Decoding the Fifth Industrial Revolution

Marching towards a resilient, sustainable and human-centric future

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Contents

1. PwC India research highlights

*According to PwC India's latest research, 93% of senior executives across six industries would like to be known for their sustainability initiatives, and yet achieve 2x to 3x profitable growth over the next three to five years. This is the Industry 5.0 paradigm. **Sudipta Ghosh, Anirban Mukherjee and Raghav Manohar Narsalay** give the lowdown.*

Prabha, an engineer in a heavy engineering plant, is at the control room. She receives a sudden alert on her cellphone about a potential machine failure on the shop floor and is informed that she has approximately 4 hours to handle the issue.

The next instant she alerts her colleagues on the shop floor and schedules a call with them within the next 30 minutes. On the call, her colleagues telecast the condition of the machine. The parameters of the machine are fed into its digital twin.

With the help of the digital twin, Prabha simulates the scenario to find out what could happen, and course corrects accordingly to preempt the failure.

Precisely 30 minutes prior to the machine failure, Prabha and her team succeed in taking corrective action and normalcy is restored. Simulation helps resolve the problem without any exposure to the hazardous site, and the swift action at the command centre helps increase the overall equipment effectiveness. The prompt actions not only help save time but also reduce overall scope 2 and scope 3 emissions.

A decade ago, this may have been probable; today, it is possible.

Welcome to Industry 5.0 – or the Fifth Industrial Revolution – that goes beyond efficiency to build resilience and sustainability with human-centric technology. While Industry 4.0 technologies helped achieve efficiency-driving automation, the focus of Industry 5.0 is on fruitful collaboration between humans and technology to drive sustainability and to make production and manufacturing systems more resilient to external shocks, and ready to respond to business challenges with agility.

In the past, the primary goal of industrial revolutions was to harness the power of technology to increase output and drive efficiency, often at the expense of human well-being and environmental sustainability. Industry 1.0 introduced mechanisation through water and steam power; Industry 2.0 brought mass production and electricity; Industry 3.0 ushered in the age of computers and automation; while Industry 4.0 integrated cyber-physical systems, the internet of things (IoT), and big data analytics to further automate and optimise industrial processes.

Industry 5.0 builds a symbiotic relationship between humans and advanced technologies such as artificial intelligence (AI), robotics and IoT, helping raise human productivity and opening new production possibilities that are automated, safer, sustainable and resilient. The automation it entails is in collaboration with humans to make the environment safer, sustainable and efficient for the human worker and for society at large. By making technology more human-centric – both from a workforce and consumer standpoint – Industry 5.0 paves the way for widespread adoption of digital technologies with a human touch, driving impactful collaboration among a wide group of stakeholders across businesses.

Embracing Industry 5.0 necessitates that the C-suite – especially heads of manufacturing, operations and supply chains – prioritise the long-term wellbeing of their workforce, consumers and/or end-users along with environmental impact, while achieving both short and long-term business goals.

The questions that then arise are:

- Are leaders ready for this mindset change that places business goals on par with workforce sustainability and consumer expectations?

- Are businesses ready to invest and move to the next level to ensure a fine balance between business interests and workers' safety?

- Are business leaders willing to factor in environmental impact in all that they do?

PwC India's research, conducted between May and July 2024 and covering 180 manufacturing senior executives from the automotive, cement, chemicals, industrial goods, metals, and textiles and clothing industries attempts to find answers to such questions.

Though most industries in the manufacturing space are, to varying degrees, keen to maintain a fine balance between business interests, workforce resilience and overall sustainability of the ecosystem, not all have begun the Industry 5.0 journey. Executives were candid about their vision for their respective industries in the long term and highlighted the subtle but significant changes they have been observing among stakeholders in the ecosystem. They stated that consumers along with the workforce want them to prioritise sustainability in unequivocal terms.

The following are the key findings that emerged from our research:

Most executives agree that their readiness pertaining to Industry 5.0 capabilities relevant for their customers, workforce, supply chains, business models, and ESG commitments would help enhance their revenues by 6.42% on an average over the next one to two years.

Executives from the chemicals, cement, and textiles and clothing sectors believe that their sectors would, on adoption of Industry 5.0, be the most significant gainers with potential revenue expansion amounting to more than 7%.

Most executives from the automotive and metals industries highlight that their customers are ready to pay a premium for innovative products and services. In textile and clothing, executives note consumer readiness to pay a premium for sustainable products.

More than 95% of the respondents in the chemicals and industrial goods sectors are prioritising investments in real-time inventory tracking to optimise inventory levels, reduce stockouts, and minimise excess inventory, this year and the next.

Inability to provide secure access to GenAI and similar such technologies to enhance workforce productivity is a challenge for many executives across industries such as chemicals, textiles and clothing, cement and automotive.

Figure 1: The need to embrace Industry 5.0 is being experienced across industries

Automotive, chemicals and metals: Over 80% of executives across automotive and chemicals envision that their industries will be admired for their actions to drive sustainability and employment and become one of the safest and most secure industries for customers to engage with. That is because they see their workforce and customers becoming sensitive about the environmental and social friendliness of goods and products they produce and consume. Most automotive and metals executives highlight that their customers are ready to pay a premium for innovative products and services.

Cement: Executives in this industry – over 90% – are slightly more eager to be admired for actions taken to drive sustainability and employment. They believe it is only then that they would be able to align with a workforce that would, in turn, become increasingly conscious about health and safety standards while completing their tasks.
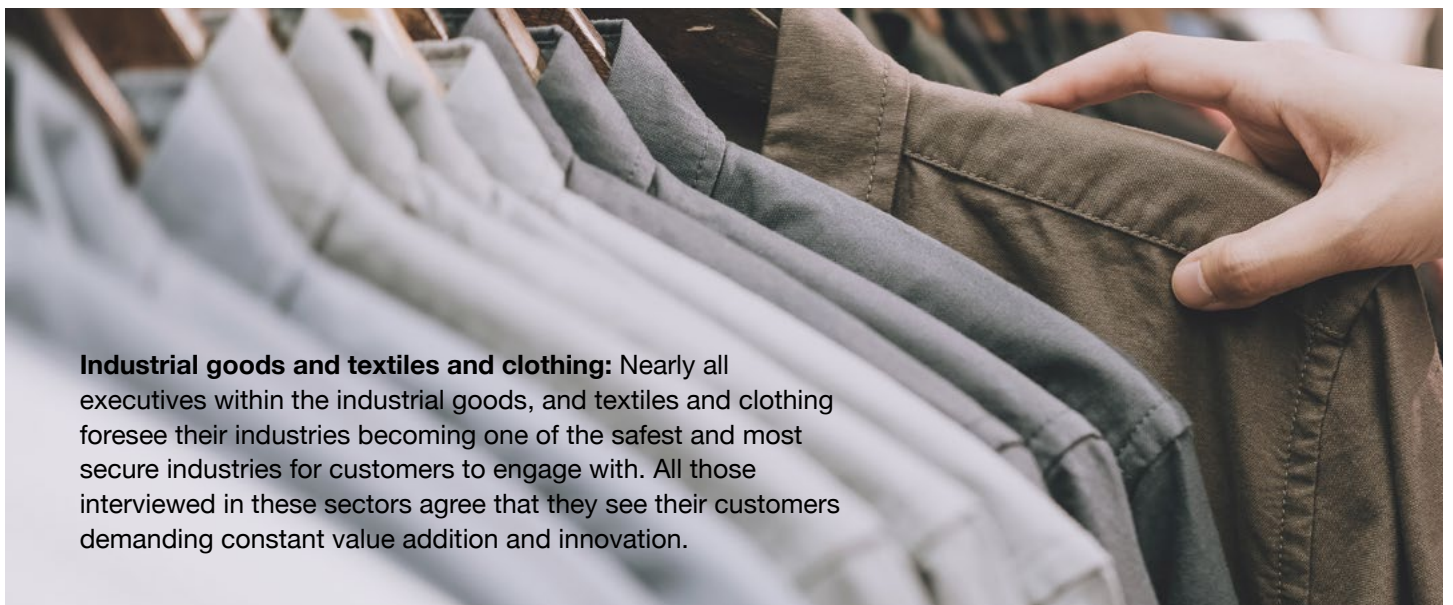
Industrial goods and textiles and clothing: Nearly all executives within the industrial goods, and textiles and clothing foresee their industries becoming one of the safest and most secure industries for customers to engage with. All those interviewed in these sectors agree that they see their customers demanding constant value addition and innovation.

2. Six transformational shifts

Delivering on the near-term financial and business goals while building a more sustainable, resilient and productive business with human-technology entails making transformational shifts across the enterprise. Some companies have started the journey, while others are keen to invest, as our research indicates.
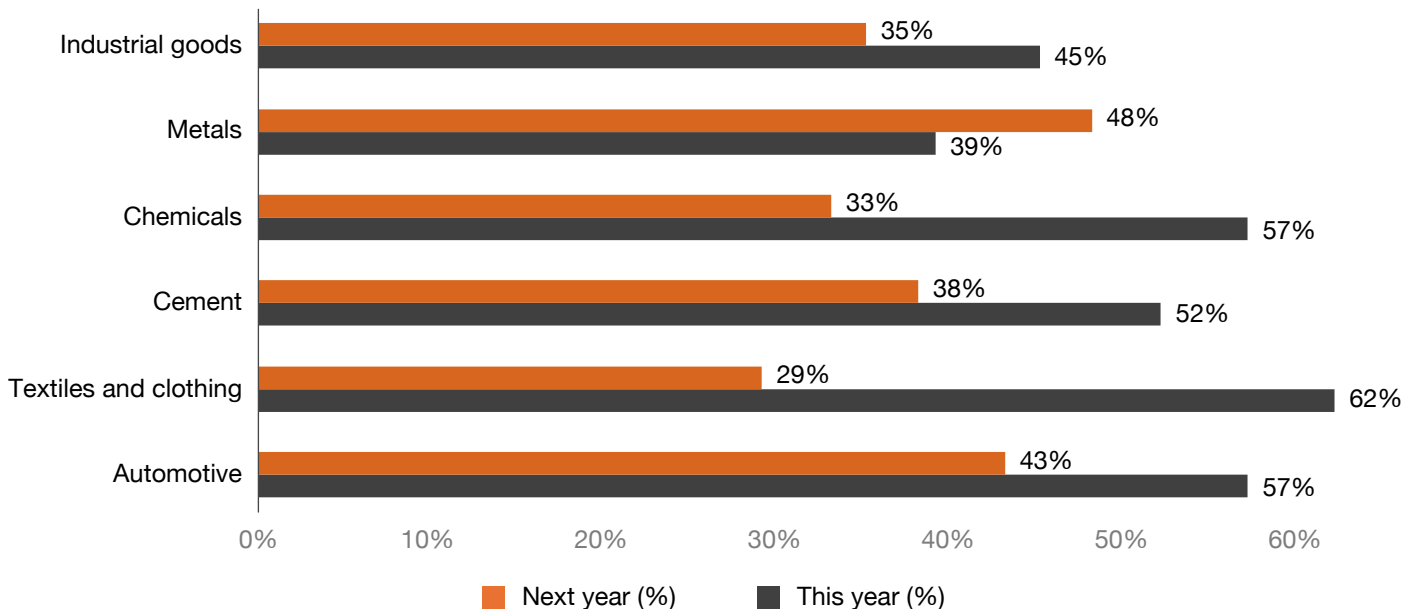
1. From product personalisation to experience customisation

While the historical focus was on the ability to personalise products and workflow, organisations are now customising the entire experience to meet dynamic customer and workforce needs that include services, interactions and user experiences.

On an average, for 52% of executives across industries, providing seamless and connected customer experience across various touchpoints through automation and integration of technologies such as artificial intelligence (including GenAI and IoT) is an investment priority this year (see Figure 2).

Figure 2: Percentage of organisations for whom providing a 'seamless customer experience' is a top investment priority for this year and the next

Industry	Next year (%)	This year (%)
Industrial goods	35%	45%
Metals	48%	39%
Chemicals	33%	57%
Cement	38%	52%
Textiles and clothing	29%	62%
Automotive	43%	57%

■ Next year (%) ■ This year (%)

The lead taken by the automotive industry towards making this shift is well documented. A large Indian auto OEM started a pilot programme using GenAI capabilities for its product campaign, targeting the tech-savvy Gen Z user pool via an instant messaging platform. Once the campaign was scaled up for key products, 30% of the lost leads were recovered. The firm further integrated GenAI into its dealership experience, allowing customers to scan a QR code and connect with an AI bot to have engaging, human-like conversations to know more about various products. The GenAI-based customer relationship management (CRM) and dealer management
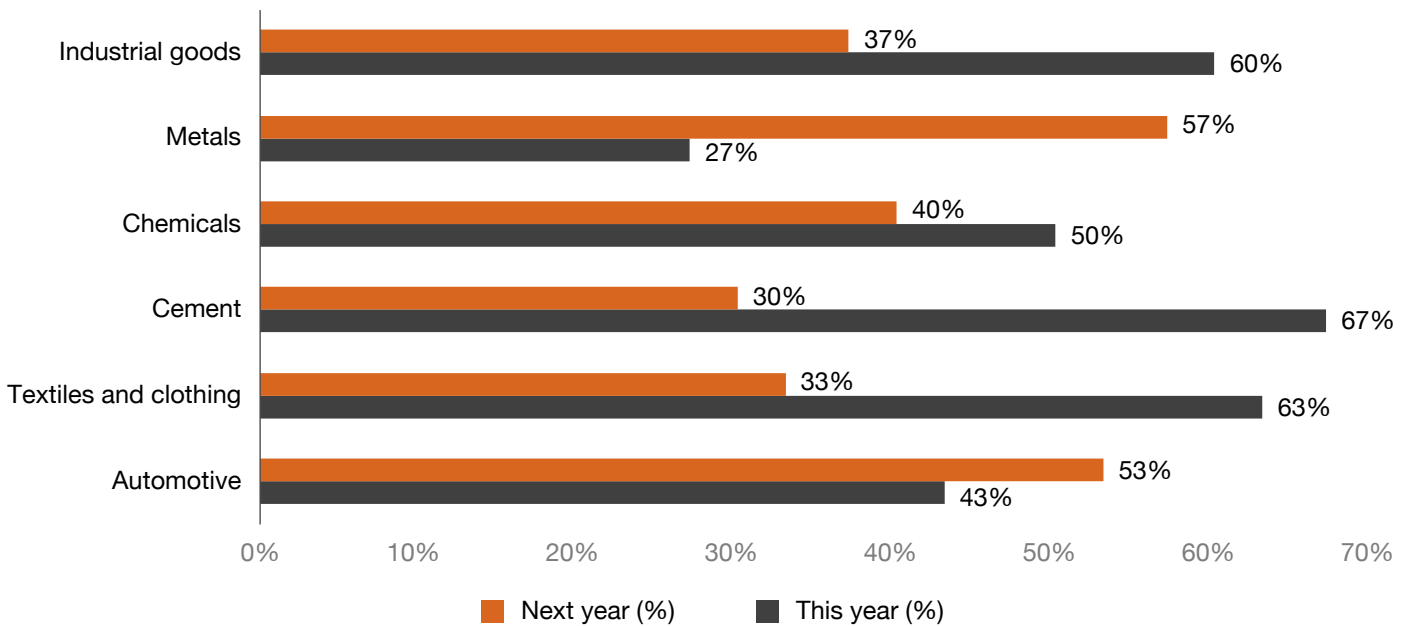
system (DMS) applications provided substantial value to the sales team by generating custom sales pitches based on customer profiles.

When it comes to experience customisation for the workforce, nearly 52% of executives on an average, across industries, said that their respective companies were prioritising investments in automating repetitive and mundane tasks this year. This is to allow employees to focus on more meaningful and value-generative work requiring creativity, problem solving, and critical thinking, leading to higher job satisfaction and engagement (see Figure 3).

Figure 3: Percentage of organisations keen to prioritise investments in 'automating mundane tasks' for this year and the next

| Industry	Next year (%)	This year (%)
Industrial goods	37%	60%
Metals	57%	27%
Chemicals	40%	50%
Cement	30%	67%
Textiles and clothing	33%	63%
Automotive	53%	43%

2. From predictive to preemptive

Predictive analytics has been a hallmark of Industry 4.0, enabling businesses to anticipate trends and make data-driven decisions. Industry 5.0 goes a step further by becoming preemptive as much as prescriptive, using intelligent algorithms and real-time data to model and simulate multiple corrective scenarios, helping businesses address potential issues before they arise. This proactive approach will enhance operational and supply chain efficiency, and reduce downtime, leading to more resilient and responsive systems and in turn reduce human stress and improve shop floor safety.

On an average, nearly 50% of executives in our research are channelising their investments to build responsive supply chains by factoring in real-time data and analytics so as to check for potential disruptions and adopt prescriptive measures to mitigate risks, this year. Fifty-nine per cent in cement and 54% in chemicals and textiles and clothing industries are investing in building a responsive supply chain this year already (see Figure 4).

Figure 4: Percentage of organisations investing in 'responsive supply chains with real-time data and analytics' for this year and the next
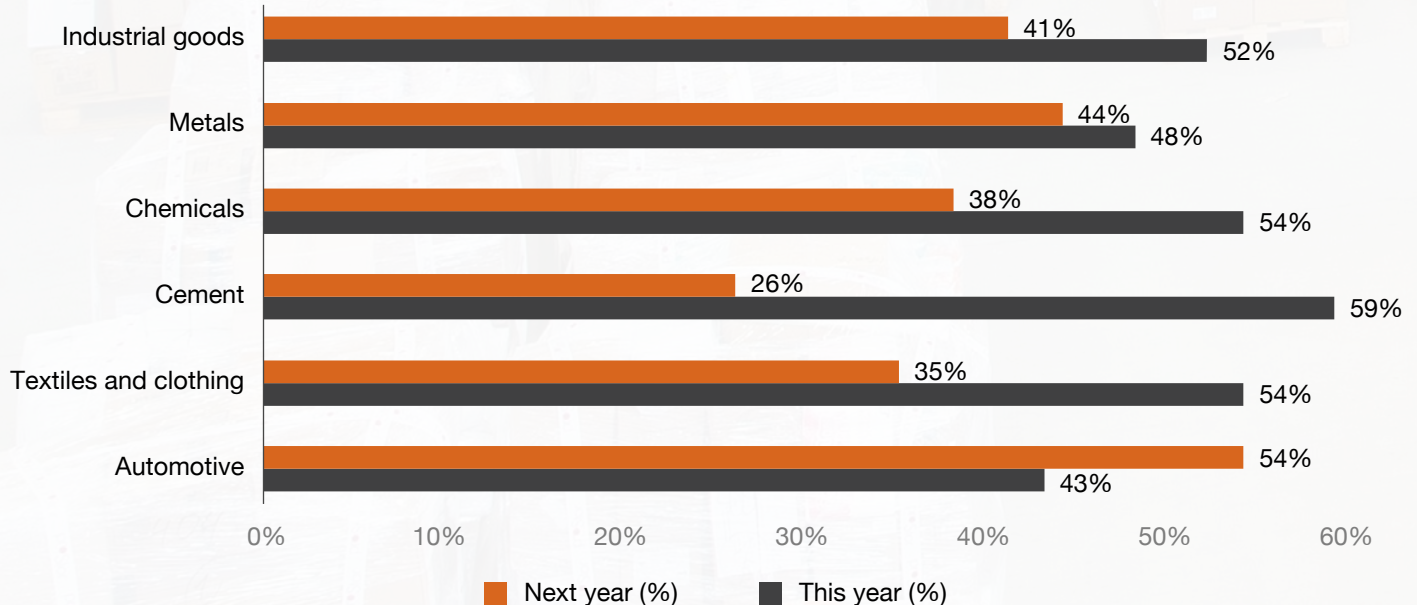
Some companies have already started on this journey. An Indian company, for instance, has embraced a data-driven approach to decision making and integrated IoT to accelerate its digital transformation. With this setup, real-time deviations in process safety are detected and notified, allowing teams to take preemptive measures to avoid any potential safety incidents. Additionally, the incorporation of digital twins for its plants ensures that all information, specifications and processes linked to the equipment are digitised. By utilising real-time and historical data, market intelligence, and advanced statistical models, including machine learning algorithms, the company generates accurate estimates at the depot stock keeping unit (SKU) level. Such optimisation ensures material availability while minimising procurement and consumption costs.

Nearly half of the executives surveyed on an average, with cement and industrial goods in the lead, are also prioritising investments in real-time inventory tracking to optimise inventory levels, reduce stockouts, and minimise excess inventory this year (see Figure 5).

Figure 5: Percentage of organisations prioritising investment in 'real-time inventory tracking and optimisation' for this year and the next
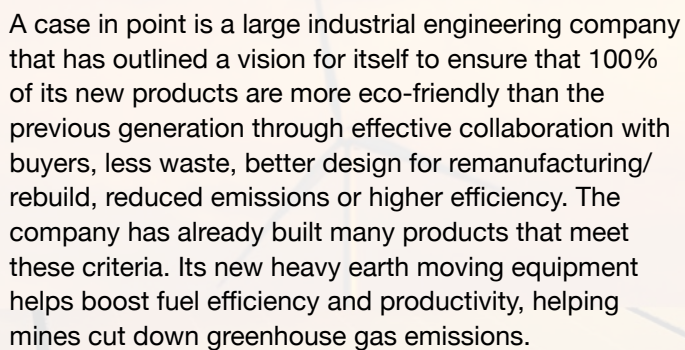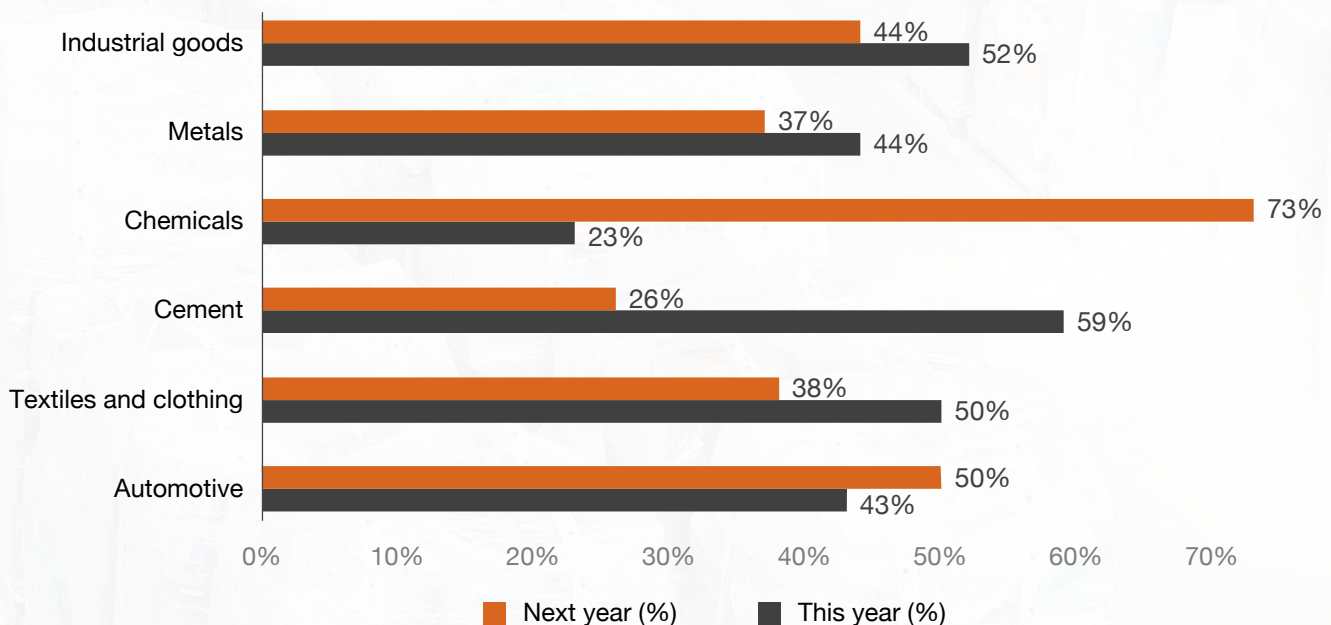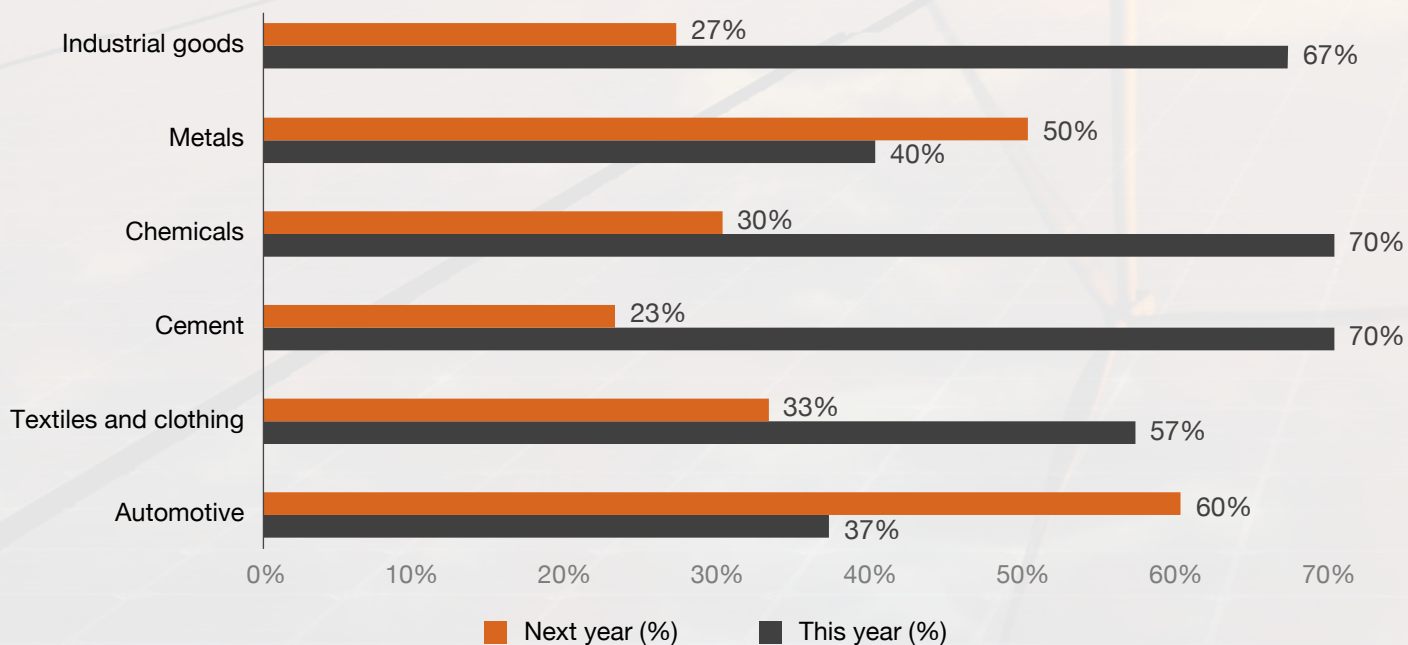
3. From basic safety to overall sustainability

While basic safety measures are usually adopted in industrial environments, it is efficiency that is often the driving factor. Industry 5.0 is designed to make the human-machine symbiosis deliver safer and sustainable experiences for the workforce, consumers and the environment across the value chain.
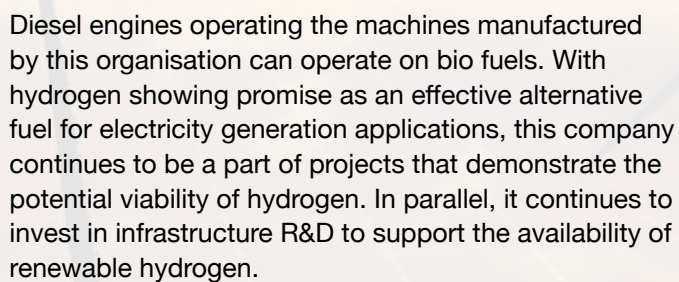
More than half of the executives in our research are prioritising investments this year towards building mechanisms to facilitate adoption of renewable energy sources, implement energy-efficient practices, reduce waste generation, and manage water usage responsibly through digital and other technologies (see Figure 6).

Figure 6: Percentage of organisations prioritising investment for this year and the next towards 'building mechanisms facilitating adoption of renewable energy sources, implementing energy-efficient practices and reducing waste generation'

Industry	Next year (%)	This year (%)
Industrial goods	27%	67%
Metals	50%	40%
Chemicals	30%	70%
Cement	23%	70%
Textiles and clothing	33%	57%
Automotive	60%	37%

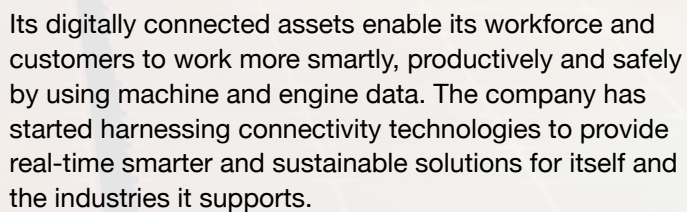Legend: Next year (%) — orange; This year (%) — dark grey

A case in point is a large industrial engineering company that has outlined a vision for itself to ensure that 100% of its new products are more eco-friendly than the previous generation through effective collaboration with buyers, less waste, better design for remanufacturing/rebuild, reduced emissions or higher efficiency. The company has already built many products that meet these criteria. Its new heavy earth moving equipment helps boost fuel efficiency and productivity, helping mines cut down greenhouse gas emissions.

Diesel engines operating the machines manufactured by this organisation can operate on bio fuels. With hydrogen showing promise as an effective alternative fuel for electricity generation applications, this company continues to be a part of projects that demonstrate the potential viability of hydrogen. In parallel, it continues to invest in infrastructure R&D to support the availability of renewable hydrogen.

Its digitally connected assets enable its workforce and customers to work more smartly, productively and safely by using machine and engine data. The company has started harnessing connectivity technologies to provide real-time smarter and sustainable solutions for itself and the industries it supports.

4. From functional maturity to organisational excellence

Functional maturity refers to the optimisation of specific processes and operations within an organisation, with a focus on efficiency. Industry 5.0 focuses on building organisational excellence, which means reskilling and upskilling the workforce and talent to develop the ability to adapt to changing circumstances, and continuously innovate. This may also at times require efficiency to take a back seat to attain the desired level of long-term organisational excellence.

The research findings reveal that 52% of senior executives, on an average, across industries are prioritising their investments this year towards building a culture of lifelong learning, providing opportunities for upskilling and reskilling employees to encourage experimentation and innovation at speed and scale (Figure 7).

Figure 7: Percentage of organisations prioritising investment for this year and the next towards 'building a culture of lifelong learning and providing employees with opportunities for upskilling and reskilling' to encourage experimentation and innovation
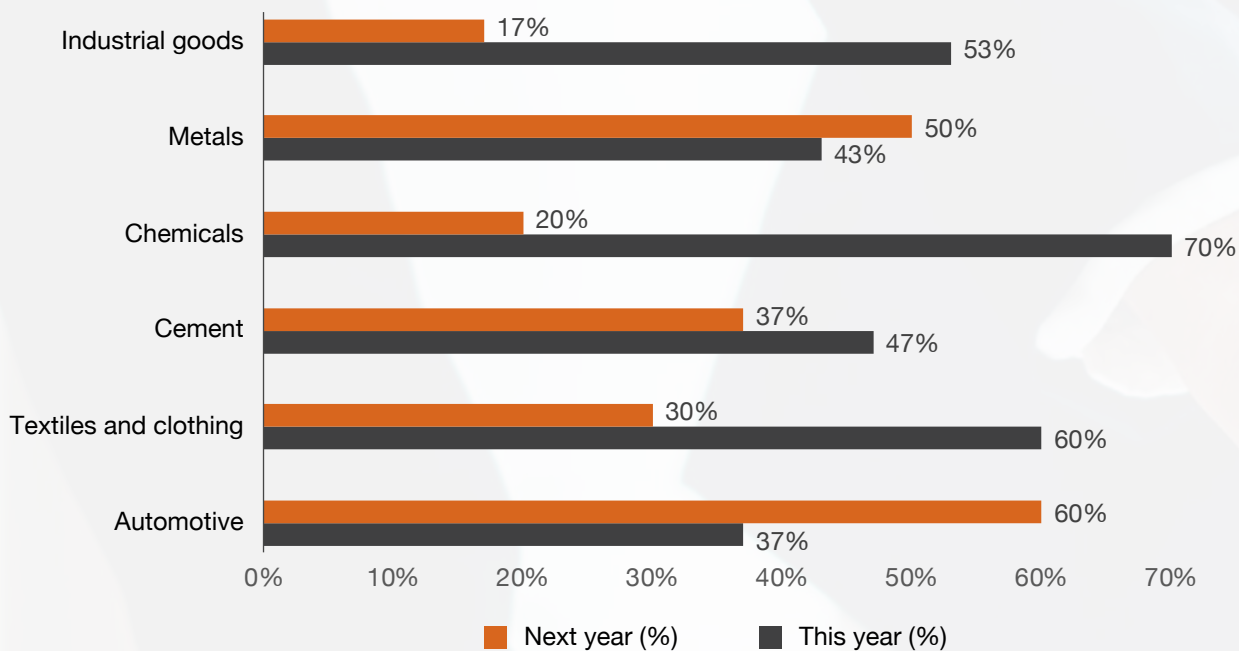
A metals and mining company demonstrates its commitment towards training and skilling. The company's systematic efforts have helped it set up geotechnical engineering teams at each site. These teams are essential in defining key mining parameters such as infrastructure location, excavation size and stopping sequence. They also monitor the rock mass's response to mining activities, integrating closely with the mining teams. To ensure the availability of mining geotechnical engineering expertise, the company has partnered with an engineering institute to train engineers and geologists in this specialised field. It is this collaboration that reflects the company's commitment to investing in its professional workforce and ensuring the sustainability of these critical skills for future mining operations.

5. From punctuated value creation to rapid value reinvention

Traditional value creation entails identifying and exploiting opportunities for profit within existing frameworks. Industry 5.0 emphasises rapid value reinvention that implies continuously seeking new ways to create value in response to evolving market conditions and technological advancements.

Nearly 50% of senior executives, on an average, across industries are prioritising investments for integrating advanced technologies and human expertise to rapidly reconfigure and accommodate changes in product design or customer requirements, allowing for more customised and personalised manufacturing — during the present year (see Figure 8).

Figure 8: Percentage of organisations who have prioritised investments into building capabilities towards driving rapid value reinvention, 'integration of advanced technologies and human expertise'
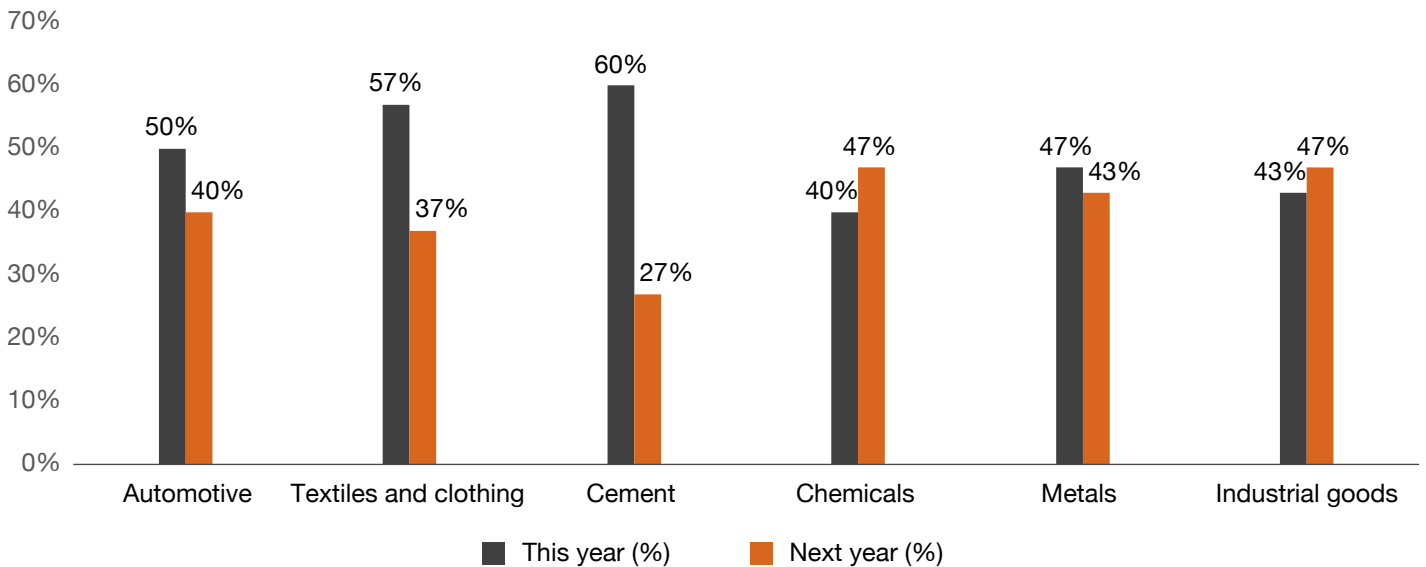
A case in point is one of the leading companies crafting circular supply chains for strategic minerals such as cobalt, lithium, molybdenum and tungsten. Rather than only achieving improved efficiencies through sustainable mining of such metals, it decided to consciously take an unorthodox route towards ensuring resilience and

sustainability of the strategic mineral value chain. Combining the power of human intellect and digital intelligence, it developed digitally-enabled solutions to reclaim value from industrial waste with catalyst companies, helping eliminate end-of-life impact of its products.

6. From enterprise-wide protection to lifecycle cybersecurity measures

The IT-OT convergence that began with Industry 4.0 will continue to grow in terms of scope and intensity in Industry 5.0 to form the extended IoT. More connected assets, workforce, consumers and enterprises through their lifecycle and across different product and service value chains will warrant intelligent and preemptive cybersecurity measures to ensure resilience, reliability and integrity of businesses, especially vis-à-vis their manufacturing processes and operations.

Recognising these concerns, 46% of executives on an average across industries are prioritising investments in the current and following year towards building capabilities aimed at protecting from cyberthreats manufacturing systems, data and intellectual property embedded in products manufactured to ensure the integrity and reliability of operations (see Figure 9).

Figure 9: Percentage of organisations prioritising investments during the current and following year towards 'building capabilities for protecting manufacturing systems, data, and intellectual property from cyberthreats to ensure integrity and reliability'
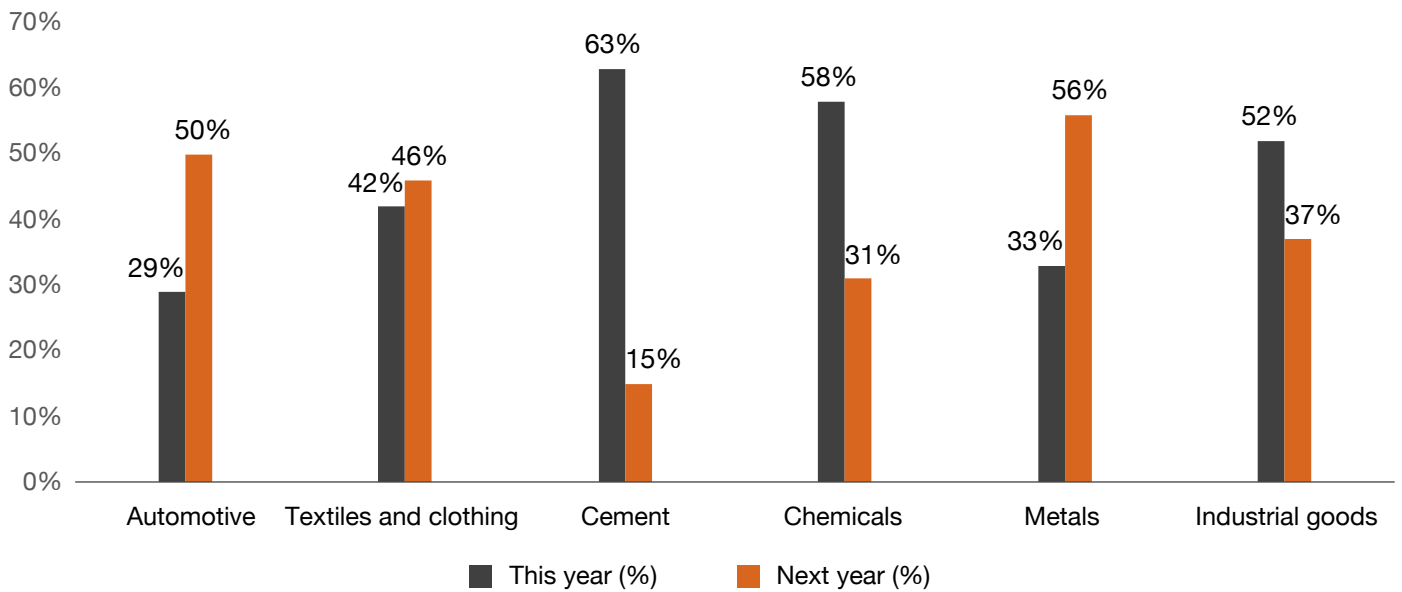
Today's smart cars are a case in point. They have 100 million lines of code and by 2030, this is predicted to reach 300 million. With cars evolving into sophisticated containers of software providing mobility, entertainment and buying, they have become prime targets for cyberattacks. The Government of India has made it mandatory for automakers to install a cybersecurity management system in both passenger and goods carriers, in order to secure vehicles against potential cyberattacks.

Moreover, emergence of 'as-a-service' models within different industries (such as automotive, industrial goods) will create more IT touchpoints and endpoints needing 24x7 cybersecurity protection.

A large presence of unorganised players, across the value chain of industries such as textiles and clothing, and automotive components, with limited funds to invest in cybersecurity of their manufacturing and other operations, makes the larger supply chain of these industries susceptible to shocks due to cyberattacks.

3. Industry 5.0 readiness: How companies can make these transformational shifts

Our research indicates that companies have already started building and deploying capabilities at scale towards driving these transformational shifts shaping the Industry 5.0 opportunity.

While companies in each industry are prioritising the scaling up of relevant capabilities, there are certain capabilities that are a priority for businesses across most industries.

Across industries, companies are building platforms and applications to facilitate sustained customer listening and feedback. Similarly, companies are seen to be actively scaling up technologies such as machine learning and IoT to enable real-time monitoring and feedback, allowing the workforce to adjust and improve their work, thereby building their continuous feedback muscle.

In addition to the automotive and metals industries, companies across the remaining four industries in our sample are scaling up mechanisms to facilitate the adoption of renewable energy. They are also implementing energy-efficient practices, reducing waste generation, and managing water usage responsibly using digital and other technologies, strengthening themselves in the space of environmental sustainability.

Recognising the importance of freeing up workforce bandwidth to focus on more strategic and creative aspects of production, companies across industries are leveraging technologies such as robotics to streamline and optimise manufacturing processes at scale – building their advanced automation capabilities.

Towards aligning supply chains to the changing consumer, workforce and ESG landscape, companies are scaling up the use of real-time analytics and AI to identify areas of improvement in terms of environmental impact, ethical sourcing, and social responsibility, to make informed decisions to reduce carbon emissions and optimise transportation routes.

In response to the increasing demand of customers and workforce for sustainable products and processes, companies across industries are designing human-centric value propositions at scale. This includes conceptualising products, services and experiences based on sustainable design principles, eco-friendly manufacturing processes, and responsible supply chain management to minimise environmental impact.

Recognising the need to reinvent for building human-centric value proposition-based products, services and experiences, companies seem focused on building operating models to provide opportunities for upskilling and reskilling employees and create a lifelong learning environment that encourages experimentation and innovation at speed and scale.

While companies are busy scaling up a host of capabilities, there are areas where they are finding it difficult to scale up and are stuck with pilots – tested or not tested[1] – for instance, digital twins and human-machine collaboration (see Table 1). Scaling up these capabilities is equally critical to succeed at driving transformational shifts shaping the Industry 5.0 journey and secure a return on investments.

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1   The top three capabilities against each of the seven pillars are the ones with highest ratios: (Percentage of respondents from each industry piloting and/or testing the capability) ÷ (Percentage of respondents from each industry deploying the capability at scale).

Table 1: Top three capabilities in which companies are struggling to scale up to become Industry 5.0-ready*

Sectors	Addressing changing consumer behaviour	Addressing changing workforce behaviour	Addressing the changing ESG landscape	Aligning manufacturing and operations with the changing consumer, workforce and ESG landscape	Aligning supply chains to the changing consumer, workforce and ESG landscape	Building robust business models	Building robust operating models
	Pillar 1	Pillar 2	Pillar 3	Pillar 4	Pillar 5	Pillar 6	Pillar 7
Automotive	1. New consumer insight integration 2. Personalisation 3. Preemptive analytics	1. Digitised employee well-being 2. Inclusion and diversity 3. Human-machine collaboration	1. Consistent reportage 2. Governance 3. Tax and regulation management	1. Digital twinning 2. Augmented skilling and support 3. Advanced automation	1. Track and trace 2. Increased visibility and transparency 3. Continuous improvement	1. Human-machine harmony 2. Collaborative ecosystems 3. Human-centric customer value proposition	1. Open and inclusive communication 2. Industrial intelligence 3. Ethical and responsible foundations
Cement	1. Preemptive analytics 2. Seamless customer experience 3. Co-creation and customisation	1. Autonomy and empowerment 2. Collaboration platforms 3. Human-machine collaboration	1. Tech debt management 2. Consistent reportage 3. Inclusion and diversity	1. Cobots 2. Digital twinning 3. Digital threading	1. Demand-driven networks 2. Tax responsiveness 3. Responsive supply chains	1. Human-machine harmony 2. Collaborative ecosystems 3. Human-centric customer value proposition	1. Design and innovation centres 2. Open collaboration 3. Flexible and agile processes
Chemicals	1. Preemptive analytics 2. Consumer data lake 3. Real-time responsiveness	1. Autonomy and empowerment 2. Digitised employee well-being 3. Human-machine collaboration	1. Tech debt management 2. Science tech 3. Consistent reportage	1. Cross-functional co-innovation 2. Augmented skilling and support 3. Digital twinning	1. Efficient inventory management 2. Demand-driven networks 3. Tax responsiveness	1. Flexibility and customisation 2. Scaling at speed 3. Human-machine harmony	1. Ethical and responsible foundations 2. Open collaboration 3. Industrial intelligence

* The top three capabilities against each of the seven pillars are the ones with highest ratios: (Percentage of respondents from each industry piloting and/or testing the capability) ÷ (Percentage of respondents from each industry deploying the capability at scale).

Sectors	Addressing changing consumer behaviour	Addressing changing workforce behaviour	Addressing the changing ESG landscape	Aligning manufacturing and operations with the changing consumer, workforce and ESG landscape	Aligning supply chains to the changing consumer, workforce and ESG landscape	Building robust business models	Building robust operating models
	Pillar 1	Pillar 2	Pillar 3	Pillar 4	Pillar 5	Pillar 6	Pillar 7
Industrial goods	1. New consumer insight integration 2. Real-time responsiveness 3. Pre-emptive analytics	1. Human-machine collaboration 2. Autonomy and empowerment 3. Digitised employee well-being	1. Tech debt management 2. Science tech 3. ESG-integrated business and operating strategy	1. Digital threading 2. Augmented skilling and support 3. Cross-functional co-innovation	1. Increased visibility and transparency 2. Responsive supply chains 3. Demand-driven network	1. Secure and sustainable experiences 2. Human-machine harmony 3. Outcome-based profit models	1. Open and inclusive communication 2. Open collaboration 3. Ethical and responsible foundations
Metals	1. Co-creation and customisation 2. Customer data lake 3. New consumer insight integration	1. Collaboration platforms 2. Digitised employee well-being 3. Inclusion and diversity	1. Science tech 2. Active board 3. Risk management	1. Cross-functional co-innovation 2. Digital twinning 3. Augmented skilling and support	1. Increased visibility and transparency 2. Track and trace 3. Efficient inventory management	1. Collaborative ecosystems 2. Secure and sustainable experiences 3. Human-machine harmony	1. Design and innovation centres 2. Industrial intelligence 3. Flexible and agile processes
Textiles and clothing	1. Customer data lake 2. Personalisation 3. Preemptive analytics	1. Autonomy and empowerment 2. Rewards 3. Inclusion and diversity	1. Consistent reportage 2. Inclusion and diversity 3. Risk management	1. Augmented skilling and support 2. Digital twinning 3. Digital threading	1. Responsive supply chains 2. Tax responsiveness 3. Demand-driven networks	1. Collaborative ecosystems 2. Heightened personalisation 3. Human-machine harmony	1. Flexible and agile processes 2. Open collaboration 3. Open and inclusive communication

At a cross-industry level, companies seem to find it challenging to scale up the following capabilities:[2]

1. **Pre-emptive analytics:** This entails using the power of analytics to anticipate customer needs and provide proactive service by analysing customer data and patterns. Deploying this capability at scale could help companies offer personalised recommendations, enhancing customer relevance and loyalty.

2. **Digitised employee well-being:** This entails using technologies such as AI to provide personalised support and assistance, enhancing employee well-being and work-life balance.

3. **Human-machine collaboration:** This includes tools and technologies to build a harmonious relationship between machines (e.g. robots) and humans. Harmony between humans and machines can help nurture a work environment that fosters continuous learning, upskilling and reskilling to adapt to technological advancements, ensuring employee well-being, augmenting employee creativity and their problem-solving abilities.

4. **Autonomy and empowerment:** This entails motivating employees by providing them with autonomy and decision-making authority with the help of technologies such as computer vision, GenAI, and augmented and virtual reality (AR and VR), thereby helping them take ownership of their work and contribute to the organisation's success.

5. **Consistent reportage:** This equips companies to leverage big data, machine learning and other technologies to ease the regular capture of data and its publication of non-financial ESG metrices.

6. **Digital twinning:** This entails the creation of a virtual replica or simulation of physical assets, processes or systems using IoT, cloud computing, data analytics and visualisation tools, allowing companies to test the resilience of operations under different conditions.

7. **Augmented skilling and support:** This is built with AR overlays providing workers with real-time instructions, visualisations, and guidance during complex assembly or maintenance tasks, thus improving accuracy and reducing errors.

8. **Demand-driven networks:** These are built with real-time data and analytics, allowing companies to drive more accurate demand forecasting. They also equip companies to produce customised products in smaller batches, reducing waste and inventory holding costs.

9. **Open collaboration:** This allows for issue-specific collaboration with external stakeholders, including suppliers, customers, research institutions and startups, resulting in the creation of different types of open innovation platforms.

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2   The capabilities highlighted in the table and identified in the list are the ones recurring across all or most of the six industries under each of the seven pillars. In case of a tie for the highest recurrence, all the relevant capabilities have been included in the list.

4. Steps for a resilient and responsible tomorrow

As our research indicates, several companies have embarked on the Industry 5.0 journey, although they may be at different stages of maturity. It's time now for them to build and scale up capabilities that help them deliver value and move on this path to make the journey rewarding for all the stakeholders, including society at large.

By their own admission, significant quantifiable value could be left on the table by not being party to the Fifth Industrial Revolution.

- When asked to assess the revenue their respective companies would have foregone in FY24 due to lower maturity on capabilities relevant to Industry 5.0 readiness in the context of their customer, workforce, supply chains, business models and ESG commitments, the weighted average number obtained from senior executives across sectors was 4.37% of their revenue.

- Executives from the chemicals, industrial goods, and textiles and clothing sectors believed that their sectors were the most potentially impacted, claiming revenue losses of more than 5% (see Table 2).

Table 2: Industry 5.0 readiness: Revenue lost versus revenue to be gained[3]

Sectors	Revenue foregone (weighted average)	Revenue to be gained (weighted average)
Automotive	3.10%	5.98%
Cement	4.95%	7.00%
Chemicals	5.51%	7.05%
Industrial goods	5.21%	6.36%
Metals	2.34%	5.11%
Textiles and clothing	5.12%	7.01%
Average	**4.37%**	**6.42%**

- The executives highlighted that their readiness pertaining to Industry 5.0 capabilities relevant for their customers, workforce, supply chains, business models and ESG commitments would help enhance their revenues by 6.42% on an average over the next one to two years.

- Executives from chemicals, cement, and textiles and clothing believed that their sectors would be the most significant gainers with potential revenue expansion amounting to more than 7% (see Table 2).

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3   In our survey, industry executives were requested to estimate the revenues they would have possibly foregone during FY24 or perhaps gained in the short term, based on lower or higher maturity of Industry 5.0 capabilities. These responses were sought in the context of categories such as changing customer and workforce behaviour, changing ESG landscape, and the ability of their manufacturing and operations and supply chains to respond to such changes. Executives identified a particular range for revenues either foregone or gained against each of these categories. Using the median values of the range identified against each category, a weighted average figure for revenues foregone and gained for each industry was determined.

Therefore, the key question is - how do companies build Industry 5.0 capabilities to be deployed at scale?

We recommend five actions:

1. Embrace a comprehensive data management programme to build a secure data core

Data is at the foundation of building tangible business value with Industry 5.0-relevant capabilities. With authentic and accessible data sets, Industry 5.0 capabilities such as preemptive analytics capable of helping companies offer personalised recommendations, or demand-driven networks allowing companies to drive more accurate customer demand forecasts can be deployed at scale.

However, collecting authentic data and making the best use of it continues to be a challenge for companies. For 50% of executives from cement and industrial goods along with 52% from automotive and 39% from metals, consumer data gathered lacks consistency and is not accessible on time for their functions. Further, 76% of executives from the textiles and clothing industry and a whopping 65% from industrial goods say that their companies find it difficult to convert disparate data from the data lake into actionable insights at speed and scale. Also, more than a third of executives from the automotive and cement industry underlined the inability of manufacturing, product design and innovation teams to use each other's data sets.

To overcome such challenges, companies need to adopt a comprehensive data management programme to build a secure data core. Under the auspices of such a programme, the company must design, develop and deploy:

- Robust data quality, data-processing and data-sharing practices that help different functions access each other's data securely with minimum procedures and latency.

- Technology platforms and data architectures that help functions build actionable insights from diverse data sets.

Moreover, it is imperative to institutionalise responsible data governance by ensuring data transparency, protection and auditing standards.

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2. Foster data-driven collaboration across functions and within ecosystems

Equipped with a robust digital core, companies must continue to build a culture of cross-functional and ecosystem-wide data-driven collaboration. With more collaborative minds scattered across distinct functions and within ecosystems, Industry 5.0 capabilities such as digital twinning, which allows companies to test the resilience of operations and supply chains, and open collaboration, which allows for issue-specific collaboration with external stakeholders, including suppliers, customers, research institutions and startups, can be deployed at scale.

Fostering such a culture will help companies:

- Thread distinct functions towards making the best use of real-time data and other technologies – currently a challenge for more than half the executives surveyed from industries such as cement, chemicals and industrial goods.

- Reduce and gradually end friction between ecosystem partners and internal teams, resulting in the timely launch of products, experiences and solutions – currently a challenge for companies, as identified by 47% of executives from the cement industry, 43% from chemicals, 30% from metals and 50% from the textiles and clothing sectors.

The following are some of the steps that could be taken to consciously build a culture of data-driven collaboration across functions and ecosystems:

- The chief executive officer (CEO) must underline data-driven collaboration as a top priority for leaders driving digital transformation in their respective functions, and create KPIs such as new products built/costs saved due to cross-functional data-driven collaboration to make them accountable for driving the same.

- Functional leaders must come together at regular intervals to conceptualise and execute cross-functional projects aimed at solving vexed business issues.

- The chief digital officer (CDO) must use cross-functional collaborations to enhance the quality and stability of the digital core.

- The chief financial officer (CFO) must prioritise funding for business projects that drive cross-functional collaboration.

- Employees excelling at cross-functional collaboration projects must be publicly felicitated.

3. Find business opportunities to make humans, machines and technologies work in sync

Einstein once said, 'The only source of knowledge is experience.' This rings true in the case of building a body of knowledge towards transforming human-machine interaction to a humane-machine one. The ideal way for the workforce to recognise the benefits of such a collaboration first-hand is to make them work with machines with adequate care and safety. Only then can the capability of human-machine collaboration towards building a harmonious relationship between machines (e.g., robots) and humans be deployed at scale.

Creating a business case to start a constructive dialogue between humans, machines and technologies could be the first step. This would help secure the desired investment from the CEO's office towards the same, making training more substantive – a challenge currently identified by nearly 60% of executives from the chemicals, industrial goods, and textiles and clothing industries. With training becoming more substantive and on-the-job, the workforce could start experiencing how machines and technologies have the potential to complement as well as supplement their skills, helping them do their work faster and better. This could help alleviate apprehensions around machines (e.g. robots) and digital technologies leading to job losses – a point highlighted by nearly half of the executives surveyed from the automotive and cement industries.

Historically, machine and technology integration on the shop floors and operations happened with a top-down perspective. In the context of GenAI, the story would differ slightly. In this case, the bottom-up innovation focus will need guidance through adequate top-down guardrails. However, inability to provide secure access to GenAI and similar such technologies to enhance workforce productivity has bubbled up to be a challenge for many executives across industries such as automotive (30%), cement (53%), chemicals (77%), and textiles and clothing (57%).

Companies need to address this challenge without further delay to deploy GenAI to build the capability of augmented skilling and support towards improving effectiveness and reducing errors across operations and supply chains at scale and to strengthen employee well-being, the digital way.

The following are some actions that could enable companies to secure access to GenAI and similar technologies:

• Engage with partners that can build a customised front-end which leverages the advancements of large language models (LLMs). There is also a need to help employees appreciate the business and security risks of these technologies.

• Ensure that the security and confidentiality of the data is protected by empowering the workforce with tools and techniques towards measuring, monitoring and labelling training data.

• Celebrate the best practices that the workforce brings to the table through gamification.

4. Design agile, responsible and secure innovation architecture

The interests of the workforce and stakeholders in building customer-relevant, data-driven use cases and solutions through cross-functional or ecosystem-based collaboration could suffer a setback if these solutions and offerings stay untested and do not translate into scalable solutions and products. This has been identified by 50% of industrial goods executives as well as 40% of automotive and chemicals executives as one of the major challenges for companies readying themselves to build value with changing consumer behaviour.

On many occasions, innovation architecture built by organisations is inflexible as it is largely relevant for mechanical products and serves the market dynamics of yesteryears. In such situations, teams are compelled to test the entire solution or an offering at one go. Such systems do not allow teams to either fail-fast or fail-forward. Moreover, such rigid architectures make continuous piloting and testing costlier and prone to wastages.

The following measures may be taken:

- Teams must embed the principles of agility, responsibility and security in their innovation infrastructure to overcome such a challenge. In practice, agile innovation involves breaking large solutions or offerings into smaller, manageable parts. Teams work in 'sprints' or short cycles, allowing for quick adjustments based on what works and what does not. This approach helps organisations stay aligned with user needs and market changes – part by part – enhancing the chances of the larger solution or offering succeeding. Agile processes allow teams to stay flexible and responsive, helping them create value at every step at a lower cost and with less wastage. As a result, they keep uncovering factors that would make the solution or the offering work at scale. More importantly, agile processes are also seen to help greater stakeholder and cross-functional collaboration.

- As solutions and offerings – both B2C and B2B – are becoming increasingly digital and software driven, such agile innovation architecture must be kept safe and secure. Testing of software and digital solutions on external platforms and in collaboration with partners can pave the way for intruders to sabotage the offering or the solution, as well as the data core on which it is based. Companies must therefore adequately secure the innovation architecture from any digital and cyberthreats by building firewalls, intrusion detection/prevention systems, encryption protocols and incident response mechanisms.

Securing the innovation architecture allows companies to provide their workforce with the autonomy and empowerment to take ownership of their work and take calculated risks using combinations of newer technologies such as computer vision, GenAI, AR and VR.

5. Build a data-reporting and measurement culture around sustainability

What gets measured gets managed. However, an important condition needs to be met for this principle to be put into practice, namely measurement needs to be done consistently and systematically.

Unfortunately, a sizeable number of executives interviewed across industries believe that this management paradigm is accepted more in spirit rather than in practice in the context of ESG data and metrics: 63% of cement executives, 60% of chemicals executives, and 40% of metals executives surveyed said that their companies lack standardised reporting systems and tools to collate ESG data across functions.

Complexities associated with consistent reporting of ESG metrics have been identified as a challenge by 63% of textiles and clothing executives, 43% of metals executives and 33% of automotive executives.

This challenge has a cascading effect. Inability to collate consistent ESG data across different functions and units comes in the way of functional leads integrating circular economy principles while designing products and packaging for easy recycling or repurposing – a challenge encountered by 50% of industrial goods executives. It does not allow them to conduct meaningful dialogue with stakeholders on embedding ESG considerations into the core business strategy and decision-making processes. That is a strategic challenge acknowledged by 40% of automotive executives. Without proper data, executives struggle to navigate the evolving regulatory landscape and comply with the same – a challenge being faced by 37% of automotive executives, 47% of industrial goods executives, 41% of metals executives and 50% of textiles and clothing executives.

The inability to address this challenge jeopardises the collective long-term sustainability vision of these industries (see Table 1).

The following actions could perhaps help address this challenge and its cascading effects.

- The CEO in collaboration with the chief human resources officer (CHRO) and the CDO/chief information officer (CIO) must seed a top-down data reporting and a measurement culture. This can be done by asking functional and unit leads to appoint data champions in their respective functions and units who would take ownership of ensuring that relevant data is measured promptly, stored safely, and shared with relevant teams without hurdles.

- Data reporting, management and application must be incorporated as a key KPI for reviewing the performance of function and unit leads.

- CDOs must celebrate 'data weeks' where they can offer prizes to teams solving business challenges associated with data measurement, management and its applications using the evolving palette of digital technologies.

- Typically, from an ESG standpoint, boards and CEOs must ensure that CFOs consciously allocate budgets towards collating relevant ESG data across various departments and subsidiaries – currently a challenge for 60% of cement executives, 47% of industrial goods executives, 43% of metals executives, and 57% of textiles and clothing executives.

Allowing for more intuitive and efficient collaboration between humans and machines, Industry 5.0 could, in due course, usher in a clean, green, and responsible tomorrow, enhancing both economic and societal value.

Notes

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