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# Immersive

# Outlook

**Fifth edition**

Mastering the art of  
long-term value creation



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In developing countries, driving societal change is as important if not more than business change, emphasises **Dr Arif Dowla**, Group Managing Director, ACI Group in Bangladesh, in an insightful conversation with **Arnab Basu**, PwC India Advisory Leader. **44**

# Foreword

An eminent industrialist had once narrated how in the manufacturing operations business, just-in-case and just-in-time are equally important as inventory management strategies. He spoke about how disruption has brought about sweeping changes, mostly for the better, and how ‘vendors’ have now transitioned to ‘partners’ in the global value chain.

Admittedly, Industry 4.0 has moved manufacturing operations to the next level through actionable intelligence and greater harmony between people, processes and equipment. Several pertinent answers have surfaced by asking just the right questions, feeding into quantifiable long-term value creation. The power of people and ideas has helped navigate bottlenecks, automate operations and infuse sustainability at every touchpoint in this space.

Mastering the art of long-term value creation then forms the overarching theme of this edition of Immersive Outlook. The articles and C-Suite interviews address disruptions, and recommend designs and collaborative process improvement strategies in the operations management space to prevent rather than detect defects, reduce waste and improve operational processes, manufacturing quality and business results.

**Vadiraj Kulkarni**, CEO, Paperboards and Specialty Papers Division, ITC, for instance, emphasises the need for asset-intensive industries to focus on design, automation and incremental change in order to excel. In an interview with **Pallab De**, Partner and Manufacturing and Operations Consulting Leader, PwC India, the CEO traces the company’s business excellence journey and outlines why top management’s commitment is necessary to drive digital transformation.

The thought resonates with **Dr Arif Dowla**, Group Managing Director, ACI Group in Bangladesh. In his insightful conversation with **Arnab Basu**, Advisory Leader, PwC India, he agrees that artificial intelligence (AI) can provide companies with a competitive edge, although AI, to him, is more of an elaborate statistical function. While touching upon the various businesses of the conglomerate and the vision behind these, he prioritises societal change over business change, and the importance of educational apps for unlocking the creative potential of children. He also goes on to focus on the importance of sensor-based data in tapping opportunities available in the manufacturing space.

Manufacturing executives, the world over, have undoubtedly bought into the idea of advanced analytics, data security issues notwithstanding. That forms the focal point of the article **Using AI to fast-track manufacturing operations**. Co-authors **Pallab De** and **Prahalad Chandrasekharan** elaborate on ways to harness the transformative potential of AI while simultaneously underlining the risks that could surface with such a technological leap.

Medium-sized businesses are growing exponentially. India has the third largest number of medium-sized family-run businesses after the US and China, despite challenges on their growth path. **Prahalad Chandrasekharan** and **Arun Raychaudhuri** examine the top five challenges

in **What gets measured, gets maximised**. The authors propose potential solutions that factor in risk mitigation and the aptitude necessary to anticipate and respond to disruptions to business continuity.

Business continuity today entails the adoption of sustainable manufacturing practices. Increasingly eco-conscious consumers also prefer environment-friendly enterprises. It is therefore imperative for businesses to align with this consumer want and simultaneously adhere to sustainability reporting requirements. In **Four ways to embrace and adopt sustainable manufacturing practices**, **Mandar Mahajan** and **Amit Kumar Kaushal** recommend four ways to

effectively infuse sustainability into manufacturing operations.

They say a tree with strong roots laughs at storms. As the manufacturing operations ecosystem has multiple stakeholders, it is important to ensure that the tree of operations grows strong roots. The perspectives offered in this edition of Immersive Outlook are meant to catalyse that growth.

We hope you find this edition insightful. Reach out to us if you would like to have a more detailed discussion on any of the aspects we have touched upon.

**Vishnupriya Sengupta**  
Senior Director, Markets



# ‘Asset-intensive industries can excel if they focus on design, automation and incremental change’

In an interview with **Pallab De**, Partner and Manufacturing and Operations Consulting Leader, PwC India, **Vadiraj Kulkarni**, CEO, Paperboards and Specialty Papers Division of ITC, explains the inflection points that operations management is going through, highlights how asset-intensive industries can accelerate their business excellence journey and outlines why commitment of top management is necessary to drive digital transformation.



Pallab De (left); Vadiraj Kulkarni (right)



## Excerpts from the interview

**Pallab De:** Welcome to this edition of *Immersive Outlook*, Mr Kulkarni. The operations management system has undergone a lot of changes in the last three to four years. What do you think are the challenges and the benefits of that?

**Vadiraj Kulkarni:** Yes, thanks for inviting me. I would say there are two inflection points the industry is going through. One was, of course, COVID. I think all of us are familiar with the unexpected changes it brought in, especially in terms of complexity in the supply chain. We had challenges, even moving material from one part of India to another because of a lot of issues like lockdown, transportation issues, unavailability of truck drivers, etc. The second point is the geopolitical environment of the past one-and-a-half years. We may think that it is impacting only a couple of countries, but I think it is affecting far more because today supply chains are connected globally.

We had always done a risk assessment based on certain known factors. There could be

floods, transport strikes and labour unrest, but we never envisaged that the globe would be affected by a pandemic like this one. Normally, nobody knows when geopolitical issues will occur and how and what kind of implications they will have on a lot of organisations like ours that are manufacturing and connected to the globe.

So, I think our risk management strategies have completely changed. The framework has gotten broader. We have got more variables. We have people who are smarter, who can think on their feet, who can look at different kinds of risk scenarios, contingency scenarios, and be better prepared for them. Our supply chain has become more agile than it used to be.

**Pallab De:** Thank you for this. And do you foresee similar kinds of challenges will continue to arise in the future?

**Vadiraj Kulkarni:** I wish I knew. Surely not a pandemic kind of situation, but I think there could be a variety of factors that affect supply chains, and we are slowly getting better prepared for these.

**Pallab De:** But do you think that we are now better prepared as an industry to handle such situations in the future?

**Vadiraj Kulkarni:** Not only us, but I think even our business associates, partners, downstream manufacturers, upstream suppliers, all of them have become smarter. They're looking at sourcing models, they're looking at China Plus One kind of sourcing, and we got some benefit out of that. But we also have challenges out of that.

**Pallab De:** Tell us a bit about your journey in ITC. I think this is the only company you have worked for so far.

**Vadiraj Kulkarni:** Oh, yes. In fact, the current generation is very surprised that somebody can spend 27 years in an organisation. It's been an exciting journey, starting as a utility engineer, working in manufacturing, supply chain, working in a large division like tobacco, the cigarette business, and working across multiple factories. Finally, I moved into the paper and paperboards business which is far more competitive and tough while it is growing.

**Pallab De:** It's very encouraging to hear this. The ITC division particularly has been on a business excellence journey for the last two decades. Can you please tell us a bit about the journey? And also, if you have any suggestions for asset-intensive organisations that are starting their business excellence journey?

**Vadiraj Kulkarni:** I think for the pulp and paper industry, which is integrated with forestry, plantation, downstream processes and engagement with customers, sweating the assets is key. Also, improving the quality table. So, how do we do it? One option is to recruit the best managers and push them through improvements, through capital-intensive projects or via some new tools and technologies. But I think this division realised that if you want to have a sustained culture of improvement, we must involve everybody.

The business excellence platform that we've been working on with PwC for many years now, I think, is based on the fundamental assumption or hypothesis that there is always scope for improvement – if the improvement has to happen, it cannot be just a quantum improvement once in a while. If innovations are to happen, if improvement practices have to be established, it has to happen every day.

How do you make it happen? Managers will come and go. They will retire, they'll get transferred. But if you see the workers, the employees, the service providers, they mostly stay with you. So, if you involve them from day one of their entry into the factory through a very enabled kind of structure, it'll help us to have ideas for continuous improvement. For industry colleagues who may want to start on this journey, the commitment of top management is very important, in terms of the time that it commits, the time that you allot for hearing out the issues, spending time on the shop floor with them, also having the right structure in place.

We work with PwC, a process-based organisation, which will enable continuous improvement so that the issues between sales and production, production and engineering, production and quality, all these get resolved by standards and structures. We also need to commit resources, have centrally dedicated people at the units. At the same time, we need to provide them with IT platforms, tools, techniques and financial resources to manage this change. And it is very important to have ongoing recognition and rewards.

**Pallab De:** That's really great to hear. There are a lot of asset-intensive industries coming up in India. And of course, the Government is also pushing for it. What would be your suggestion for those setting up asset-intensive industries to be successful in the market?

**Vadiraj Kulkarni:** It has to start from design. If you're setting up a new manufacturing plant, or adding new capacities, go with the best in terms of technology. Also, build process automation. The third aspect is to empower people to innovate so that they make small improvements, etc., what we call Kaizen in Japanese. For example, at our pulp mill, without capital investment, we increased the throughput by 20% using digital technologies and consulting with experts, and that's significant because that is directly going into our bottom line without the addition of deployed capital.

So, I think asset-intensive industries can do a lot of things in order to improve process efficiency, and even the business excellence platform has helped us to ensure that the reliability of the plant goes up.

Some of our machines are operating at the world's best downtimes.

**Pallab De:** This is very encouraging. You know that the Government of India is giving a push to manufacturing and they want the manufacturing contribution to the GDP to go up to 25%. What do you think will make the Indian paper industry more competitive?

**Vadiraj Kulkarni:** I think one of the things is that we must dream big, which means we must set up large capacity plants. The moment we set capacities on a small scale, even if you're able to rebuild them and increase





**Pallab De (left); Vadiraj Kulkarni (right)**

throughput, you'll always be stuck with these small capacity inefficiencies. The second thing is to sweat the assets, have reliable machines and technologies, and the right people to upskill. Then comes our quality table.

And the third is green credentials. Indian industry has already started this journey. But if you're able to significantly bring down energy intensity, water intensity and people intensity, as well as bring in more renewable sources of energy, that will also make us competitive. And lastly, it is about having back-end integration in terms of fibre supplies. India is a fibre-deficient country. At ITC, we have massive agroforestry plantations working with small and marginal

farmers. And that will ensure that farmers also get benefits. They are partnering with you on your journey of growth. At the same time, you're able to secure raw materials.

**Pallab De:** Innovation is key in the paper and paperboard business. What's your plan in terms of enhancing your product portfolio in the short and long term?

**Vadiraj Kulkarni:** Yes, that's a good question. At least as far as virgin paperboards, premium recycled boards or decorative papers are concerned, we have a wide portfolio. In fact, globally, very few can supply paper

from 21 GSM to 450 GSM. Our latest laminator can go beyond that. Given this range, we have reached maximum end users and converters. The next phase of growth will come from these products which are going to be substituting single use plastics.

**Pallab De:** The Government has also banned single-use plastic last year. Do you see the demand for these kinds of paper products, which are replacing single-use plastics, increasing by leaps and bounds in India?

**Vadiraj Kulkarni:** There are corporates, MNCs and brand owners who are very committed. They want to replace plastic gradually if they have cost-competitive alternative solutions.

**Pallab De:** So, we know that ITC is focused on sustainability and eco-friendliness and a while ago you mentioned your afforestation drive. The Government of India has set a target of increasing the carbon sink by 2.5–3 billion tonnes of CO2 equivalent by 2030. And your Bhadrachalam unit has just got the Greenco Platinum Plus rating. Why don't you tell us a little bit more about afforestation and how it is going?

**Vadiraj Kulkarni:** We have afforested more than 9,00,000 acres across India. And I think the way we are growing in terms of capacities, we want to double this in the next decade.

We are working on new clones. In the last three years, we have released 10 new clones of Eucalyptus and Casuarina. We have covered different models of working with farmers. We work directly as a business on agroforestry plantations with farmers, investing in them. We provide farmers with saplings at nil cost or subsidies.

**Pallab De:** There are many other industries that are trying to work with farmers. Any specific input for them to earn the conviction and buy-in of farmers?

**Vadiraj Kulkarni:** I think the trick is to ensure that there is an assured market linkage and that we provide them with quality inputs, saplings and agri technical services. In fact, we have launched a mobile-based platform to share

best practices with farmers. I think it's a very long-term commitment, a partnership, and not just about looking at farmers only as suppliers. I think there is trust and confidence that we as an industry have to gain.

**Pallab De:** Your division is collaborating with Invest India. Can you tell us more about it? Do you believe that young India is going to help us achieve the sustainability goal?

**Vadiraj Kulkarni:** I think, yes. We came across Startup India and Invest India. We reached out and we had a lot of interest and evaluated various ideas. We are working with start-ups who need scale, market linkages, and financial support to help them come up with ideas so we can integrate those with our solutions and scale up.

**Pallab De:** Any success story on this front?

**Vadiraj Kulkarni:** Right now, it's confidential and we are evaluating them, so hopefully we'll have some success stories soon.

**Pallab De:** Nowadays, digital transformation is the buzzword for any industry that you talk about. Can you share your digital transformation journey with us? How are you using technology to remain ahead of the curve?

**Vadiraj Kulkarni:** I think ITC in general and the paper business specifically have always been leading in terms of the best technologies. We just upgraded our recovery plant to a high-pressure recovery boiler, the first in India, and that is helping us save 1.5 lakh tonnes of coal per annum. We also went for large-scale implementation of digital transformation. We used the internet of things (IoT), artificial intelligence (AI), machine learning (ML) and business analytics tools. In the last three years, we have got 2.5% EBITDA growth only through these digital interventions. And we have also set up an Industry 4.0 Centre of Excellence.

**Pallab De:** It's not just the paper industry, but other industries are also trying to digitalise. What is your suggestion for them?

**Vadiraj Kulkarni:** I think we must look at the potential application of digital technologies in our operations. We must support the right resources, give them approvals; let them try, fail and experiment. We must celebrate early successes, form a dedicated team and invest in the capabilities of employees.



**Pallab De**

**Pallab De:** Whether it is business excellence or digital transformation, you are a pioneer. What are you doing to upgrade the skills of your employees so that whatever changes you have brought to operations and manufacturing would be successful?



**Vadiraj Kulkarni**

**Vadiraj Kulkarni:** In typical organisations, when you see some successes, you close them as projects and move on. We didn't want to look at this as a project. We wanted to look at it as an ongoing programme which can help us to undertake sustainable digital transformation. We have Industry 4.0 Centre of Excellence and they train our managers. We have also tied up with digital learning platforms.

We are setting up our digital lab very soon to provide immersive learning opportunities with new technologies.

**Pallab De:** I can see a lot of initiatives and new thinking here. Thank you, Mr Kulkarni, for your time.

**Vadiraj Kulkarni:** Thank you.

# What gets measured, gets maximised

As medium-sized businesses seek to expand and grow, they encounter myriad challenges.

**Prahalad Chandrasekharan and Arun Raychaudhuri** underline the top five challenges and propose potential solutions which can help these companies optimise productivity and achieve sustainable growth.

## Did you know...

- India has the third largest number of medium-sized family-run businesses after the US and China.<sup>1</sup>
- There are, as of 2022, approximately 40,000 registered medium-sized enterprises in India.<sup>2</sup>
- The number of small enterprises that elevated themselves to the medium category increased by 75% from 3,699 in FY22 to 6,474 as of March 2023, signalling an important inflection point.<sup>3</sup>
- As many medium-sized firms strive to rise in terms of scale and growth, India may add 1,000 more companies to the list of large companies.<sup>4</sup>
- Most medium-sized enterprises in India are still run by families.
- Statistics reveal that 70% of family-run medium and small businesses fail before they can make it to the second generation and almost 90% don't make it to the third generation.<sup>5</sup> Reports indicate that 97% of them do not have family constitutions or succession planning documents.<sup>6</sup>
- In the next 15 years, 40% of India's family businesses will undergo a handover from the founder to the second generation of owners, and 35% of them to the third or fourth generation.<sup>7</sup>

1 India has third highest number of family-firms

2 <https://www.ibef.org/industry/msme>

3 Micro and small businesses in India have grown into mid-sized enterprises

4 <https://www.investindia.gov.in/team-india-blogs/growth-imperative-msme-sector>

5 <https://www.forbesindia.com/blog/business-strategy/why-do-family-businesses-disintegrate/>

6 97% of family-run businesses in India don't have succession plan documents: Study

7 Family owned-business-standing-the-test-of-time

As is evident from the figures above, several small and mid-sized companies are at the cusp of transformation. Scaling up business will require these companies to articulate their goals, identify and eliminate business model constraints and strategically allocate resources. It will also entail substantial investments in infrastructure and technology. However, this journey evidently is not without hurdles. Safeguarding the business against unexpected setbacks and establishing a strong market presence are as important as agile decision-making and professionalism to navigate the road to success.

This article highlights some of the challenges that medium-sized firms, operating in the range of around INR 250–500 crore revenue per annum, face and suggests solutions that can help them achieve the required scale and growth.

## Growth imperatives

Most mid-sized companies require external investments to help build scale. Many of them have been considering the option of launching an initial public offering (IPO) to pare some of their equity and bring in investments. Garnering investments from equity markets requires them to have financial discipline, a sound operating model, reliable operations, good governance and professional management.

Besides, these organisations need to build a sturdy support system for sustainable growth as many of them have been formed by entrepreneurs from non-technical backgrounds who showed courage and tenacity to build their businesses from the ground up learning through trial and error. As the baton passes to the next generation – who are typically well-educated and eager to introduce more professional systems – there is a desire to ensure a smooth transition, adapt globally recognised best practices and build foundations for a sustainable growth.

PwC India has the experience of working with several mid-sized owner-driven firms, which are on the cusp of transitioning into more professionalised companies, and has assisted them in their growth journey. Among other initiatives, PwC has helped tailor organisational practices to suit the unique organisational needs factoring in the firm's size, the skill level of its workforce, the aspirations of its stakeholders, and its constraints.

Entrepreneurs usually have a high degree of hunger for growth; however, often, they are not able to satiate the hunger due to poor reliability of operations. More often than not, there are enough opportunities, but companies are unable to leverage them due to poor performance delivery. An analysis of the problem reveals several interconnected factors at play such as:

- structure and accountability
- processes and digitisation
- people
- data and information
- sustainability.

At the outset, manufacturing operations leaders should be able to introspect on their current approach and determine if it is enabling an accurate, centralised and fully connected view of its business ecosystem.

Following are five key questions that these organisations need to ask themselves before embarking on their growth journey:

1. Does the organisation have the right operating model in place to attain growth?
2. Does the organisation have the right processes in place to scale new heights?
3. Does the organisation have access to necessary data to make the right decisions?
4. Does the organisation have the right people to drive transformation?
5. Does the organisation have the bandwidth and vision to focus on sustainability?



## Insights

### 1. Does the organisation have the right operating model in place to attain growth?

**Case study 1:** A family-run organisation wanted to transition from a small to a medium enterprise. Fuelled by the ambitions of the second-generation entrepreneur and supported by the third generation, it wanted to improve its sales figures. As the first step, the team at PwC India devised a plan to understand its organisational structure, operations reliability, and sales delivery before charting out the organisation's growth path to transformation.

The company's structure was evaluated from the perspective of current adequacy and future growth ambitions, along with its existing capabilities. The CEO also acknowledged that there had been a few delays and consequent penalties for late deliveries which had to be factored in.

The team recommended a few functions such as product management, technology transfer, and central planning that could be made a part of the organogram and helped devise the functional roles and KPIs. In terms of the sequence of implementation of initiatives, sales came last.

**Takeaway:** The CEO acknowledged that crafting a suitable organisational model was imperative for facilitating a smooth transition journey.

## Building an effective operating model

Since many medium-sized organisations are built from scratch and have a loyal, tenured workforce that have been with them for years together, most work gets done through informal processes. There are unclear boundaries between functions, unclear roles and responsibilities, and people are not driven by objectives.

Given the higher level of involvement of the owner groups in day-to-day operations, there is little empowerment at operating levels.

While the present organisational structure may be adequate for its operations to a certain extent, it may not suffice while scaling up. Organisations need to have the right operating model in place, one that would support growth and debottleneck senior roles from day-to-day operations. This would also involve bringing in professionals from outside and giving them adequate empowerment to build their teams.

As an organisation grows, it also needs to focus on deriving synergies across business units/ functions and focus on core competencies. The leadership also needs to configure an operating model that would comprise functions that they should strategically retain and look for functions/jobs that can be effectively done through a shared service model or through

outsourcing. This can help focus on the core functions and get the non-core functions done effectively through systems such as third parties, shared services and centres of excellence. Traditionally, functions such as accounts payable, receivables, talent acquisition, payroll, IT infrastructure management are outsourced by companies, and these can be good starting points for mid-sized organisations. Of late, functions such as engineering, quality control, stores management are also being considered for outsourcing.

## Recommendations

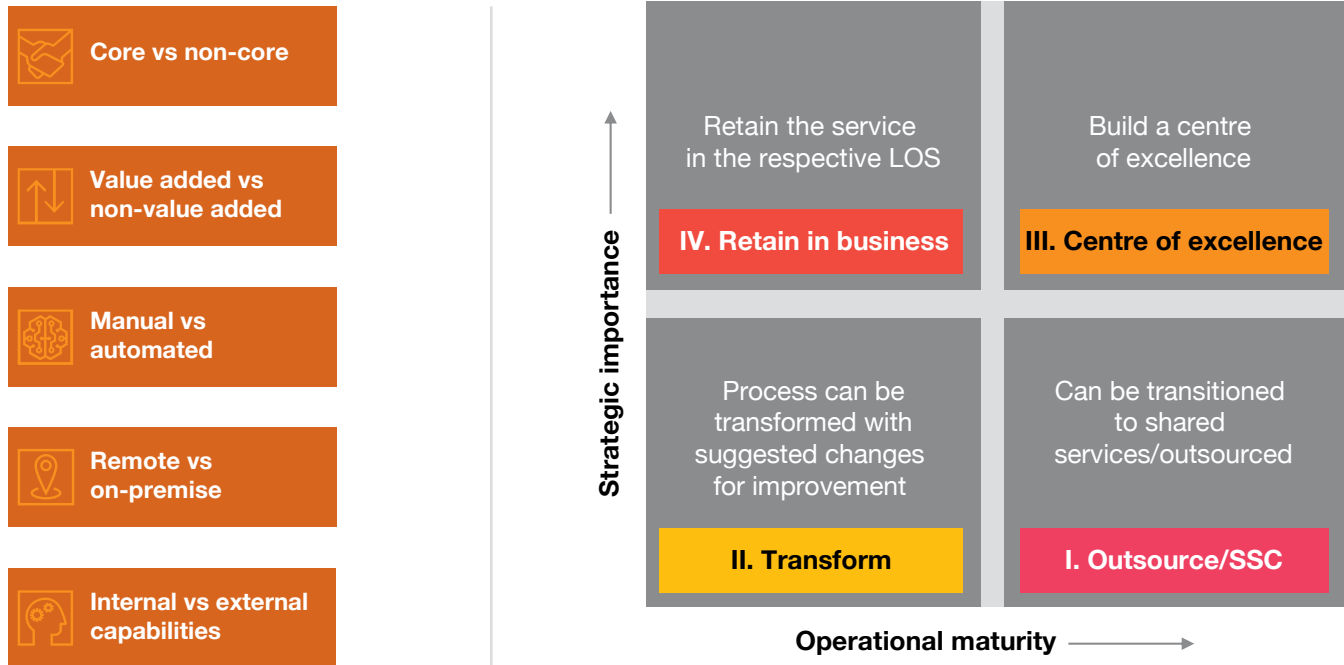
Companies need to build an organisational structure which aligns with their future growth plans. It is important to design an operating model suited to the organisation by:

- creating right functional boundaries
- clearly defining roles and responsibilities
- providing well-written job descriptions
- setting a cascade of goals, KPIs and KRAs up to the managerial level in the first year.

Subject matter experts at PwC India also assist companies in identifying strategic functions which should be retained through candidacy assessment frameworks. The team also helps structure outsourcing constructs for non-strategic and transactional work.

**Figure 1: Parameters to assess the right operating model and functions for an organisation**

**Parameters**



## 2. Does the organisation have the right processes in place to scale new heights?

**Case study 2:** A mid-sized process industry recently wanted to redraft its standard operating procedures. The owners of the INR 500-crore firm were deeply entrenched in the day-to-day activities. Smaller ticket items also went to them for signatures, creating severe bottlenecks. In the procurement function, the lead time for placing orders and receiving deliveries was high. There was a lot of manual intervention in the procurement processes. In some cases, policies were leading to more paperwork. For example, mail approvals were followed by hard copy signatures on purchase orders. Coordination with suppliers was ad-hoc – either through mail or chat – and, in the process, people missed out on crucial information.

The team at PwC India re-engineered the entire procurement process, devised SoPs for 18 processes, eliminated non-value-adding processes such as multiple approvals by creating a threshold, redefined procurement policies and authority delegation and applied a lean process design framework. The team has also helped the client in digitising the workflows.

**Takeaway:** The company acknowledged that its lead time for the procurement process has reduced significantly.

## Streamlining the organisational processes

In organisations that are at the cusp of transformation, work often gets executed through informal and undocumented processes. Even if processes do exist, they are generally not well-defined. Companies often try to overcome these challenges internally by implementing SoPs, often resulting in increased turnaround times rather than leading to faster outcomes.

### Recommendations

Creating sustainable systems and processes requires a delicate balancing act. On the one hand, organisations need to account for their limitations, such as lack of a skilled workforce or stringent financial return expectations and

on the other hand, the processes must be easy to implement and align with the firm's overall objectives. So, it is important to introduce changes that the workforce can quickly adapt to, without compromising on efficiency.

The key to streamlining organisational processes then entails:

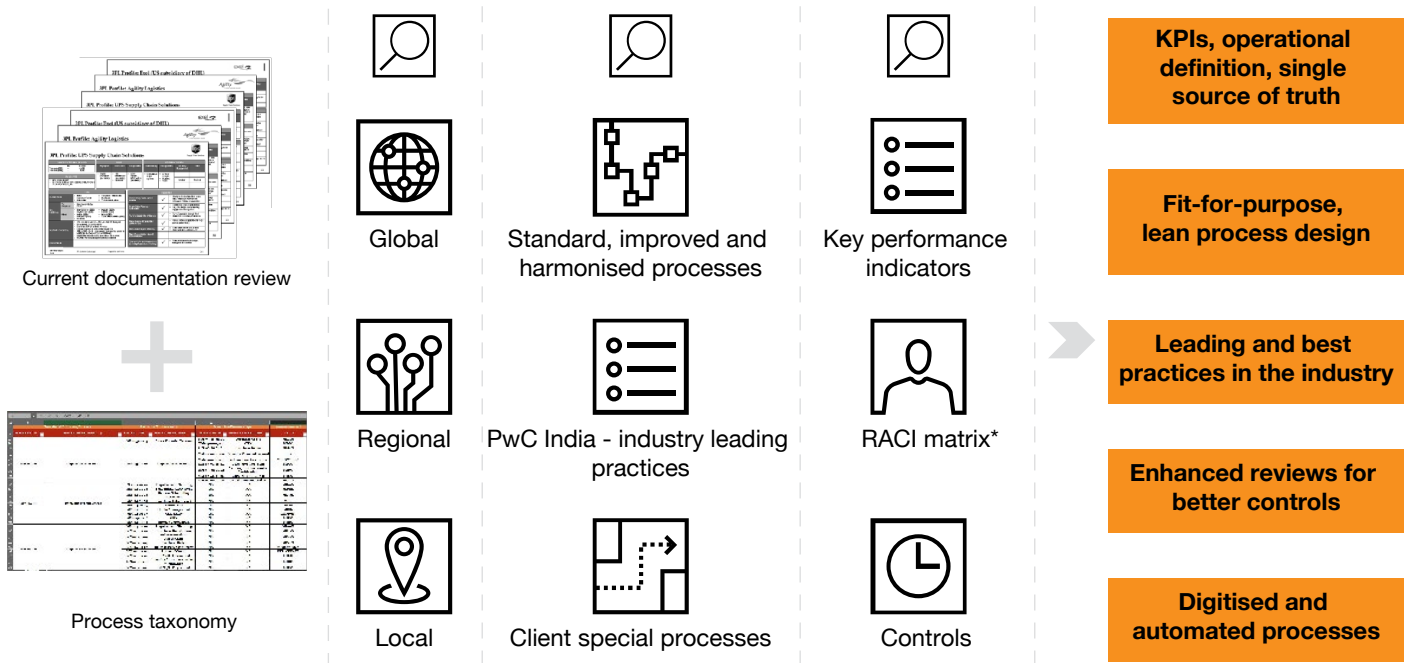
- introducing the right processes
- implementing lean processes to improve productivity and turnaround time
- having adequate internal controls.

Experts at PwC India assist in these key process changes and organisational configuration decisions so that the changes are implemented sustainably and systematically.





**Figure 2: Accurate process design for improving KPIs and controls**



\*RACI- Responsibility assignment matrix

**3. Does the organisation have access to necessary data to make the right decisions?**

**Case study 3:** An industrial products manufacturer – a second-generation entrepreneur – wanted to scale his business. He did not know how to go about it as the business operated in an environment of low margins and faced uphill competition in terms of well-entrenched large players playing the discounting game.

As long as the company was a small entity with limited stock keeping units, it was possible for the firm to run the business without much investment in the right data-capturing mechanism. However, the firm has recently breached the INR 500-crore mark and is on the verge of transformative growth.

In the initial stage, the PwC India team discussed baseline capacities, order fill rate and inventory turn with the manufacturer to know more about the firm’s style of functioning.

The team learnt that the company was measuring output in terms of tonnes, and not in terms of order fill rate or on-time, in-full (OTIF) performance. Even though the firm knew its inventory numbers, it was not calculating the inventory ageing using concepts such as first in, first out (FIFO) and traceability of work in progress (WIP). This resulted in poor inventory turns. In addition, given the competition, unless the company was on top of product level costs, the leadership was not equipped to manage profitability.

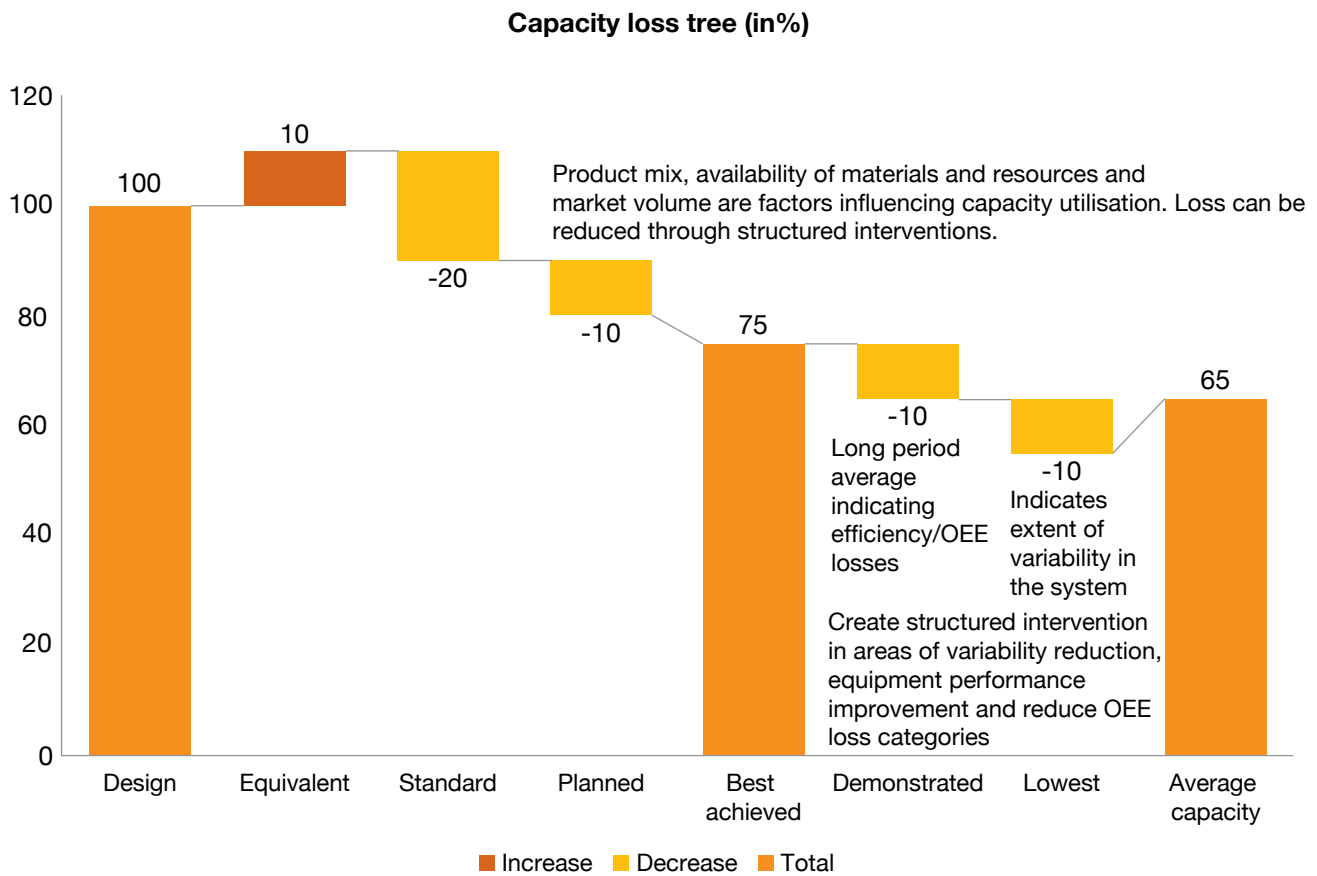
As the first step, the team helped the client to improve working capital management by

devising the right traceability for materials, right from gate-in to gate-out. This included defining the data collection mechanisms and implementing governance mechanisms. The data included elements such as raw material stock levels, ageing, WIP stock levels and process scrap.

Given the credit cycles and low margins, the team figured that for additional growth the systems would need to generate more cash than the current rate. Accordingly, the client was advised to improve inventory turns to release cash to help fund future purchases. Next, the team worked with the client on its procurement and planning

**Takeaway:** The client now goes by the motto – what gets measured, gets improved – and has implemented this in the company’s operations.

**Figure 3: Bridging gaps to help organisations achieve a higher capacity utilisation**



philosophy, keeping in mind on-time, in-full and inventory as a measure. In about four months' time, the client improved its inventory turns by 20%.

## Making data-driven decisions

Lack of a data-driven culture can often turn out to be a major obstacle for firms seeking to scale and grow in revenue. Even when data is collected, most organisations do not know how to measure the outcomes from the data. While financial indicators are generally collected as these can be quickly noticed on a profit and loss statement, many operational indicators are seldom

collected or collected in a limited way. Therefore, in manufacturing, what the organisation thinks of as its capacity and what the true capacity actually is are often miles apart.

Such organisations also struggle with the ability to fixate on a particular source of data and create a single source of truth.

Several companies tend to ignore crucial indicators such as cost of poor quality (COPQ), order to delivery lead times (OTD), OTIF performance and overall equipment effectiveness (OEE).

Such organisations also struggle with the ability to manage the supply chain, which keeps getting

complex as medium-sized firms grow. Adopting advanced supply chain management practices, such as real-time monitoring and collaboration, and data analytics can enhance the visibility of actions within the chain.

Unless organisations work on measuring what matters, understand the source of these measurements, and make these measurements come through systems digitally, there will always be confusion and mistrust over data, and a reluctance to act on what the data reveals.

KPIs, serving as the foundation of performance tracking, reveal their true power when they are meticulously aligned with growth

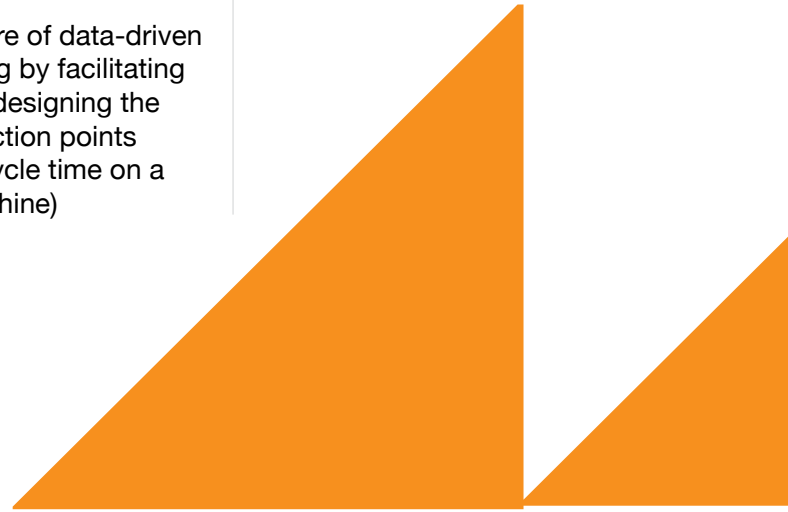
objectives. These metrics must fluidly adapt to an ever-evolving business landscape as they provide a transparent perspective on performance, unmasking opportunities for targeted improvements.

### Recommendations

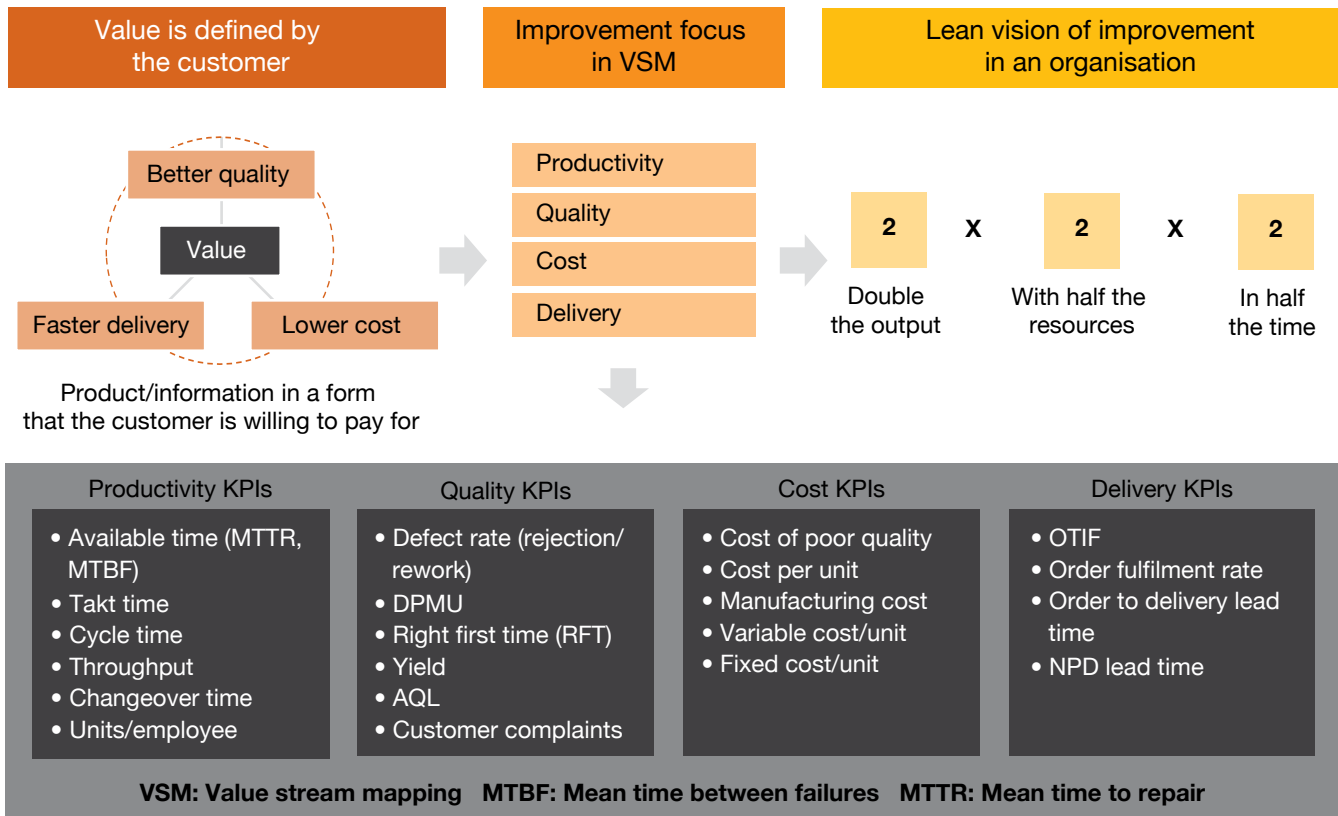
Decisions, if anchored in data, can help companies accurately predict market changes and boost return on investments. PwC India uses its extensive KPI library and helps clients measure what matters,

where it matters. What is then needed is:

- building a culture of data-driven decision-making by facilitating the process of designing the right data collection points (for example, cycle time on a bottleneck machine)



**Figure 4: Adopting appropriate measures is crucial for desired metrics of delivery, quality and cost**



Takt time: The rate at which you need to complete a product in order to meet customer demand  
DPMU- Defects per million units

- automating data collection as much as possible (for example, through supervisory control and data acquisition)
- building the right management information system and review structure (what gets measured and reported daily, weekly, monthly and the audience for each category or report).

#### 4. Does the organisation have the right people to drive transformation?

**Case study 4:** A mid-sized readymade garment manufacturer in Bangladesh was grappling with effective task execution and needed help with employee allocation and retention. In this industry, work is usually labour- and skill-intensive. As attrition levels are generally high, it entails continuous training for new recruits as well as upskilling of the existing workforce.

The PwC India team used its knowledge skill abilities (KSA) framework for the operating team and ensured that the daily tasks get executed effectively. Based on the skill index, the PwC India

**Takeaway:** The tailored programmes not only helped maximise output, but also improved the line productivity management skills of supervisors.

team assisted the company in its efforts to identify training programmes tailored for its employees. Recommendations included subject matter expert-driven trainings, multi-skilling, job rotation and training through demonstrations which was followed through with pre-defined training effectiveness checks at appropriate frequencies.

### Optimising resource allocation

People are the building blocks of any organisation. Given the ever-increasing complexities in supply chain and operations, only the right talent pool can help the company navigate these challenges and attain sustainable growth.

In many mid-sized organisations, there was a lack of skilled resources for certain roles. While these organisations did reward loyalty by elevating people to shoulder additional responsibilities, they didn't have a structured process to evaluate their skills and competencies before aligning them to new roles.

Change management enables people to understand the skills and competencies required to adjust to the new roles and challenges which arise as an organisation expands its operations and changes its ways of working.

Concurrently, talent management also emerges as a crucial aspect

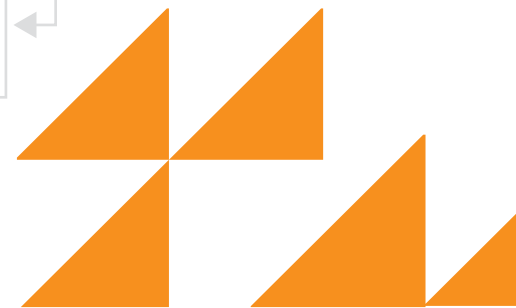
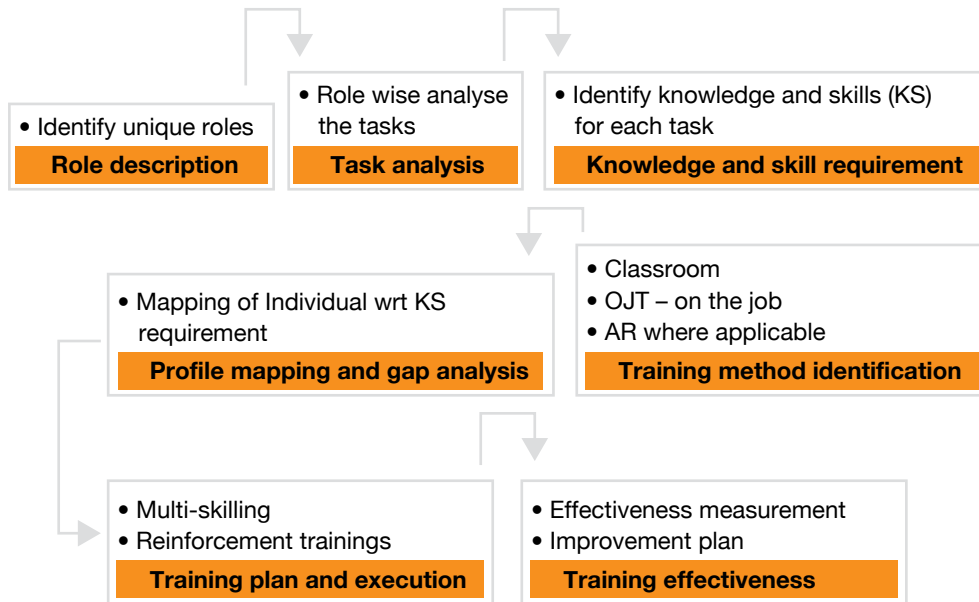
to hire skilled professionals amidst rapid technological progress. With each new initiative or programme, certain skills are likely to be found wanting in an organisation's existing talent pool. Addressing this concern isn't merely about pinpointing areas of deficiency. It is about designing and implementing strategies to bridge these gaps by aligning the workforce with the dynamic demands of the business.

#### Recommendations

Successful organisations invest in a comprehensive competency development programme. For them, the mandate is to:

- do a skill/competency assessment
- conduct a job and competency evaluation
- assess progress constantly through a strong performance management system.

**Figure 5: To ensure that people are equipped to deliver on their role's expectations, a KSA assessment followed by a training plan is paramount**



Accordingly, they redefine the skills with an understanding of the knowledge and behaviour required for each role.

The team at PwC India, with its competency framework, identifies the gaps and facilitates a comprehensive competency development programme for the company along with mechanisms to evaluate the effectiveness of these programmes.

## 5. Does the organisation have the bandwidth and vision to focus on sustainability?

**Case study 5:** A manufacturing company which owns a number of presses and generates about INR 450 crore in revenue wanted to streamline its process of production with sustainability at the heart of the initiative. Though the process of production was sequential, the placement of workstations and machines were non-sequential resulting in a criss-cross flow of materials on

**Takeaway:** The distance covered by the material was reduced by 50% compared to the baseline.

the floor. The distance which the material travelled also increased the greenhouse gas (GHG) emissions of the organisation since the material was transported through forklifts and other energy consuming mechanisms. The team at PwC India calculated the transportation index (the distance an average material travels on a floor without value addition) and devised the right layout and

material flow path to minimise the transportation index.

## Undertaking sustainability initiatives

Today, discussions in boardrooms are not complete without the mention of sustainable operations. While sustainability has several aspects, in a manufacturing context it revolves around having the right focus towards 'consuming less' for the same output. If an organisation is able to improve yields, it reduces material consumption. If a manufacturing set-up is able to improve equipment availability, it can produce more with the same set of resources.

From a design perspective, it involves engineering the product in such a way that it reduces total cost of ownership for both the organisation and the consumer.

The focus on the eight wastes of lean and making a conscious effort to minimise each category of waste not only improves turnaround times and reduces costs but can also help improve sustainability. For example:

- If the waste of transportation is reduced, it can help reduce Scope 1 GHG emissions.
- If the waste of motion is reduced, it can help improve the 'social' in ESG by helping improve employee well-being.
- If the waste of over-processing is reduced, it can help reduce consumption of resources and energy and is a direct sustainability benefit.

- Similarly, the reduction in waste of overproduction and inventory contributes to the reduction in Scope 2 and Scope 3 GHG parameters.

The waste of overprocessing is directly attributable to a sub-optimal design. This has an impact not only on resource consumption, but in many instances also enhanced lifecycle costs.

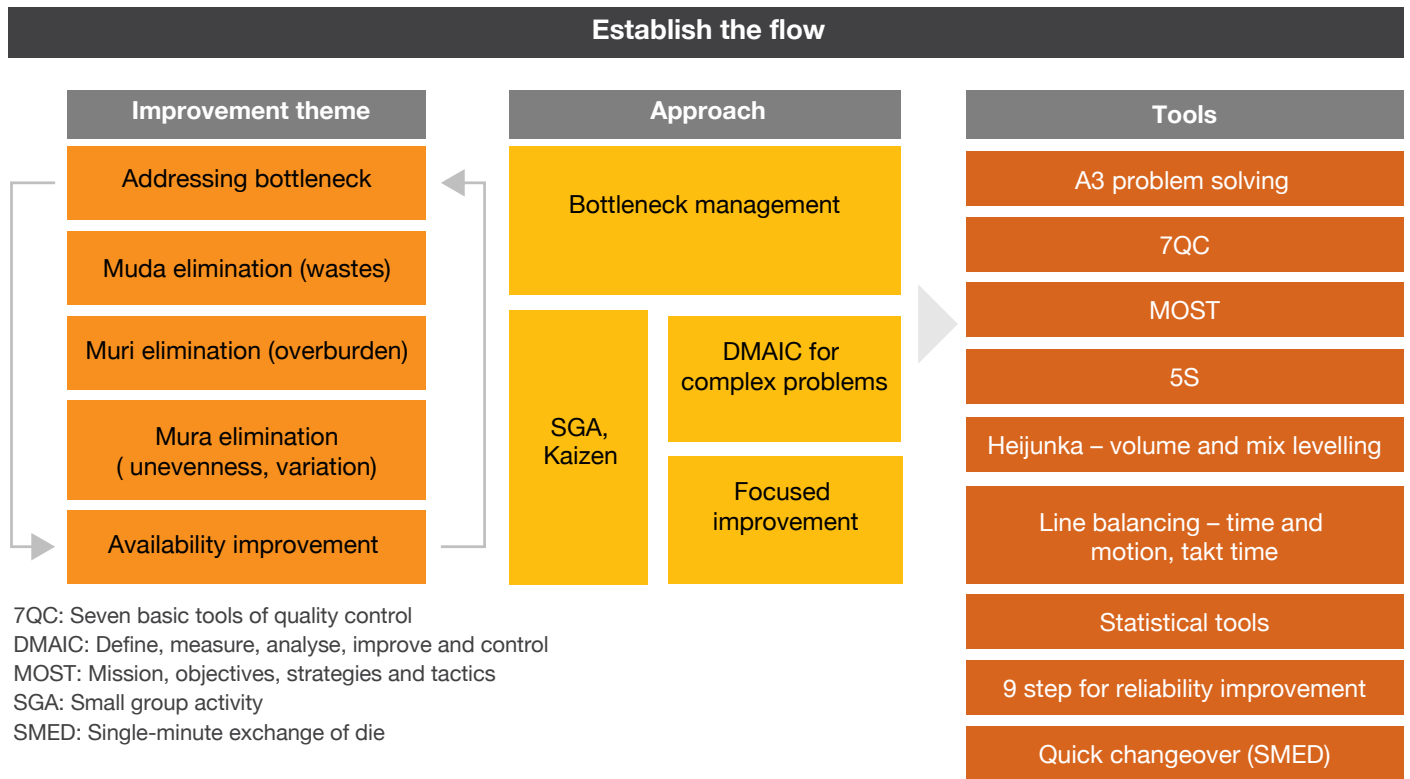
## Recommendations

It has been observed that many mid-sized firms are reluctant to invest in methodologies such as total quality management (TQM), total productive maintenance (TPM), Lean or Six Sigma. These are often perceived to be applicable only for large organisations and the processes at these mid-sized firms may not support a full-scale implementation of these practices. But mid-sized firms also need to:

- consume less for the same output
- produce more with the same set of resources
- invest in methodologies such as TQM, TPM, Lean or Six Sigma to minimise each category of waste.

PwC India is committed to making these methodologies more accessible and suitable for the client's specific needs, ultimately ensuring that they can reap the maximum benefits.

**Figure 6: Operational ESG involves reducing resource intensity through various interventions**



## Creating a well-defined roadmap to transition from local to global

The initiatives across the five dimensions discussed above are not one-time activities. These need to be evaluated at regular intervals and aligned to the changes in the business context. Companies should be able to dynamically adjust to the changes and should frequently assess the adequacy of the five dimensions.

This is where a neutral, unbiased perspective often provided in the form of assessment and backed by frameworks and insights of third parties, can come in handy. Often these frameworks are constantly amended as per the changing needs of the business.

The outcomes of such an assessment will either validate the leaders' point of view or be an eye-opener to them and their teams. It can also provide significant room for improvement by bridging the gaps between current practices and best practices across maturity levels, paving the way to create a roadmap for improvement and growth, empowering client teams to plan and execute strategic actions with clarity and confidence.

In order to derive true value from such endeavours, consultants on-site should tailor their approaches and solutions as per the individual client's needs. The aim is not to deliver ready-made solutions but to foster an environment of continuous learning and

development and ensure that the workforce is equipped with the necessary, up-to-date skills for success.

A robust operations management strategy can therefore act as a solid foundation that enables a firm to adapt, thrive and seize opportunities in today's dynamic and fast-changing business landscape. Operations management also plays a vital role in risk mitigation as it equips a company with the aptitude necessary to anticipate and respond to potential disruptions and setbacks, ensuring business continuity. By optimising processes, streamlining workflows and enhancing resource allocation, companies can identify potential bottlenecks and inefficiencies and empower the organisation to make data-driven decisions and improvements swiftly.

Over the years, PwC India has taken on the role of actively assisting India's burgeoning businesses to prepare them for the global stage. The team at PwC India strives to bridge the operational gaps and unlock the potential within these organisations, enabling them to evolve from being successful domestic firms to becoming competitive global corporations.

Also contributing to this article were **Vishnupriya Sharma Thirumale, Bikash Kumar, Arjoon Roy, Prashant Bhingardeo, Vishnupriya Sengupta and Rumela Sinha**



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# Using AI to fast-track manufacturing operations

From optimising quality control and predictive maintenance to transforming material handling and tooling, AI can aid in streamlining critical processes. **Pallab De** and **Prahalad Chandrasekharan** delve into the transformative potential of AI while underlining the risks that could surface with such a technological leap.

- **45%** of total economic gains by 2030 will come from product enhancements stimulating consumer demand, as AI will drive greater product variety with increased personalisation, attractiveness and affordability over time.<sup>8</sup>
- AI-enabled predictive maintenance could reduce maintenance costs by up to **30%** and unplanned downtime by **45%**.<sup>9</sup>
- **94%** of organisations believe that AI will help create more opportunities than be a threat to their industry.<sup>10</sup>

The uses of AI in operations consulting are manifold. From improving the quality of products and processes to the use of robots for autonomous decision-making to optimising and reducing overall supply chain costs, AI is all pervasive – a must-have rather than a nice-to-have technology.

8 Sizing the prize: PwC's Global Artificial Intelligence Study: Exploiting the AI revolution

9 <https://thedata scientist.com/data-automation-and-british-manufacturing/>

10 AI: An opportunity amidst a crisis, a PwC India report

While companies are already benefitting from using AI in numerous application areas, it is surprising to note that 38% of Indian companies that had participated in a PwC India survey recently revealed that they do not have any plans to adopt digital technology for their businesses.<sup>11</sup> One of the reasons could be the way technology programmes are implemented and managed. Having said that, it is important for manufacturing companies to embrace change and focus on digital transformation to stay relevant in the dynamic global ecosystem and reap the benefits of AI-based solutions.

Following are some instances where PwC has partnered with clients to deliver AI-based solutions:

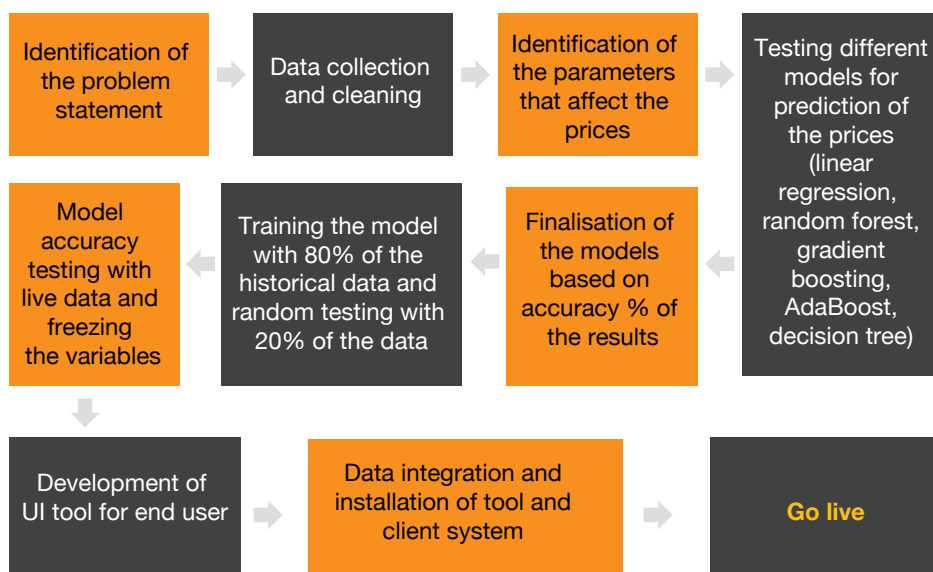
- In an engagement with a capital equipment supplier, PwC provided an AI-based model for predicting trailer rates based on the random forest gradient boosting method. The successful adoption of this model led to a 10% reduction in logistics cost base.<sup>12</sup>
- For a manufacturer of ferro alloys in India, PwC facilitated the creation of an AI-based model for accretion reduction in direct reduced iron (DRI) kilns. Over 30 parameters were identified to build a successful

model and develop a two-hour forecasting model which is installed in the distributed control system (DCS) terminal. Every two hours, the model predicts the output and indicates what parameters to change (secondary air flow in various chambers, coal throw, primary air flow) to the kiln operator. The kiln operator is expected to follow the model's outputs and change the parameters accordingly. This is a good example of the application of AI as a decision support system.

- PwC also facilitated the implementation of a vehicle routing problem (VRP) solver with a cloud fleet

routing request, to optimise distribution costs for a large conglomerate in Bangladesh. The tool implements a randomised version of the Clarke-Wright savings algorithm for vehicle routing problems. It takes input from a text file listing each customer's location (latitude and longitude) and demand. Distances may be entered explicitly or computed automatically using Euclidean or great-circle metrics/maps. This tool has helped to optimise the distance travelled by the fleet by 15% for the business units in scope and improved distribution planning.<sup>13</sup>

**Figure 1: A recommended structured approach for AI implementation**



11 PwC India report: Reimagining digital factories of tomorrow

12 Percentage based on PwC analysis

13 Percentage based on PwC analysis

However, implementation of such AI models is not without certain risks and challenges. One such challenge is driving change management while implementing such models, and ensuring that the change sticks. The implications of AI in manufacturing operations are also raising concerns around data intensiveness, use cases and whether the benefits outweigh the associated costs.

Though AI has certain limitations that will require considerable effort to overcome, it is also a moving target that promises advances to create new opportunities. A deep dive into the benefits and associated costs of AI in manufacturing operations may help businesses weigh the pros and cons. However, given that AI may be used in a variety of ways including but not limited to removing bias, improving productivity and decision-making using predictive levers, it may help to first gain some insights from a few use cases.

## AI's pivotal role in building manufacturing operations of the future

Following are the areas where AI is supporting manufacturing operations functions to stay one step ahead in times of change:

- 01 Quality control
- 02 Maintenance
- 03 Design
- 04 Sales
- 05 Material handling
- 06 Tooling

### 1. Quality control

In situations where visual inspections are required, AI, with a trained dataset, is effective in eliminating human bias and providing accurate outcomes.

Let us consider some common use cases of visual inspection. For instance, in a glass bottle manufacturing plant, there is usually a conveyor through which, post-production, bottles pass an inspection station where quality control operators accept/reject bottles based on visual defects such as scratches, blemishes, shade gradation variation, bubbles and minor spots. Some of these defects are only visible to a highly trained eye, and given the high degree of focus required, statistically there are possibilities of type 1 (reject a good bottle) or a type 2 (accept a defective bottle) error. Sometimes such mistakes can cause significant customer dissatisfaction and to avoid this, there is one more inspection on a sampling basis before the final dispatch. This is not only effort intensive, but also a wasteful process.

**AI's role:** An in-line camera sensor which can capture a 360-degree image of the bottles in the line and has the ability to map the data back to the various categories of defects and provide an accept/reject outcome could solve this problem and improve the quality and efficiency of the inspection process. As the number of inspections increase, the data gets populated further and the outcomes become more accurate. However, the prerequisite for AI to be implemented in the process is to have large volumes of data/images for each of the defect

categories so that the AI algorithm can be trained to eliminate the bias in its assessment.

As the next step, the ability to monitor and plot control charts, use the seven principles of control chart interpretation (outliers, 2 consecutive points above 2 sigma limits) and map them back to the process parameters that resulted in these defects can further help in enhancing the process control through a feedback loop.

Over a period of time, the system would then be able to analyse process parameter deviations from the norm intelligently and, instead of noticing control chart parameters on finished products, the system can start monitoring the control chart for process parameter deviations and correct them at source or provide alerts to supervisors for correction. This would help businesses move from a reactive to a pro-active stage.

This proactive stance in a manufacturing environment can enable businesses to address defects at the source even before they appear in the product. The maker-checker process can also be minimised resulting in a reduction in the number of inspections.

Another use case would be in the automotive industry which requires an accurate visual defect identification of painted surfaces. Currently, due to manual inspection, this process has certain levels of subjectivity which can be addressed using the power of AI. AI can learn to classify the defective painted surfaces from non-defective ones through vast data, eliminate subjectivity and provide more accurate outcomes.

The use cases of AI pertaining to quality control are evolving rapidly and companies need to adopt AI-based solutions on a rigorous evaluation of return on investments. Accordingly, the skill set required for a quality control personnel has to evolve in tandem with the newer ways of working. Resources will no longer have to specialise in measurements but will need to be equipped to interpret the signals which the AI provides. They also need to be made aware of the technology behind the AI, at least at a basic level, with a focus on the use cases where AI can be beneficial for their day-to-day tasks. AI can effectively improve the measurement system.

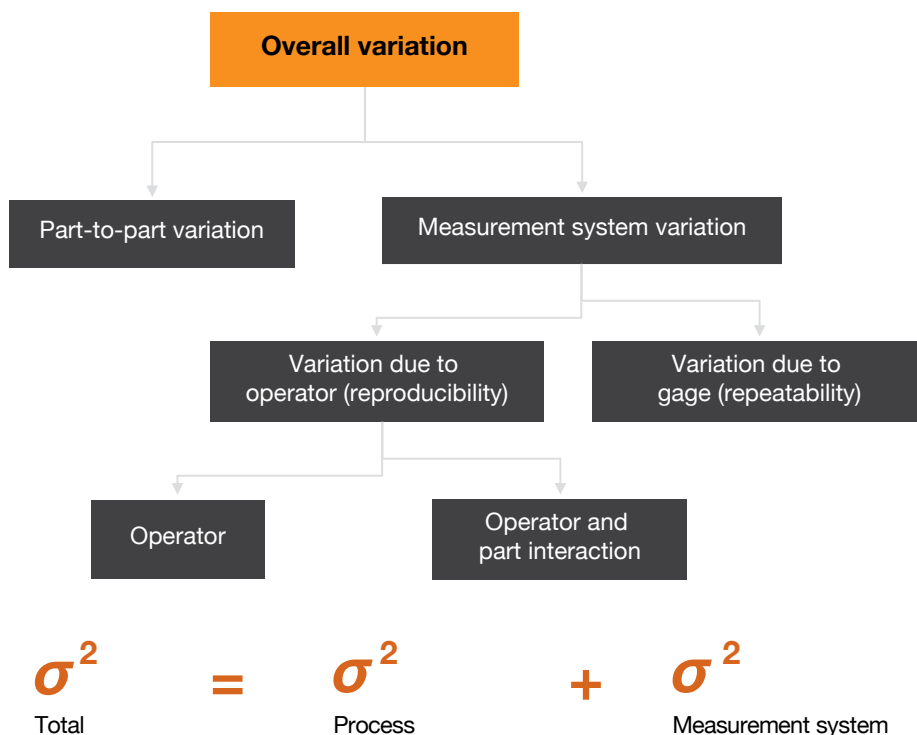
## 2. Maintenance

With the ability to track the mean time between failures (MTBF) trends and detect early warning signals, AI may effectively prevent unplanned outages. This is particularly useful in critical equipment where uptime requirements are close to 100%. Maintenance functions have been trying to move from preventive to predictive maintenance, and with AI this goal is well within reach.

At present, most companies follow time-based maintenance for their equipment and have schedules such as preventive maintenance once in six months. However, this does not guarantee that an equipment failure will not occur in the interim.

**AI's role:** With a wide variety of failure modes and causes pertaining to an equipment being fed in as training data, AI-based tools can start looking for similar

**Figure 2: A well-trained AI tool can help in reducing variations emanating from the 'reproducibility' parameter**



likely events when the equipment is under operation. For example, if a critical equipment has had repeated motor failure due to various causes such as heating of bearing or overload of equipment, the company can invest in thermal scanning of bearing while the equipment is under operation and load parameter monitoring. This way, any deviation from expected temperature and load can trigger an alarm/alert for the maintenance technician to take quick action.

An added benefit of adopting AI is the ability to manage requirements for spares since AI will be able to predict the failure frequency. Experience suggests that spares are generally managed through a vital, essential and desirable classification with certain levels of inventory holding. In most

manufacturing environments, ageing of spares is an important concern. With AI, one may be able to accurately predict when a spare would be required and then plan to procure it when needed. This not only reduces non-moving inventory, but also helps recalibrate the vital, essential and desirable spares.

There is a wide variety of use cases of AI in predictive maintenance, and a good application of the technology could be in planning the shutdown maintenance of a kiln in the ceramic industry. Most shutdowns today are planned based on time/cycles of operation, however, with AI, this can be shifted to maintenance based on proactive triggers.



### 3. Design

For businesses which operate on responding to tenders, it is important to quickly bring out a solution at the bidding stage so that the bids can be submitted on time. The computational ability of AI can design solutions quickly and objectively with the help of training data. In an engineer-to-order environment, products may have to undergo incremental changes to meet certain client-specific requirements. The incremental changes which are required in the product could be a new feature or a new performance parameter requirement. For example, one of the requirements could be a lighter product for the

same strength specifications. In such scenarios, if people need to look for solutions or prototypes with various permutations and combinations, the time to find a solution will be very high.

**AI's role:** If all product features, and corresponding performance requirements are made available as data points to an AI algorithm, the AI, over a period of time, will be able to suggest the best material and process combination that can meet the performance parameter for any incremental changes that are required for the product.

This aspect of AI can be useful in an engineer-to-order environment, such as the defence sector, where companies can leverage AI to get

the best strength for a protective equipment for a given cost and weight consideration.

### 4. Sales

AI, coupled with a vast amount of point of sales (PoS) data and an ability to recognise patterns, can accelerate sales for a variant/depot combination. Recommendations made on supply chain networks and footprints based on emerging trends in consumption can contribute to boosting the sales of a product.

Take the example of rooftop solar systems. The panels and accessories are generally supplied through a channel partner which is replenished by a depot. Since this is a sunrise industry, the demand can be quite unpredictable and the customers for these categories also have options to switch if a local dealer doesn't have stocks of the product that they are looking for. For end customers, this is a cash and carry option, therefore, it is important to have the right inventory close to the source of consumption.

**AI's role:** Based on historic consumption and demand patterns, analysis of lost sales due to stock-outs, and cross shipments across depots, AI can help identify the right inventories to be kept at each consumption point. Over a period of time, based on heat map of consumption and replenishment points, AI can also provide intelligence on how the network should be organised to feed the demand using certain decision parameters such as consumption frequency, replenishment time and customer's

willingness to wait. AI can help rationalise inventory holding across the supply chain, in addition to enhancing sales.

## 5. Material handling

Material handling, which involves movement, control, storage and protection of goods through the different stages of manufacturing, distribution and consumption plays a crucial role in supply chain management and logistics with efficiency and productivity being the focal areas of attention.

**AI's role:** The adoption of AI tools, enhanced by deep learning, can optimise transportation index within a plant for mobile material handling equipment and can also suggest layout modifications to reduce transportation index. Leveraging AI in planning milk runs within a plant for movement of materials according to the production run, along with the optimised transportation index may boost the production capability of the plant.

## 6. Tooling

Tooling is essential for manufacturing, production, assembly and other operations to ensure that tasks are performed with precision.

**AI's role:** Through monitoring and analysis of tool usage and tool wear, AI technology can be leveraged to predict the remaining useful life of the tool and spares management for tools. An example of this is in fabrication shops

where the punch and die process can be closely monitored through image scanning and a plan for refurbishment of the tools can be made well in advance.

While the example demonstrates AI's role in manufacturing operations, the technology can also be used in other business processes such as workforce planning, procurement, logistics and store management. The application of AI will depend on the type and nature of the industry, maturity of operations, product life cycle and other factors.

## Limitations of AI

While AI's application in solving business problems extends across nearly every sector of the economy, the limitations in implementing AI to overcome real-world challenges could at times discourage leaders from reinvesting in it. The questions which arise while adopting AI in business operations are:

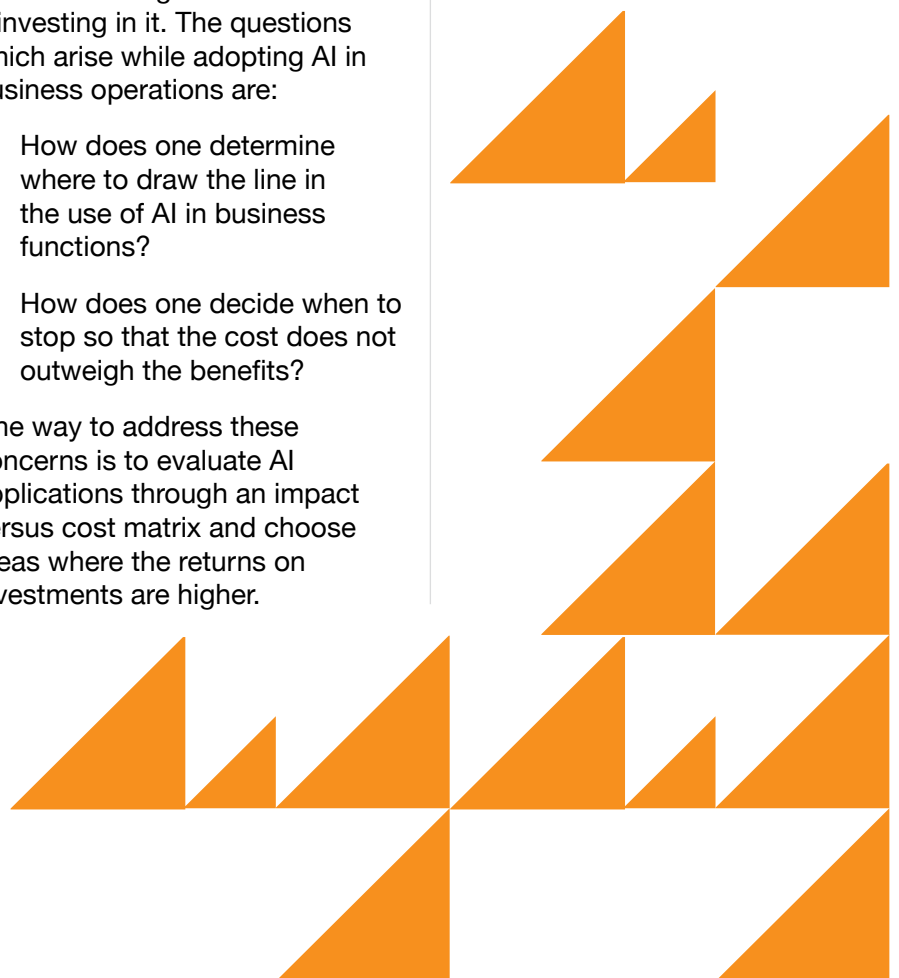
- How does one determine where to draw the line in the use of AI in business functions?
- How does one decide when to stop so that the cost does not outweigh the benefits?

One way to address these concerns is to evaluate AI applications through an impact versus cost matrix and choose areas where the returns on investments are higher.

When it comes to manufacturing operations, AI has been beneficial in key areas of operational metrics such as

- cost of poor quality (COPQ) reduction
- overall equipment effectiveness (OEE) improvement
- order to delivery lead time reduction.

Organisations need to have some foundational elements in place for successfully leveraging AI. First, it is essential to understand the concept of 'measuring what matters'. Granular data elements, which are generally not collected in day-to-day operations, need to be collected for effective base lining and reasons behind current baseline performance need to be understood.



**Figure 3: Measuring what matters starts with understanding customer requirements and converting them to critical to quality (CTQ) parameters**

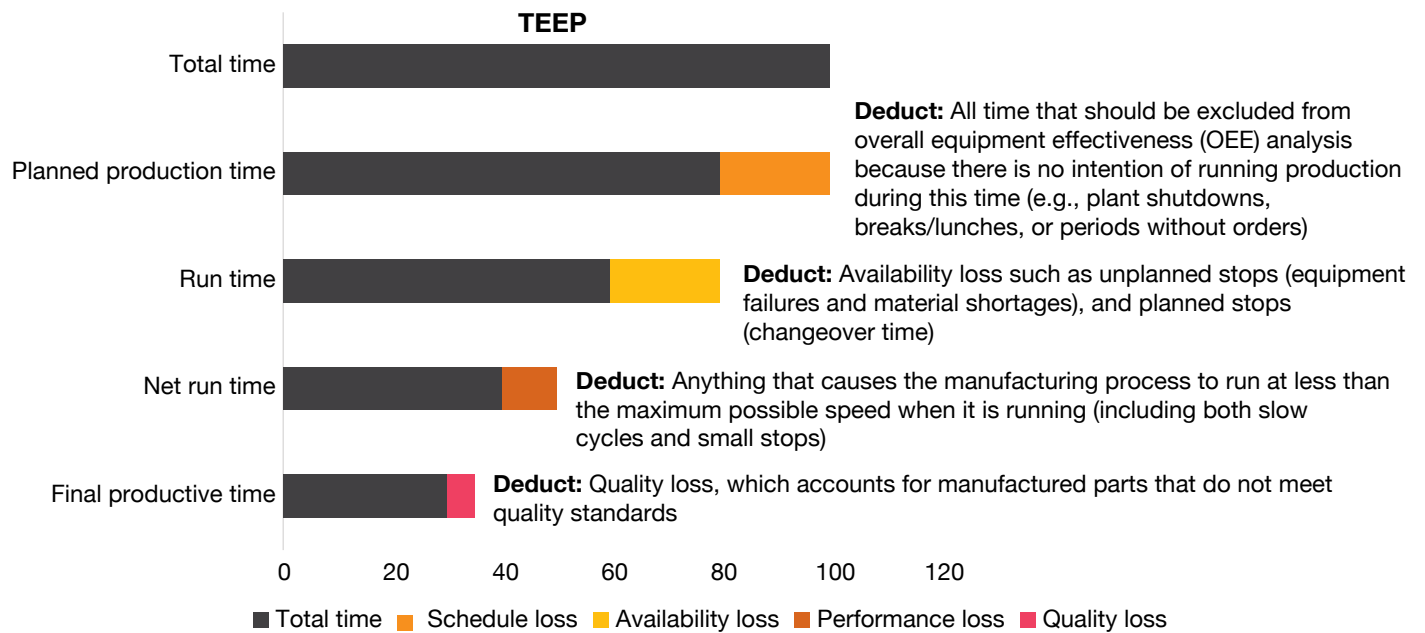


In a particular implementation, a company had certain standard units per hour in their manufacturing line. When the actual units per hour were measured, they were at 80% of standard, with a difference of 20%. Though line stops due to unavailability of manpower or changeover times could explain the difference of 10%, the company did not have the parameters to explain the remaining 10% of the losses.





**Figure 4: Plant assessment is recommended to be done through total effective equipment performance (TEEP) evaluation**



Therefore, a prerequisite for getting the best outcomes and deriving real time benefits is to ensure the right quality, specific duration and source of data, along with investing proactively in data collection and automation of the collection process. Optimal quality data can be generated by moving to a single source of data when the data is obtained directly from the system, without any manual intervention or updates. Usually, higher the duration of data collected, better are the outcomes as the system can then understand factors such as seasonality, shift-to-shift and operator level variations.

The application of AI is evolving and manufacturing organisations will require newer skill sets, both in operating as well as managerial positions, to implement the technology in their operations. Therefore, it is necessary to have a strong programme management and governance mechanism to ensure that change is accepted and embraced through rigorous change management initiatives.

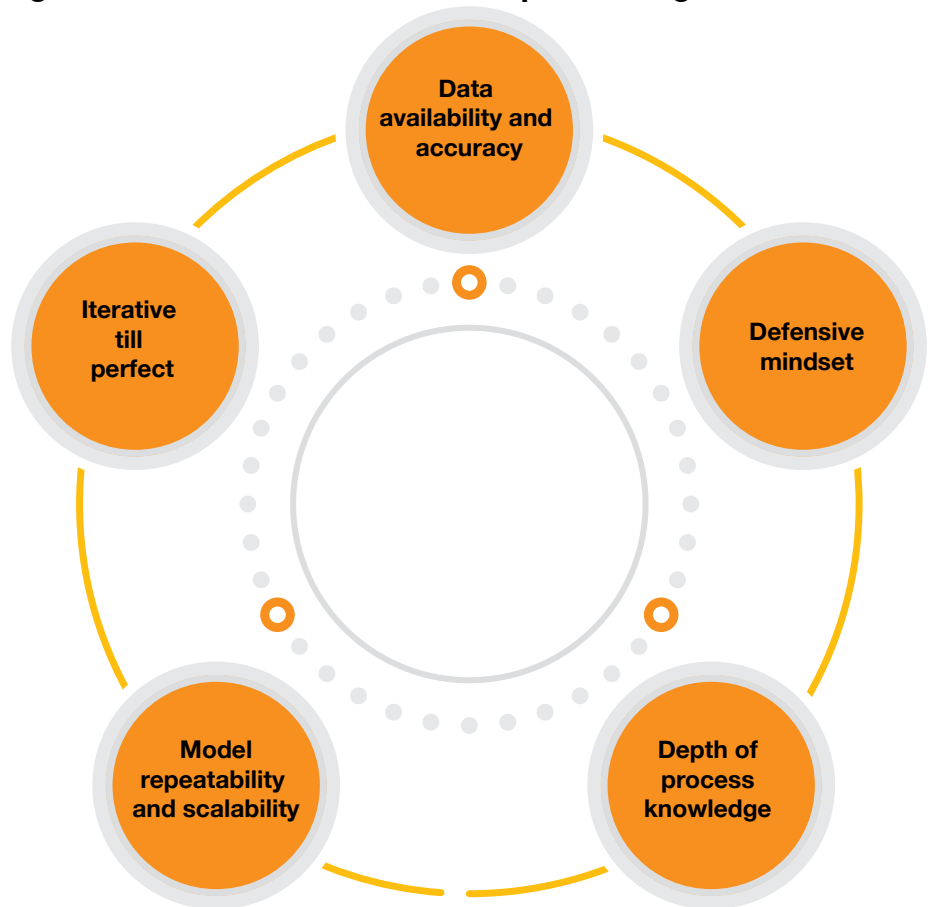


## De-risking AI

The implementation of AI models has its fair share of risks. Some of the risks associated with implementing AI are:

- An AI-based model requires a lot of data for training. Mid-sized firms may not have either the systems or processes to provide quality data. As indicated earlier, granular data elements and their availability over longer periods help increase the accuracy of the model.
- The mindset of the operators is defensive as they are worried that the model will take away their control and knowledge and make them redundant. A huge amount of effort in upskilling the workforce and assurance about their role in the process is required to manage the insecurity and defensiveness of the employees through change management initiatives.
- Model quality monitoring is a function which requires deep technical understanding of the process. However, AI-based data scientists cannot develop these models without the technical knowledge of the subject. This necessitates the cooperation and collaboration among technical experts of the process and technical experts of model building for a seamless integration of AI in the process.
- Adopting an existing model to a similar use case is not straightforward and entails some complexities. Often, the parameters associated with a particular outcome are based on the manufacturing

Figure 5: Risks associated with implementing AI



technology, age of the plant, process maturity and other factors. Therefore, in order to replicate a model for a similar operation will require a considerable amount of time and effort to rework the model and customise it for the current use case.

- Implementing AI in the operations of an organisation involves a cost component –and companies need to have patience in developing and implementing AI-based solutions. The process is iterative and the initial outcomes sometimes are suboptimal compared to what a manual process could have delivered. The more the

number of iterations required, the greater are the costs involved. But AI implemented accurately can not only generate insights but also bring in huge benefits in terms of operational excellence.

The promise of AI is immense. Companies that are able to understand the prerequisites of adopting AI-based tools and direct their efforts to areas where it matters the most will be successful in the future. With experts and researchers poised to solve AI's complex problems, it's time to understand the capabilities of AI-based solutions to learn, explore and unlock new possibilities which AI has to offer.

Also contributing to this article were **Vishnupriya Sengupta, Anindya Mukherjee** and **Prashant Bhingardeo**.



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# Four ways to embrace and adopt **sustainable manufacturing practices**



Consumers are becoming increasingly eco-conscious and prefer environment-friendly enterprises. This is encouraging businesses to further embrace sustainable practices. In this article, **Mandar Mahajan** and **Amit Kumar Kaushal** underline four ways through which manufacturers can effectively infuse sustainability into their operations.

- When an Indian multinational launched a powder-to-liquid handwash – intended to replace the use of two bars of soap – it was a lighter product than soap. As a result, four times more handwash refills could be transported per truck which resulted in using less fuel for transportation and lowering the company's carbon emissions.
- An e-commerce giant, focussed on packaging, has been trying to optimise the size of its delivery boxes by using machine learning and data analytics. The company is also working on both onsite solar and offsite solar energy initiatives, with solar panels installed in many warehouses, wherever space permits.
- A consumer electronics maker has been testing its washing machines using air instead of water long before sustainability became a buzzword.

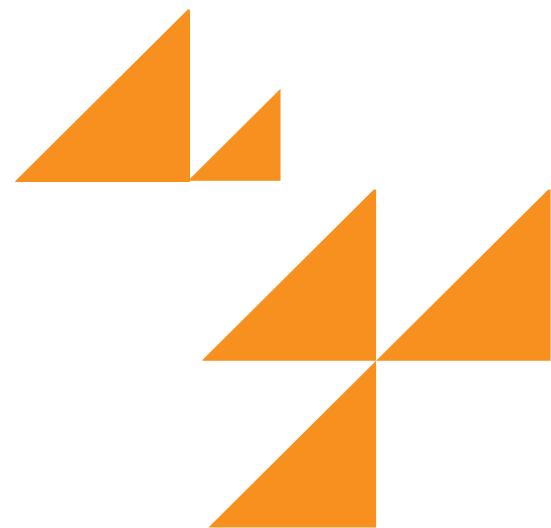
Conducting business sustainably does not merely mean designing and producing products that are sustainable. It needs to take into consideration the entire value chain and its impact on the environment and society at large. In recent times, pressure has mounted on manufacturers to adopt more sustainable practices and the call to action comes from the following stakeholders:

- consumers who seek sustainable products and are willing to pay a premium for it,
- investors who prefer companies that are mitigating their ecological footprint, and
- governments enforcing regulations to curb emissions.

This offers companies with new opportunities to rethink their business operations by incorporating environmental, social and governance (ESG) principles into their strategies. According to PwC's 25th Annual Global CEO survey, India CEOs perceive transition to net-zero commitment as a critical component for driving product and service innovation, and meeting customer expectations.<sup>14</sup> The following numbers underscore why companies need to put sustainability at the core of their operations:

- India's CO<sub>2</sub> emissions stood at 2.88 gigatonne (GT) in 2021.<sup>15</sup> India has set a target of bringing down its carbon emissions by 22% by 2030.<sup>16</sup>

- By 2030, India aims to reduce the carbon intensity of its economy to less than 45%.<sup>17</sup>
- The manufacturing sector, which contributed 14.4% to India's gross value added (GVA) in 2022<sup>18</sup> and accounts for about 15% of the country's gross domestic product (GDP) is also a major contributor of the country's emissions.
- Between 2005 and 2013, the greenhouse gas emissions of India's manufacturing companies almost doubled from 315 million metric tonnes (MMT) to 623 MMT.<sup>19</sup>



14 PwC's 25th Annual Global CEO survey

15 Centre for Science and Environment

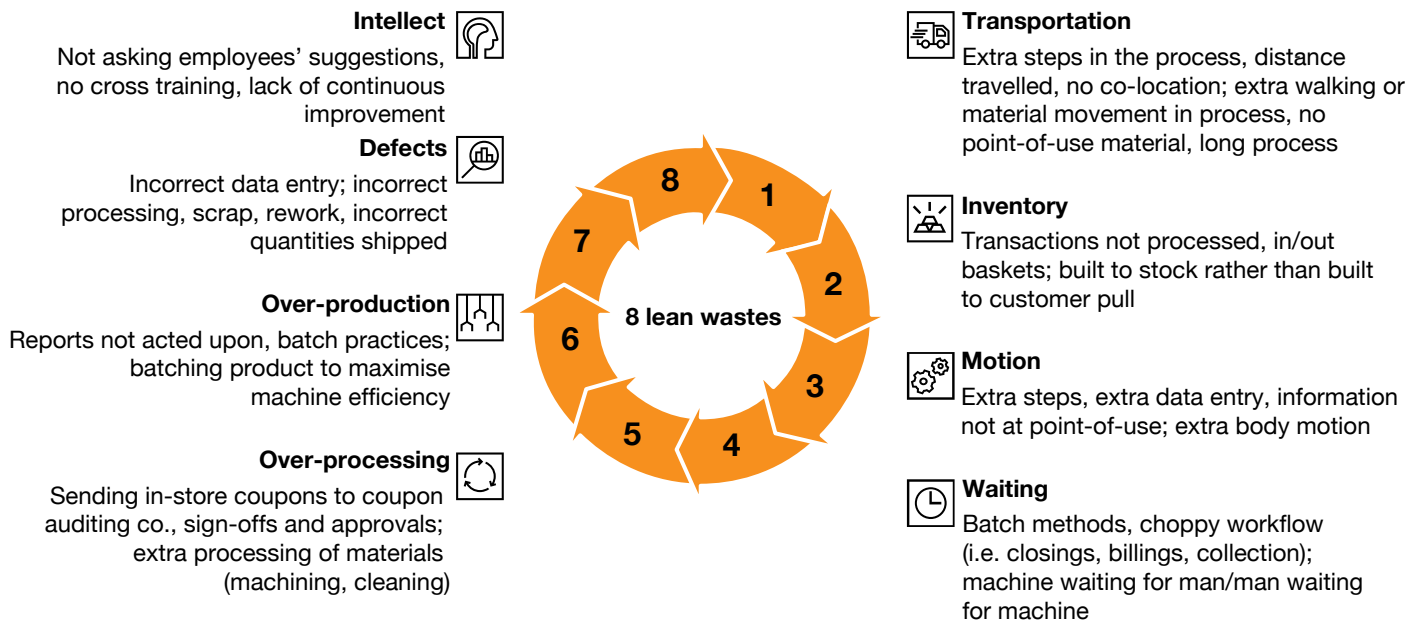
16 Ibid.

17 Ibid.

18 India's long-term low-carbon development strategy

19 Gupta, V., Biswas, T., & Ganesan, K. (2017). Industrial Emissions (Ver 2.0). Retrieved from GHG Platform - Council on Energy, Environment and Water.

**Figure 1: Eight lean wastes in manufacturing and non-manufacturing (service) environments**



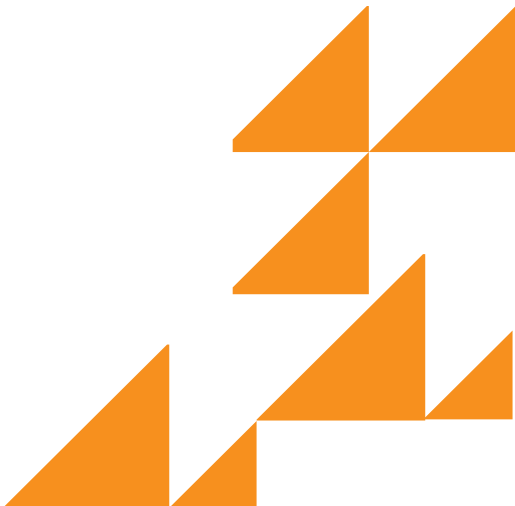
To build sustainability into their operations, businesses may consider the following strategies:

**focus on asset care to optimise performance,**

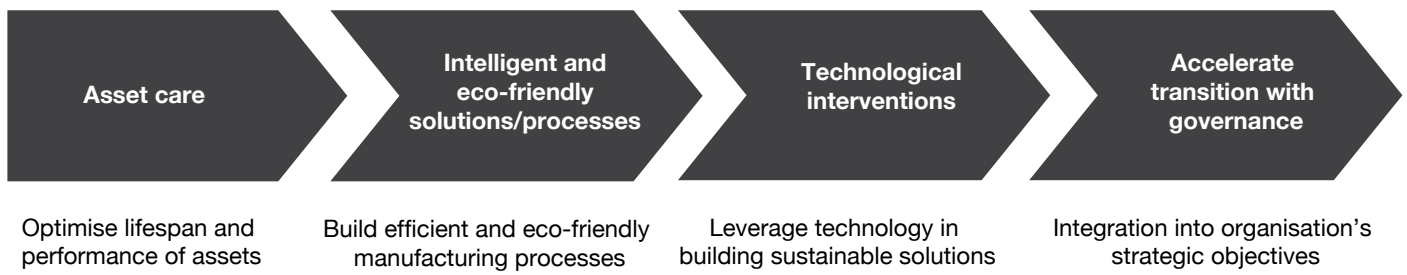
**build intelligent solutions and eco-friendly processes,**

**use technology-based interventions, and**

**accelerate transition with governance.**



**Figure 2: Key considerations to ensure sustainability in operations**



## Asset care

The first step in asset care is to optimise what the company has. Operations can become sustainable if companies can enhance the lifespan and performance of machinery, reduce downtime and minimise resource use. Major manufacturing companies are adopting the following sustainable practices:

- **Waste minimisation:** Implementing just-in-time (JIT) principles, lean inventory management techniques and minimising inventory waste while ensuring adequate asset availability.
- **Emissions reduction:** Streamlining transportation processes through route optimisation and shipment consolidation to bring down transportation waste and reduce fuel consumption and carbon emissions.
- **Energy investments:** Implementing predictive maintenance techniques and investing in energy-efficient technologies to lower energy consumption and emissions.

## How to achieve excellence in asset optimisation?

Industry players have achieved operational excellence by integrating people, process and asset care initiatives, realising throughput increase and overall equipment effectiveness (OEE) by more than 15% along with a reduction of in-process inventory, and energy and raw material costs. However, challenges related to asset maintenance are usually centered around the following questions:

- How to ensure peak performance of assets?
- How to undertake asset management at optimised cost?
- How to extend an asset's functional life?
- How to maximise efficiency of assets?

## Recommendation: Find the right mix of asset care, people and processes

Firstly, businesses need to ensure that their assets and asset systems remain aligned with operational strategies and performance levels

support annual business plan delivery. Active involvement of the leadership is critical to ensure the commitment and alignment of an organisation's sustainable goals with the overall business strategy. Asset maintenance requires proper work, shutdown and material management along with the identification of critical assets and condition monitoring. Business partner management, for instance, encouraging vendors to sustainably source raw materials, and proper hydrocarbon management – which ensures hydrocarbon materials are stored and handled safely – are also important for conducting effective sustainable operations. However, the key to achieving sustainability is through the successful implementation of operational excellence elements comprising:

- **Asset care:** Maximising the life of an asset by ensuring optimal utilisation and availability of an asset.
- **Process care:** Ensuring productivity and quality of output with a focus on building process capability, standardising work practices and adopting best practices in operations and maintenance.
- **People care:** Focusing on upgrading and enhancing the skill set as well as ensuring the availability and retention of skilled manpower.



Therefore, the right combination of asset management, processes, people and technology can lead to excellence in sustainable performance and deliver better outcomes in terms of:

- **Optimised asset performance:** Better availability and utilisation, longer mean time between failures (MTBF), longer mean time between service incidents (MTBSI), and improved product quality.
- **Lowered costs:** Waste elimination and continued improvements in processes, maintenance efficiency with regard to labour, material and contractors, maintenance effectiveness in terms of work and material quality.
- **Enhanced risk management:** Managing risks through identification of critical assets, developing life cycle plans, and asset health monitoring.

## Intelligent and eco-friendly solutions/processes

Leveraging technology to build intelligent and eco-friendly manufacturing processes can also help a business in achieving their sustainability goals. Optimising production processes through lean manufacturing methodologies, which aim to eliminate waste and boost productivity, can improve resource utilisation and lower energy consumption. Contract manufacturing organisations have

improved their productivity by adopting lean and the Six Sigma approach by 15–20%.<sup>20</sup>

## How to minimise waste and maximise value?

Businesses that are trying to streamline manufacturing processes encounter several challenges. For instance, identifying and minimising non-value-adding activities in production processes. Another common obstacle that manufacturers face is identifying sources of waste and eliminating them, addressing bottlenecks and defects, and reducing downtime to manage idle resources is also critical for continuous production flow, managing the transportation process which may lead to an increase in waste and increased costs, and aligning production with actual demand. Businesses walk a tightrope when it comes to inventory management. Excess inventory can tie up capital and take storage space while inadequate inventory can cause losses.

## Recommendation: Follow a process improvement approach

PwC India can help clients employ innovative approaches through process mapping and analysis to identify areas of inefficiency, waste, and environmental impact. A process improvement approach includes assessing the current processes, designing solutions

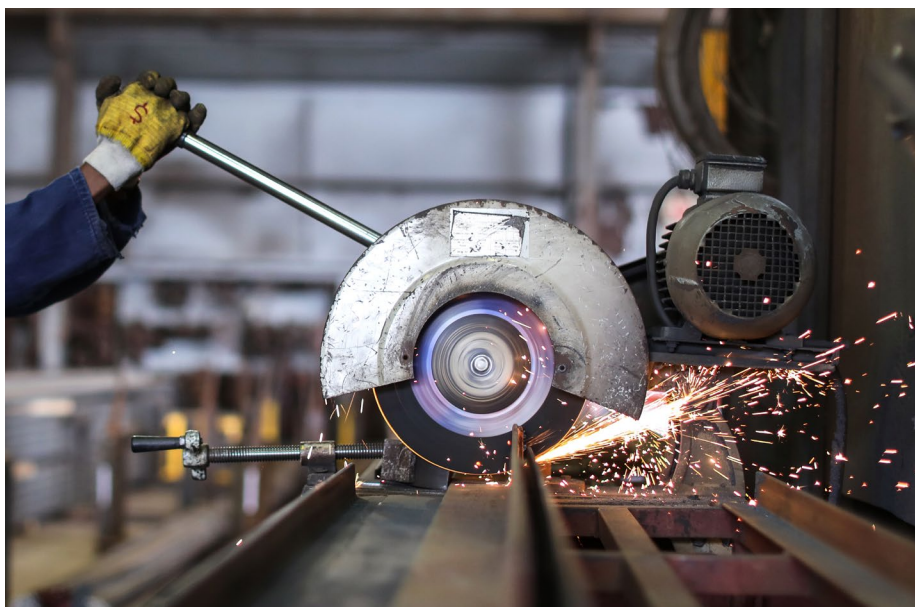
for improvement, implementing the solutions and maintaining the same. The following are the steps of a process improvement plan:

- **Assess:** This phase provides complete as-is mapping of processes, machines, capacity and manpower resulting in identification of bottlenecks, OEE levels and capacity.
- **Design:** In this phase, cross-functional teams are deployed for problem solving, solution design, prioritising areas of improvement and identifying quick win implementation areas.
- **Implementation:** The next step is implementing the new approach by setting up and empowering teams while tracking and monitoring KPIs.
- **Sustain and control:** New targets/KPIs are established to sustain the benefits and control mechanisms are designed and implemented to minimise risk.

A typical process improvement approach uses OEE and capacity evaluation to identify and drive areas of improvement. Value stream mapping also helps to identify wastes and bottlenecks and helps in eliminating or managing them systematically. The aim of this approach is to minimise non-value-added (NVA) activities, such as overproduction and overprocessing, in the desired state of processes. As a part of process improvement, process excellence is driven across the organisation, by mapping processes, identifying gaps, and improving turnaround times.

<sup>20</sup> Percentage based on PwC analysis





## Technological interventions

To drive sustainability, organisations must utilise advanced technologies by leveraging automation, robotics, and artificial intelligence to optimise processes, cut down errors, and boost efficiency. Companies can also enhance their ability to identify and prevent defect waste with smart quality control systems and predictive analytics. Adopting digital manufacturing technologies, such as the industrial Internet of Things (IIoT), gathering real-time data for data-driven decision-making, and optimising processes can help organisations in reducing waste generated through overprocessing.

Leading engineering and capital goods players have identified transformational opportunities across functions such as supply

chain and manufacturing and implemented improvement roadmaps comprising process, policy and digital interventions, resulting in 30% throughput improvement in critical chain tasks,<sup>21</sup> savings in manufacturing and raw material procurement, and effectively capturing the cost of poor quality (COPQ).

## How to align digital strategy with business objectives?

According to a 2023 PwC survey, Indian manufacturers are underprepared to start their digital transformation journey despite it being high on the agenda.<sup>22</sup> Most companies have seen moderate to low returns despite high investments due to lack of digital strategy and business strategy alignment.<sup>23</sup> The recent PwC survey revealed that:

- **38%** of the firms surveyed were yet to create a roadmap for digital transformation.
- **37%** of the firms surveyed believed that resilience and sustainability were driving digital transformation.
- **54%** of the firms surveyed showed an upward implementation trend towards adopting analytics and AI.<sup>24</sup>

## Recommendation: Foster digital knowledge through upskilling and change management initiatives

Indian companies are more likely to put people, policies and mindset first while global companies are more inclined to develop the right system for driving any transformation.<sup>25</sup> Successful digital transformation requires elements of centralised standard-setting. A typical digital transformation approach is focused on optimising the overall cost of operations via tactical and strategic interventions spread across three key themes. These include business process re-engineering (BPR), cost optimisation and digital interventions across functions/departments with due consideration and integration of:

- organisation strategy and governance ensuring the implementation of digital transformation.
- training/capability enhancement to ensure

21 Percentage based on PwC analysis

22 PwC survey. Reimagining digital factories of tomorrow

23 Ibid.

24 Ibid.

25 Ibid.

implementation and sustainability of digital transformation.

- change management for successful integration, implementation and sustenance of digital practices.

Thus, companies can undertake various initiatives such as organisational re-structuring, process efficiency improvement, enterprise resource planning (ERP) implementation, and vehicle management system to successfully adopt sustainable practices.

## Accelerate transition with governance

Robust governance practices ensure that sustainable operations are integrated with an organisation's strategic objectives. Establishment of clear policies, performance monitoring, and maintaining compliance with environmental regulations will meet market demand and reduce overproduction waste. Additionally, establishing clear metrics and KPIs, and implementing environmental management systems, such as ISO 14001 – an internationally agreed standard that sets out the requirements for an environmental management system – can help systematically manage environmental risks and drive continuous improvement.

## How to integrate sustainability with organisational goals?

Commitment from top leadership is essential to integrate environmentally responsible practices into a company's overall mission. While discussions on ESG are increasingly dominating the boardroom, directors still struggle to understand the connection between ESG and company goals.<sup>26</sup> PwC's Annual Corporate Directors Survey 2022 revealed that only 45% of the directors surveyed in the US believe that ESG issues have an impact on company performance. However, companies have been integrating ESG goals into their compensation plans for executives.<sup>27</sup> Today's workforce is also more eco-conscious and demands accountability from employers. For instance, PwC's Global Hopes and Fears Survey 2023 highlighted that 56% of the Indian respondents said that their employers have the responsibility to take action to address climate change.<sup>28</sup> Thus, employers need to incorporate ESG and include their employees in driving sustainable goals.

## Recommendation: Develop well-defined policies, performance metrics

A successful approach for incorporating sustainability into an organisation's objectives

requires establishing a three-step continuous improvement process which assesses the organisation's practices through a sustainability lens, identifies gaps, provides solutions and implements action plans. Given below are the details of the three steps of the process:

- **Review:** A process team monitors KPIs that measure the impact of sustainability initiatives and takes regular feedback from operational teams on areas which have optimisation potential (existing environmental management systems and risks) wherein a root-cause analysis is performed.

### Pre-requisites:

- Report and monitor KPIs
  - Operational team leads regularly collect and communicate feedback
  - Clear responsibility allocation
- **Solve:** Measures are suggested for each cause identified during the review stage. Meetings are arranged with multiple stakeholders to brainstorm and discuss the measures and change requests. It is important to have a training plan to align the changes with the organisational goals.
- **Pre-requisites:** A well-defined change request process.

26 PwC's 2022 Annual Corporate Directors Survey

27 Ibid.

28 PwC's Global Hopes and Fears Survey 2023

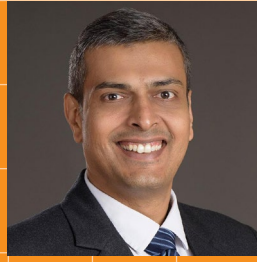
- **Execute:** The approved change (if needed) is executed. This may require change in IT requirements, trainings, communication or updating documents.
- **Pre-requisites:** Change implementation (IT/Non-IT)

## The way forward

India is slowly but steadily moving towards 'panchamrit' and its goal of net-zero carbon emission by 2070 to enable the green industrial and economic transition. The National Green Hydrogen Mission, with an outlay of INR 19,700 crore, will facilitate the transition<sup>29</sup> of the economy to low carbon intensity, reduce dependence on fossil fuel imports, and help the country assume technology and market leadership.<sup>30</sup>

Organisations can improve resource efficiency, reduce waste generation, and enhance environmental stewardship by focusing on long-term vision, adopting a holistic approach, working in collaboration with stakeholders, and aligning manufacturing processes with ESG principles. The Government of India is providing various green manufacturing incentives for conducting environmental audit, water conservation (25% grant to SMEs for expenditure incurred on audits subject to a maximum of INR 1 lakh), wastewater treatment and rainwater harvesting.<sup>31</sup> Lean manufacturing, process optimisation, and ESG goals can aid organisations in their journey towards building resilient and sustainable manufacturing operations that align with India's sustainable development goals.

Also contributing to this article were **Prahalad Chandrasekharan, Unmesh Lohite, Vishnupriya Sengupta and Ruchika Uniyal**



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29 PIB release on National Green Hydrogen Mission

30 Ibid.

31 PIB release

# ‘For me, AI is nothing but a **simple statistical function**’

In developing countries, driving societal change is as important if not more than business change, emphasises **Dr Arif Dowla**, Group Managing Director, ACI Group in Bangladesh, in an insightful conversation with **Arnab Basu**, PwC India Advisory Leader.



Arnab Basu (left), Dr Arif Dowla (right)



## Excerpts from the interview

**Arnab Basu:** Welcome to this edition of Immersive Outlook. Today, we are really privileged to have with us Dr Arif Dowla, a man who wears many hats. A PhD in mathematics from the University of California, San Diego, Dr Dowla took over as the Managing Director of ACI Limited in July 2005. He is the functional head of ACI Group. He is also the former Chairman of Mutual Trust Bank Limited. Currently, he serves as the director of the bank. Prior to that, he was the Director of Pioneer Insurance Company Ltd for seven years. Dr Dowla has diversified the ACI business, and today, ACI is the largest turnover-based conglomerate in Bangladesh. In 2008, he started a retail chain business under the name Shwapno. With more than 350 outlets, Shwapno has spurred the people of his country to dream about improving the quality of their lives. Welcome to this session, Dr Dowla.

**Dr Arif Dowla:** Thank you, Arnab. I am really happy to be here.

**Arnab Basu:** You have had a successful career, spanning diverse industries. Walk us through the key milestones and defining moments of your journey.

**Dr Arif Dowla:** First of all, it was a big jump for me, moving and changing gears from a very research-oriented environment in the US to coming back to Bangladesh and being a part of ACI as an executive consultant, a position I held for three years before becoming the managing director of the group.

I think the biggest jump happened when I felt that I had the responsibility to grow this company. I also felt that there was a lot of economic development that needed to happen in Bangladesh.

This was the first big challenge. I looked at many other South Asian countries whose economic development was much faster or that were already developed. I tried to understand what happens in those countries. What are the must-haves? What's the sequencing of the development of an organisation inside a country?


It was for me mostly about the country, Bangladesh. How would Bangladesh evolve and how could I align the organisation with that evolution? So, we launched a lot

of new businesses, and that was the first growth milestone across fundamental areas.

I always wanted to make sure that we were in the must-have segments and that should happen in the next five years. I wasn't thinking about where we will be 25 years from now. I thought that the landscape of the world is changing too rapidly for me to worry about, but to get a strong foothold in the next five years was important.

Diversification was also important, because there are a lot of things in Bangladesh that needed to be done but were not being done. I thought since we have some level of credibility, good support from banks and a good image, it would be nice to get into important and fundamental areas where there should be rapid growth and where there is a necessity. I thought that would align organisational growth with the country's growth. That was very critical for me. It was also challenging in the sense that at that time I didn't have a clear idea. We had to do a lot of brainstorming, getting people together and asking those big questions.

Another challenge was that people found it very odd to discuss such big picture questions. They thought we should busy ourselves with the day-to-day operational aspects of the business. For me, finding the big picture so that all pieces fit in was the critical part.



**Arnab Basu:** Thank you, Dr Dowla. Given the rapidly changing industry dynamics amid global economic upheavals, how do you plan to secure the business, increase resilience and maintain a focus on process optimisation?



**Arnab Basu (left), Dr Arif Dowla (right)**

**Dr Arif Dowla:** I think it's important to make sure that there is clarity around what we want to do in the next few years. One year is, of course, too short a time, I usually look at three to five years. What are the things that we need to achieve and what are the major processes that can bring about the achievement? Once these processes are clearly understood – there's of course a lot of debate that goes on before we achieve some level of clarity – then the issue is, how do we make sure these processes are completed in a cost-effective way? So, I think as much time has to be spent on finding out what is important as on the business of optimising things.

Here, I found that even within our own team there was a little bit of an issue. It's not about how much we work, it's about how we decide to work, and what is fundamental and what is accidental. It's very important to identify those few things that you need to get right. You can't get everything right, but

few of the core things should really get 80% of your attention, those must-ensure things that need to be refined and optimised. That's how I tried to link long-term goals with short-term operations which need to be managed by people who are very good at those specific opportunities. Does that make sense?

**Arnab Basu:** Absolutely. That makes a lot of sense, Dr Dowla. And I think, going deep into some of those aspects makes all the difference. Technology integration comes into play here. Tell us a bit about how your company is leveraging technology and automation in operations management, and about your take on the power of AI and its use in the manufacturing space.

**Dr Arif Dowla:** I divide technology into different categories. One category is the digital and AI revolution that's occurring. That actually can penetrate almost every system and process. Initially that may be through a collection of data and getting your data to be more visible. This allows for more clarity and different technologies coming into the system – not necessarily AI technologies because I find that in many cases, we don't have enough data to run an AI engine. But we have enough data to run a business insights engine where you can actually do more traditional types of information analysis. In some cases, of course, it is AI susceptible. There is this other type of technology that is the business-specific technology that customers need, relevant technologies that will allow your business to move to the next level. And that's very important. In fact, that allows your business to reach out to the customer with the technologies of that particular business.

Since we are diversified, digital technologies are a must-have across all our businesses in terms of creating an overall platform, but it also requires a lot of articulation of data.

To your point about manufacturing, I think it brings us a huge opportunity. But before that happens, we need a lot of data collection in the appropriate sectors. We need sensor-based data, we need automated data to come in because AI cannot really work unless there is speedy data that's flowing in through the different machines of the factories.

Right now, we are at a stage of establishing those data centres, making sure we have a sensor in that machine. We are not yet at that stage where we can put all that information into an AI engine with recommendations.

We have many people working on that, they are trying to manage the hiccups or the opportunities that present themselves. But it's still done by people and data. To make it move to the next level, we need more sensors.

But we need to get more frequent, rapid streams of data, and then the AI engine has to be optimised. AI can give a lot of unfeasible answers, so you have to optimise the AI answers so that they fit into the practical business constraints. So, the human constraints and the contextual constraints have to be embedded in the data-enriched capabilities of AI. We still have a long way to go. Companies that can do this will enjoy a huge competitive advantage.

**Arnab Basu:** Absolutely. The pace of data can make such

**a big change. It is the way of the future. Coming to the next question, ACI has long been exporting medicines to various countries, including the US. Are you looking at expanding beyond borders and also at more joint ventures with India like you have done in the past?**

**Dr Arif Dowla:** Collaborative partnerships are important, and we also believe in transparent, long-term relationships. We have quite a few technological partnerships and joint venture (JV) partnerships. ACI, as a company, is very open and transparent with clear objectives. I think we make a good partner. We can't do everything on our own. It's important to solve problems quickly, and that will come through collaborative partnerships.

We have started exporting to the US directly from our manufacturing facilities. We also export medicines to many other countries.

But as we move into other areas and try to globalise, we need to become more competitive in terms of our ability and our right to win. It's work in progress, that's the frank answer. ACI exports only a small fraction. We are primarily a domestic conglomerate with export opportunities now opening in pharma.

**Arnab Basu:** Thank you, and it's really heartening to know about those plans. One of the other things I wanted to ask you about is Shwapno, the huge supermarket chain your company owns in Bangladesh. Did the disruptions in the supply chain in the recent past impact

**Shwapno? And what are some of the lessons learned from that disruption?**

**Dr Arif Dowla:** There were disruptions. There were a lot of products that we could not make available in the shops on time. But that was a disruption for others too. So, we tried to make sure that we had a competitive advantage over others. We tried to make sure we did more than what others could do. As a result, we have actually gained more trust, earned more customers.

**Arnab Basu:** ACI is known to be the first company in Bangladesh to have obtained ISO 14001 Certification for Environmental Management Systems. What are some of the specific measures being taken by your company to promote sustainable practices across its operations?

**Dr Arif Dowla:** I think that in this space, we have a lot more to do. But we have been able to at least ensure that all our factories have proper effluent treatment plants. We make sure that we don't waste energy and whatever we discharge from all our factories is discharged at an environmentally friendly level. These are the specific measures. We installed those treatment plants across our factories, and we have more than 20 factories.

**Arnab Basu:** Your company has recently launched two digital education apps, 'Medhabir Supernova' and 'Kids Brain Builder', to make learning easier

**for children. What measures do you think the EdTech industry must take to cater to the diverse learning needs across different regions without deepening the digital divide?**

**Dr Arif Dowla:** I think we went with these two with a particular view in mind. There's a lot of factual knowledge in our educational curriculum, but factual knowledge is not what's really needed, right? What is needed is conceptual understanding and the ability to synthesise different types of information into something meaningful.

We thought that if we launch education apps, where we use animation to explain to children more challenging and difficult concepts, things that are hard for teachers to teach in the normal blackboard setting, it will help. If you have a concept like Archimedes' principle, it's much better explained in terms of animation. Or something in physics, for example, Pascal's law of pressure, or you want to show Boyle's law or the gas laws, or some more complex stuff, this requires animation, and a lot of students don't really get to ever understand these deeper scientific concepts. They learn facts but they don't learn ideas, but animation and visual technology, especially with the ability to repeat it in case you miss the idea, is extremely powerful for a country like Bangladesh.

There are so many people who see literacy as the ability to read and write. But that's not really what education should be. Education should be about opening and unlocking the

conceptual potential of the human brain. So, these apps are about solving problems and more oriented toward developing creative thinking. I think there should be more apps, especially in developing countries, so that the ability of children to become a technology-oriented, future-fit population will be much higher. Our countries will be greatly benefited by that. School teaching and learning is very expensive and long term. And it also involves a lot of memorisations, learning by rote. But it would be nice to see scientific ideas reaching the young population in a visually simplified way. They can start thinking early so that they can grow into individuals with a powerful mindset as they're moving into the future of an AI-driven world, a world where technology will often overwhelm humans. If we can do this meta thinking and start early, we can at least control AI.

**Arnab Basu:** That's a very innovative and probably revolutionary way of thinking about children's education. Thanks for that. Shifting gears a bit – ACI is also engaged in the marine business. It has recently launched marine engines that can be used in vessels, industrial machinery and dredgers. What prompted this move? Are there other projects in the pipeline to contribute to the country's blue economy?

**Dr Arif Dowla:** ACI has started an agricultural machinery business from which we developed a very large team of service engineers. A natural consequence of that is to service

marine engines. We are a country of rivers, and our marine system is very weak and very unscientific. There are a lot of things we can get through the rivers. There's a lot of information that the river water carries, we need to get sensors in the rivers. We need to also understand how we can turn it into a source of competitive advantage. We have not been able to capture any of this. There are a lot of things to be done. And since we have this agricultural service team of over 800 engineers that we have developed, we need to focus and start somewhere. So we decided to start with servicing of marine engines.

But through this, we need to open up a gateway of information. And then we will be able to go deeper into understanding what's happening in this sector.

**Arnab Basu:** Thank you, that's really great. You have mastered mathematics. Tell us a little bit about your area of research and how that has played a role in your career graph and what keeps you motivated as a person?

**Dr Arif Dowla:** What excites me about the future is that we are a country that's developing. A lot of human needs are being satisfied through the work that organisations do, so I want to see that we are able to drive change and be impactful in terms of the development of human life. That's why if you look at our businesses – we are into agriculture, even these education apps, all of these are connected to what is fundamentally required in our country.



We can't do everything, we can't develop rockets, but within the spectrum of what we can do, we are trying to mobilise a lot of technology around that space. Now that we are almost a 1.5-billion-dollar company – that is large from the perspective of Bangladesh – we can mobilise many of these resources to be able to capture that.

The mathematics that I have learned is very conceptual. I think that maths helps only in terms of understanding the rate of growth of different key performance indicators (KPIs). And that tells a story, actually. If your organisation has different KPIs, different growth rates, most people will look at growth rates. For someone like me, we have to look at growth rate, rate of rate of growth, rate of rate of rate of growth. So, I look at higher derivatives. I use some of my understanding of calculus to give me early indicators of what's happening.

And another thing that happens is that you recognise patterns. And you understand what AI actually does. For me, AI is nothing but

a simple statistical function that is a little more elaborate than the normal ones. So, AI is not a mystery to me when you look at it from a mathematician's point of view, a lot of this is nothing but statistics and computers and numbers which are algorithms. A lot of the mysteries are taken out.

It's something that has helped me. Directly on a day-to-day basis, I think business is a lot about understanding technologies, but more about making sure that people are excited when they come to office.

So, I am actually trying to look at the psychological aspect more because I understand the technical aspect. For me, it's more important to make sure that people are motivated. I don't want math to hinder my empathy with people. I think leadership is about that empathy.

**Arnab Basu:** You have touched upon so many key points, and I think our viewers would appreciate that here is a man who's driving not just

**business change but, more importantly, driving societal change. So, Dr Dowla, thanks a lot for spending time from your busy schedule with us.**

**Dr Arif Dowla:** Thank you, Arnab, for asking such wonderful questions. I really appreciate it.



**Arnab Basu (left), Dr Arif Dowla (right)**

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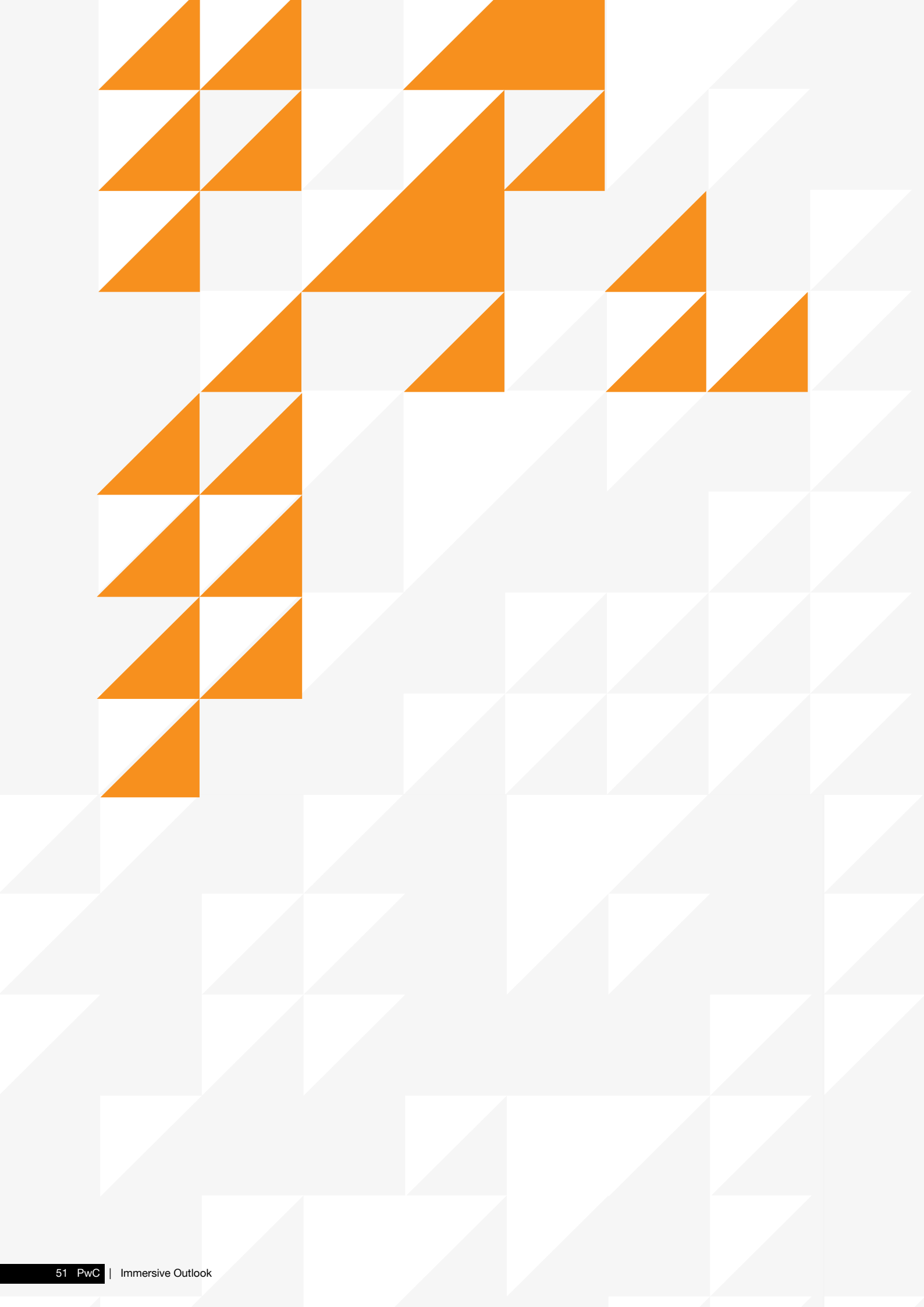
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