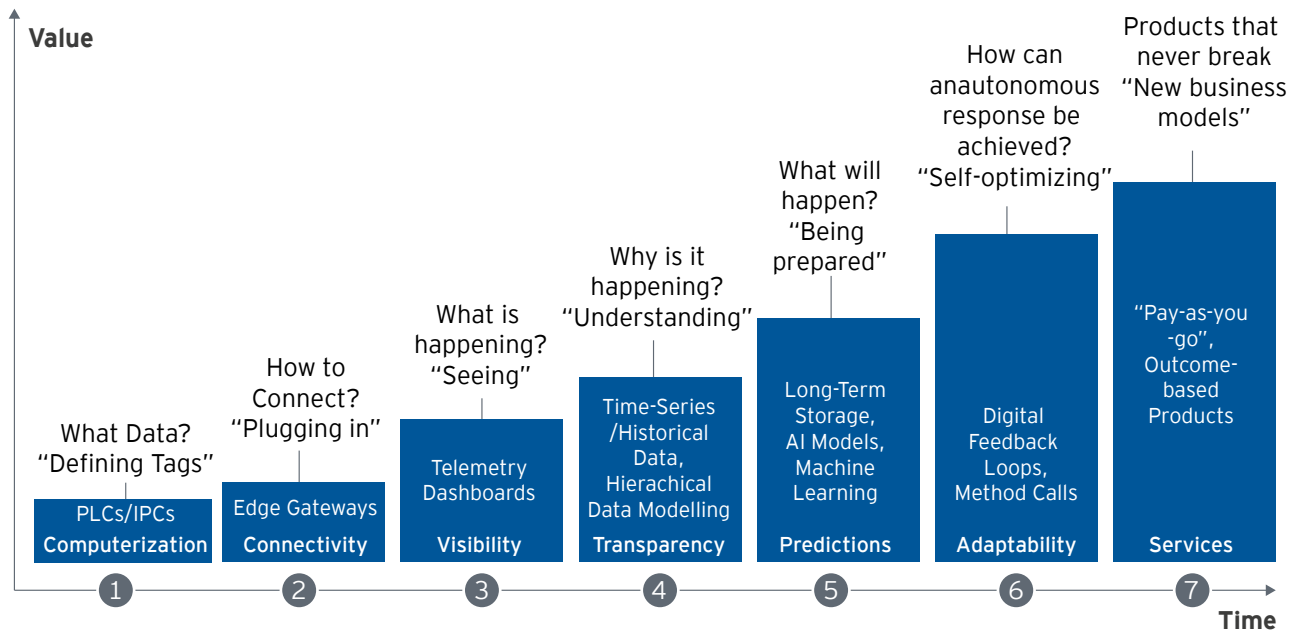
Then why others are not adopting Industry 4.0?

Today, the cost of sensors has come down to less than 1% of what it was 10 years ago. Similarly, the cost of industrial robots, drones, and three-dimensional printers have also reduced drastically. So, cost is not the factor. Today, India is emerging as a hub of Industry 4.0 startups. So, it is not the availability of talent or solutions. The cloud world has made the best use of Industry 4.0 technologies that are available, which signifies the availability of technologies. The following graphic on a seven-stage process could help us pin down the biggest challenge in adoption of Industry 4.0 in India.

Typically, when an organization considers an Industry 4.0 initiative, the view they take is up to Stage-3 (Seeing - what is happening). Just the "visibility" into operations does not justify investments and the initiative goes to the backburner or gets scaled down. Manufacturing organizations, business consultants and technology companies should work together to envision the future stages of the complete digital feedback loop to drive adoption of Industry 4.0.



## Digital Transformation for Industrial IoT



Source: Microsoft point of view on IoT





# Conclusion and recommendations

07

The study provides an insightful reflection of the awareness, readiness and status of implementation of Digital Manufacturing in India. It is apparent that manufacturing leaders have started exploring the adoption of Digital Manufacturing in their organizations. Some of them even have a strategy and a budget ready for Digital Manufacturing initiatives. However, lack of clarity on the economic benefits of the investments required to integrate hardware, software and technology infrastructure with digital systems and decision intelligence capabilities is acting as a roadblock for these organizations to move towards the adoption of Digital Manufacturing.

Industry leaders are employing emerging technologies to improve the monitoring of process performance through measurement and visualization of KPIs, performance tracking, throughput enhancement and quality improvement. However, there seems to be a wait and watch approach and a majority of leaders are waiting to confirm the success/failures of the existing PoCs before getting convinced about the adoption of emerging technologies such as AI, 3D printing, Machine Vision, and Augmented Reality at scale.

We believe that in an evolving world of well-connected consumers, systems and processes with tremendous ease in accessing information, manufacturing organizations are expected to be proactive, agile, flexible and adaptive. In order to meet these expectations, companies can leverage Industry 4.0 technologies to enable them to:

- ▶ Have real-time, on-demand information and visibility across the production chain
- ▶ Apply advanced analytics capabilities to refine process and production techniques
- ▶ Facilitate end-to-end integration with suppliers, channels, business partners and customers
- ▶ Gain agility in manufacturing processes like implementing new products, cutting down cycle and waiting times, changeovers, and feedback loops
- ▶ Reduce wastages (rejects, reworks, idle time, excess inventories) and be cost efficient

While some organizations have indicated their understanding towards the significance of structured problem-solving frameworks, Manufacturing Excellence Programs are not placed at a strategic level and have been diluted over the years into tactical initiatives. There have been issues concerning the scalability, standardization and sustenance of these programs. But today, cloud-based digital tools provide an opportunity to organizations to not only revive Operational Excellence initiatives but also to put them back on the strategic agenda of a firm.

It is therefore essential for all the companies, be it small, medium or large, to embark on the journey of implementing Smart Factory to remain competitive and achieve global success. It is also essential to remain in the race with competitors and attain a world-class status.

The time to act is now and as a first leg of the journey, it is important for companies to identify and onboard the right talent and collaborate with the right partners who could provide them with a platform, hardware, sensors, and an application. The need of the hour is to quickly formulate their Digital Manufacturing strategy that takes cognizance of specific needs and utilize data as the central asset. While having the right strategy is only a beginning, a clear roadmap defining the functions and combination of technologies would help companies to move forward.

Losses on the shop floor are enormous and most performance gaps are hidden. In the last few years, the manufacturing sector has adopted various techniques to identify and reduce these losses. However, now we are at a point where older methods are not moving the needle significantly and emerging technologies are considered probable to enable companies to move towards zero losses.



# Digital Manufacturing at EY

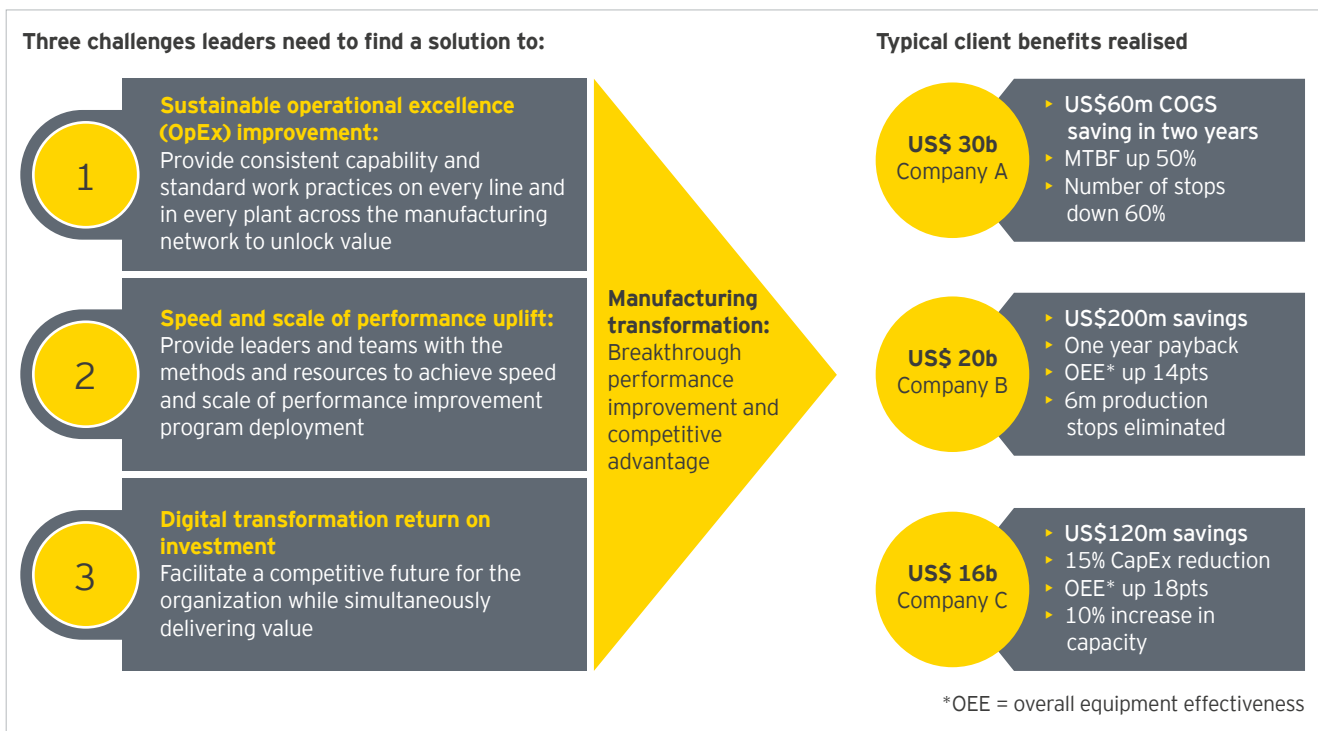
08



EY India has a holistic point of view on how organizations can transform to Digital Manufacturing and reap handsome financial benefits from it. As a unique approach, there are some differentiated assets such as, a digital Operational Excellence platform (EY Catalyst), and our suite of smart apps that digitize several work processes related to maintenance, energy management, quality, and material flow on the shop floor. All these assets are over and above the IoT-based solutions EY offers and can provide companies with a complete system that augments their existing initiatives.

## EY Smart Factory

EY's Smart Factory suite of assets is a four-box approach that relies on the foundation of a world-class manufacturing excellence system (Box 1). Through a people-centered digital platform (Box 2) and powered by execution applications (Box 3), EY Smart Factory embeds manufacturing excellence by arming the shop floor with dynamic predictive Data Analytics, Virtual Reality and Artificial Intelligence to deliver unprecedented performance. Finally, our IoT-based specific solutions (Box 4) can propel organizations towards a full-fledged digital journey.



Source: EY Smart Factory thought capital

## EY Catalyst: an industry leading cloud-based platform

EY Catalyst digitizes a company's Operational Excellence initiative and significantly enhances the performance improvement programs of the companies in supply chain and manufacturing. It allows companies to access an extensive Intellectual Property (IP) database that contains tens of thousands of supply chain and manufacturing operational capabilities in multiple languages that has been in use for more than 20 years in major companies across Europe, the US, Latin America, Asia-Pacific and Australia. This allows companies to tap into a rich repository of leading practices, including self-assessments, custom-built Operational Excellence journey maps, training tools and analytics capabilities, at any time to help them plan, manage and monitor their operational improvements. EY Catalyst brings these Operational Excellence tools directly to the shop floor through mobile apps that empowers companies to put Operational Excellence in the palms of their employees.





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