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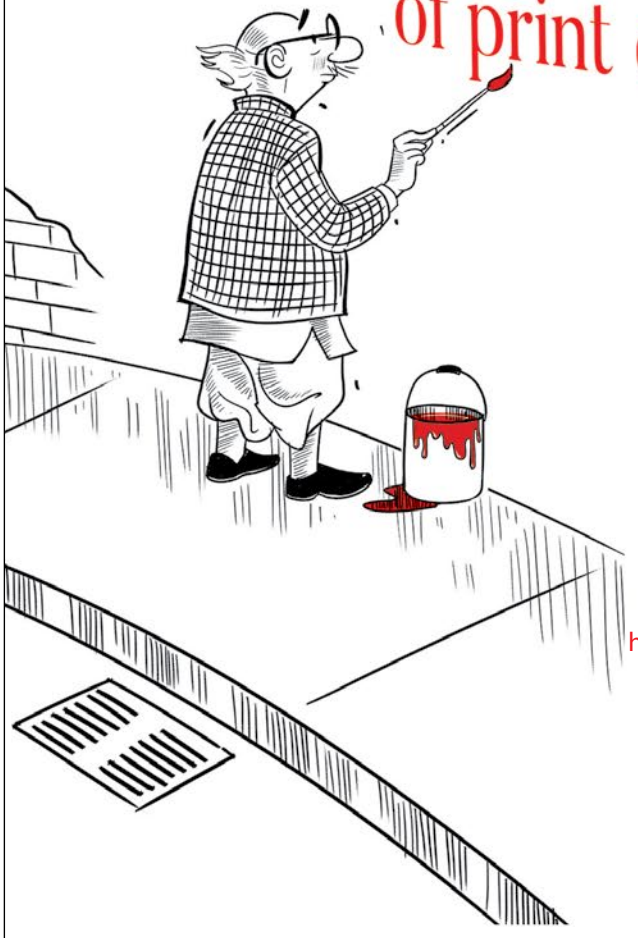

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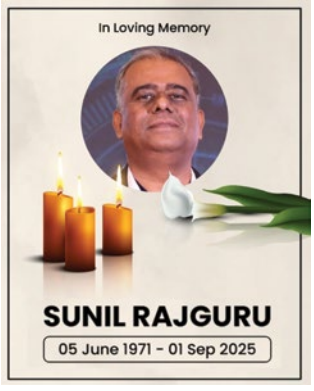

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AI + HUMAN COLLABORATION: WHEN ALGORITHMIC INTELLIGENCE MEETS HUMAN WISDOM

Shrikanth G
shrikanthg@cybermedia.co.in

Technology evolution is all about inflection points and disruptions. Each cycle nudges us to pivot to the next, though not without trade-offs. While the impact of AI in IT is debated threadbare, the human–machine interplay is not new to manufacturing.

From steam engines to assembly lines, from computers to industrial robots, each cycle of automation promised speed, scale, and savings in manufacturing. But we are now entering a new chapter – one where the real breakthrough is not machines replacing humans, but machines working alongside humans. That's what this issue is all about.

At ground zero, artificial intelligence, robotics, and automation are converging to create what many call the Industry 5.0 era. In this model, technology no longer sidelines human skill but amplifies it. Collaborative robots, or cobots, are already redefining shop floors *(USD 12 billion market by 2030, Allied Market Research)*, where people handle judgment-intensive work while robots execute repetitive tasks with precision. In hospitals, AI-powered surgical assistants support doctors in complex procedures, improving outcomes without displacing the surgeon's critical role. There are many real-world use cases.

As AI and humans forge a meaningful collaboration, one will see a clear line of demarcation – and sitting at this line of control is the gatekeeper: the human-in-the-loop. The lesson here is clear: organisations must harness this collaboration. While AI can crunch vast datasets, spot anomalies, and recommend actions in real time. Humans, on the other hand, bring empathy, ethics, and contextual intelligence – qualities no machine can match. Together, they form a win-win partnership that is stronger, smarter, and more resilient than either alone.

But a grounded view makes us mindful of the implications. The big one is the fear of job losses, which is real, but the bigger risk is failing to invest in reskilling. When we look at India, with its large young workforce, we have a unique opportunity: to use AI not as a substitute for human capacity, but as an amplifier of human potential turning that into intellectual capital. This requires deliberate policy, ethical oversight, and corporate will.

At the end of the day, the promise of robotics and AI is not simply faster production or automated workflows. It is the chance to design a human-centric economy. It's a chance to humanise technology. It's a chance to leverage 'tech for good'. The future of automation is not about machines taking over. It is about humans and machines learning to work in tandem for purposeful outcomes.

Here's to the rise of machines, powered by humans.

TECHTONIC

In Memoriam: Sunil Rajguru (1971–2025)

Editor, Thinker, Storyteller, and Indomitable Spirit

It is with deep sorrow and profound respect that we bid farewell to Sunil Rajguru, Editor of *Dataquest* (DQ) and *PCQuest* (PCQ), and briefly steward of *CIOL.com*—a multifaceted journalist, editor, and friend who passed away on September 1, 2025.

Sunil's journalistic journey with CyberMedia in three vibrant stints, each marked by transformation, curiosity, and a relentless pursuit of excellence. His most recent tenure began in 2019, following a creative sabbatical during which he authored a few works of fiction—testament to his love for storytelling and his ability to think beyond the conventional.

What defined Sunil most was his fearless embrace of challenges. Whether it was realigning editorial strategies, reviving formats, or taking on additional responsibilities, he never shied away. A true team player, Sunil also mentored and led CIOL during a transitional phase, balancing it alongside his leadership roles at DQ and PCQ with remarkable calm and creativity.

Even as illness crept upon him unannounced, Sunil never stopped working. Until August 6, 2025, he continued to close and pack the latest edition of DQ—his dedication undeterred, his spirit unbroken. He fought his illness with the same resolve that he brought to every editorial conflict and crisis—quiet, focused, and full of heart.

To many of us, Sunil was more than a colleague. He was a friend, a sounding board, and a curious conversationalist—always ready to deep-dive into the latest tech, dissect a geopolitical drama, or passionately argue over a cricket match. His breadth of knowledge—spanning technology, politics, history, culture—was truly rare.

We will dearly miss those spirited editorial huddles, idea marathons, and yes, those chai-fuelled debates about the future of Indian cricket, journalism, content, and community.

Just a fortnight before his passing, I had the privilege of seeing him. Despite his condition, he

remained hopeful, speaking of always returning to work. That was quintessential Sunil—ever optimistic, ever planning the next headline.

Goodbye, dear friend. You leave behind not just editions, articles, and bylines—but also ideas, friendships, and a legacy of courage and creativity. Your chair at the editorial table may now be empty, but your voice echoes in every meaningful story we will tell henceforth.

Rest in peace, Sunil. Until we meet again. My sincere condolences to his family.

Thomas George,
Managing Editor & CEO,
CyberMedia Group of Publications

Sunil Rajguru, veteran CyberMedia editor, passes away

CyberMedia mourns the loss of Sunil Rajguru, editor of Dataquest and PCQuest, remembered for his insight, mentorship, and unwavering editorial excellence.

CyberMedia announced with deep sorrow the passing of **Sunil Rajguru,** Editor of *Dataquest* and *PCQuest,* who died on September 1, 2025, at 14:30 IST while undergoing treatment in hospital. He had been battling cancer for over a year.

He is the first working editor from CyberMedia to pass away, a loss that has left colleagues across the organisation and the wider journalism community deeply saddened.

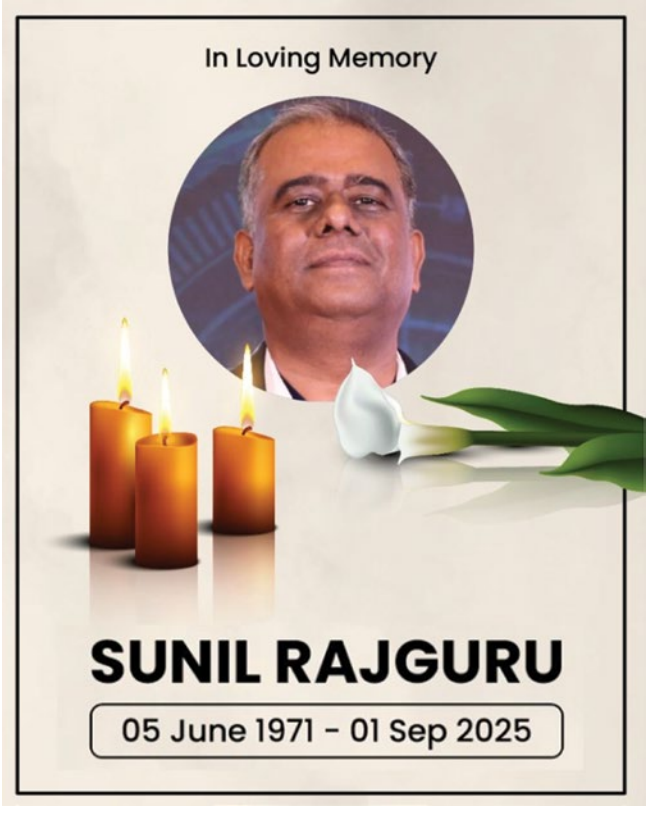
A seasoned journalist, Rajguru had a long and distinguished career in technology and business media. At CyberMedia, he helmed *Dataquest* and *PCQuest,* and had previously worked with *Living Digital* and IDC India.

He was known for his ability to simplify complex technology trends, and for his active role in moderating panels, conducting video interviews, and leading industry conferences and webinars.

Beyond CyberMedia, Rajguru contributed to the *Hindustan Times and the Centre for Science & Environment,* and wrote columns for *Sify* and *India Today's DailyO*. An alumnus of the Asian College of Journalism, Bangalore, he combined academic grounding with professional versatility.

Colleagues remember him for his editorial acumen, warmth, and mentorship. His passing is being mourned across CyberMedia and the wider technology journalism community.

Rajguru is survived by his mother, his wife, Suma Ramachandran, and their son.

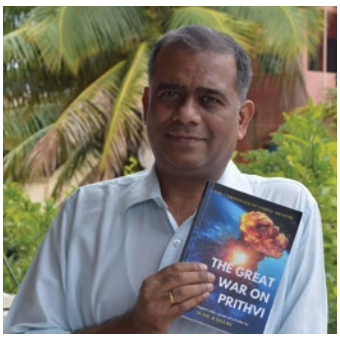


AN OUTPOURING OF TRIBUTES

Hundreds of tributes poured in on LinkedIn from across the PR, communications, and technology community, each carrying a story of Sunil's influence. Industry leaders remembered him as one of the sharpest editorial minds in Indian tech journalism, with the rare ability to explain the most complex shifts in technology in words that felt simple, relatable, and clear. Colleagues and peers spoke of his warmth, generosity, and quiet encouragement—qualities that shaped countless careers and left an indelible mark on those who worked with him.

Together, these voices painted a portrait of a journalist who was more than just an observer of the industry—he was a guide, a mentor, and a friend. His intellectual depth, his humour, and his unwavering commitment to storytelling continue to resonate across a community now united in grief, but also in gratitude for the legacy he leaves behind.

> For colleagues, readers, and the many lives he touched, he was not merely an editor; he was an interpreter of complexity, a custodian of clarity, and above all, a companion on the journey of understanding a world that changes faster than words can capture.



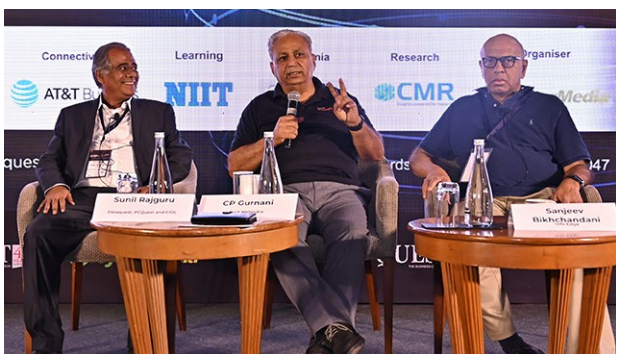
VOICES FROM COLLEAGUES AND INDUSTRY

Among those who knew him well was his former colleague Deepak Kumar, who first met Sunil after moving from Gurgaon to Bangalore, when both were at CyberMedia. What began as a workplace acquaintance quickly blossomed into a friendship bound by camaraderie, mutual respect, and shared values. Deepak remembers Sunil's rare gift for storytelling—whether writing as a cricket columnist, a cinema critic, or a keen observer of technology. He was equally admired as a quiz master, often conducting sessions that brought fun and learning together. Although their careers took them in different directions, the connection endured. Even in recent years, when conversations became less frequent, the warmth never faded. The rapid progression of Sunil's illness came as a shock, and before Deepak could visit him in hospital, the heartbreaking news of his demise arrived. "*He leaves behind a loving wife and a doting son,*" *Deepak reflected,* "*and a wide circle of friends and readers who admired his voice and spirit. His memory will live on—in the stories he told, the friendships he nurtured, and the lives he touched.*"

Chaya Arora, Head of Global Communications at SAP India, remembered him as "*one of India's most influential tech journalists—a sharp, insightful, and fearless voice in the industry.*" She noted how Sunil was also among the country's earliest podcasters, always exploring new ways of storytelling, ahead of his time, and deeply committed to his craft. "*His voice, vision, and legacy will not be forgotten,*" she said, recalling him as both a trusted source of information and an innovator in media.

That sense of loss was echoed by V. Srinivasa Rao, Chairman of BT&BT, who recalled Sunil as "*a veteran journalist admired for simplifying complex tech trends and engaging audiences.*" He praised Sunil's keen sense of the reader's pulse, which helped him curate impactful articles and knowledge capsules for the community. "*We will miss his wisdom, insights, and lasting contribution to the tech world,*" he added.

There are so many tributes.....gone too soon, but life lived with purpose.



A STORY THAT WILL LIVE ON

Sunil's passing leaves a silence that words can barely fill. For colleagues, friends, and readers, he was more than an editor—he was a voice of clarity, a source of encouragement, and a companion in countless journeys of thought. His laughter, his generosity, and his unflinching passion for storytelling will live on in memories, in the pages he shaped, and in the lives he touched. Some stories end too soon, but Sunil's will continue to echo—reminding us that true voices never fade.

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Industry 5.0: The human–machine renaissance

Industry 5.0 shifts focus from efficiency to empathy—bringing human creativity and intelligent machines together to build sustainable, resilient, and human-centred systems.

By Aanchal Ghatak

When the industrial revolution reshaped the world in the late 1700s, it was powered by steam, coal, and the belief that mechanical labour could replace human muscle. More than two centuries later, industry stands at another turning point—one increasingly described as Industry 5.0. Whereas Industry 4.0 referred to automation, IoT, robotics, and AI, this new chapter is not about humans being displaced by machines but about humans working alongside them.

Unlike earlier waves of industry, Industry 5.0 is less defined by the machines themselves and more by the partnership between human creativity and technological precision. At the core of this shift is collaboration: humans offer empathy, intuition, and design-led thinking, while machines deliver scale, accuracy, and stamina. In many ways, it is a renaissance of human-centred industry powered by the very technologies that once seemed poised to leave workers behind.

THE JOURNEY: FROM AUTOMATION TO COLLABORATION

To appreciate the opportunity of Industry 5.0, it is worth remembering the path that brought us here:

- **Industry 1.0** mechanised production with water and steam.
- **Industry 2.0** introduced electricity and assembly lines, extending the scale of industry.
- **Industry 3.0** brought electronics and IT systems, making mass automation possible.


Industry 1.0

- **Industry 4.0,** still evolving, created "smart" factories through cyber-physical systems powered by data, IoT, AI, and machine learning.

Although Industry 4.0 was transformative, its defining feature was functionality above all else. Automation offered efficiency, lower costs, and greater precision, minimising human error. However, automation without human creativity can become lifeless.

Industry 5.0 represents a rebalancing. Technology is not here to replace humans but to support them. This equilibrium is especially vital as businesses face greater complexity, climate challenges, and rising consumer expectations. Efficiency alone is no longer enough; companies must now deliver personalised, sustainable, and ethically generated experiences. Machines can calculate and automate, but only humans can ask: should this be built, is it necessary, and in what way?

"Ecosystem partnerships are core to Industry 5.0. By co-innovating with cloud, data, and security partners, we make AI interoperable, governed, and secure—while freeing humans to focus on high-value decision-making."

- Sagar PV, CTO, Mindsprint

"Industry 5.0 goes beyond digitisation and automation. It is about placing the human at the centre, where technology amplifies rather than replaces human capability."

- Abhijit Sengupta
Senior Director, Southeast Asia & India, HERE Technologies

A NEW MODEL OF SYNERGY

Industry 5.0 is most evident in the synergy between humans and machines.

- AI extracts insights from data at scale.
- Humans add judgement, ethics, and empathy.

This duality matters across sectors, from healthcare and manufacturing to logistics and smart cities. In hospitals, AI may identify tumours in scans with precision, but doctors must provide context, weigh patient histories, and decide on treatment with empathy. In supply chains, algorithms can adjust logistics in real time, but humans must assess geopolitical risk, community impact, and sustainability.

As Abhijit Sengupta, Senior Director and Head of Business, India & SAARC at HERE Technologies, puts it: "The combination of human creativity and technological accuracy is poised to unlock innovative and productive performance never before realised."

This is not abstract theory but a practical necessity. Creativity alone cannot manage global supply chains, and accuracy alone cannot design culturally human experiences. The combination of both is what will shape the future.

THE DEFINING PRINCIPLES OF INDUSTRY 5.0

Industry 5.0 is more than a collection of technologies; it is a mindset requiring firms to redefine value beyond efficiency. It is anchored in three principles:

- **Human-centricity:** People are no longer seen as costs to be reduced but as assets to be developed. Workplaces prioritise well-being, safety, and skills development.
- **Sustainability:** Industry cannot ignore the climate crisis. Circular supply chains and eco-efficiency are now strategic imperatives.
- **Resilience:** Global disruptions—from pandemics and trade wars to climate events—have shown that fragile systems cannot endure. Industry 5.0 requires adaptability as well as efficiency.

Together, these priorities form a triple bottom line of people, planet, and performance. As Sagar PV, CTO at Mindsprint, explains: "Industry 5.0 emphasises human-centricity, sustainability, and resilience. It is about taking the advancements of AI, IoT, and robotics, and balancing them with human creativity, intuition, and values."

A DAY IN THE CONTEMPORARY FACTORY

Imagine a factory floor in 2028. The sound of motors is steady. Cobots perform precise insertions, while operators oversee multiple production lines using AR headsets with quality metrics overlaid in real time. Predictive maintenance systems flag downtime windows, and supervisors engage with AI to decide whether to proceed.

This is Industry 5.0 in action: AI predicts and recommends, while humans weigh competing considerations such as cost, lead time, and safety, before making final decisions. Workers shift from repetitive motions to managing exceptions and solving complex challenges.

Real-world projects are already pointing the way. Mindsprint developed a predictive blend-optimisation platform for a global coffee manufacturer. Coffee blending has long been an artisanal craft, relying on blenders' sense memory and experience. The system analysed bean origins, roast profiles, sensory panel outcomes, and prices to generate blend options. Final recipes, however, remained in the hands of master blenders. The result: formulation cycles shortened from weeks to days, firms could react faster to price fluctuations, and the brand retained its sensory identity.

As Sagar notes: "Our AI solution analyses data across bean origins, roast levels, sensory profiles, and cost fluctuations. The system generates optimised blend options that meet flavour and margin requirements. The final decision, however, rests with the master blenders. AI accelerates experimentation, while human expertise ensures quality and brand authenticity."

> Industry 5.0 is not about man versus machine, but about collaboration—where humans and intelligent systems work side by side, combining empathy with precision to create more meaningful outcomes.

INDIA'S MOMENT IN THE 5.0 ERA

For India, Industry 5.0 is both a challenge and an opportunity. The country is already embracing elements of Industry 4.0 through digital infrastructure, a vast pool of engineers, and a vibrant start-up ecosystem. But India must also create jobs for its young workforce, meet rising environmental standards, and modernise manufacturing to remain globally competitive.

Industry 5.0 offers a path suited to India's socio-economic realities. It allows the country to leverage its abundant human capital while adopting advanced automation that enhances rather than replaces workers.

Examples are emerging:

- **Automotive manufacturing plants** where cobots and humans collaborate, improving productivity and safety.
- **Textiles and apparel firms** using AI demand forecasting to enhance sourcing and reduce waste, while artisans and designers still drive creativity.
- **Agriculture,** where drones and AI monitoring guide farmers, yet local knowledge shapes sustainable practices.

As Sengupta observes: "The future of industries in all domains will depend on their ability to create more personalised, sustainable, and resilient systems. It is about relevance and not just efficiency."

DECODING THE CHALLENGES

Despite optimism, challenges remain.

- **Skills gaps:** Workers must be reskilled for human-machine collaboration, often faster than education systems can adapt.
- **Cultural change:** Many firms still prioritise machine-first approaches, sidelining human creativity.
- **Costs:** High capital expenditure for cobots, AI platforms, and digital twins can deter small and medium enterprises.
- **Ethical concerns:** AI-driven decisions raise questions of bias, accountability, and human oversight.
- **Policy and regulation:** In India especially, the balance between automation and employment, and between sustainability and growth, will require careful governance.

A VISION OF THE FUTURE

If realised effectively, Industry 5.0 could reshape societies, not just industries:

- Factories where workers use AR to collaborate with AI in real time, solving problems faster and safer.
- Supply chains that self-correct using AI, with humans handling strategic and ethical trade-offs.
- Healthcare systems where robots conduct surgeries, while doctors bring empathy to treatment decisions.
- Smart cities designed not just for efficiency but for liveability, putting people at the centre.

These scenarios are no longer science fiction—they are already visible in pilot projects worldwide, awaiting responsible scaling.

As Sagar PV puts it: "Technology should not only lead to efficiency but ultimately deliver human and societal good. That is the true value of Industry 5.0."

Industry 5.0 represents a significant recalibration of the industrial story. Earlier revolutions replaced human muscle with machines; this one augments the mind and spirit. The journey ahead demands skills development, regulatory frameworks, and open debate on ethics. But the effort is worthwhile to create sustainable, resilient, and human-centred systems.

As Sengupta concludes: "This is not solely about efficiency—it is about being relevant in a rapidly changing world."

And as Sagar PV affirms: "The balance of human creativity with technological power will determine the industries of tomorrow."

Industry 5.0 is not the end of humans in industry—it is the beginning of a human-first future.

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Indian factories and automation: The 'everything bagel' is here

Gone are the days when intelligent machines, software and tools only touched limited areas in a manufacturing set-up. Now every ingredient is covered with new tech sprinkled all over- from design departments to assembly-lines to maintenance to QA and warehouses. Will this taste better than before, though? Perhaps, a special sauce for India could take it all a notch up. Let's bite in.

By Pratima H

What was once just some occasional cherry on the cake, has now become an all-you-want seasoning. The bagel of manufacturing is now surpassing the dough-nut phase of intelligent automation.

From the initial, and obvious, surface-areas of immediate sweet-spots like banking, retail and IT; advanced automation breakthroughs like robots, visual intelligence, AI, connectivity, analytics and sensors are now entering the more savoury sides of business landscape. Some factories in India are designing and making better products, making them faster, making them with smarter QA, and in machines that can be not just run but maintained without too much sweat. It's the turn of factories now to smell this new technology-spread.

Whether it is Mahindra Accelo trying to rethink real-time plant visibility, optimised production, and improved quality control; or contract manufacturer Dixon Technologies exploring AI-powered Industry 4.0 across 24 plants; or Chitale Dairy milking IoT and RFID; or Foxconn handing over 80 per cent production tasks to AI and planning use of humanoid robots; or Ola using digital twins for faster design to commissioning in manufacturing operations (Spinning up its largest 2-wheeler plant in just eight months)- the bagel of a typical Indian factory is neither boring nor stale anymore. And it's getting hotter and hotter.

The future of robotics and physical automation in manufacturing involves native AI integration for adaptability, human-robot collaboration, swarm robotics intelligence, and robot-as-a-service (RaaS) models lowering lower entry barriers, observes Charlie Dai, VP and principal analyst at Forrester.

Automation is entering a new phase where these technologies are not just improving operations but fundamentally changing how businesses are built and run, highlights Sivakumar Krishnamoorthy, Sr. GM, Sales and Marketing, Epson India Pvt Ltd.

SLICING THE BAGEL- WHAT'S INSIDE?

A lot of new flavours are being felt in areas like Design and product assembly lines, maintenance and factory uptime. It's not just about IoT or plain-Jane AI anymore. The ambition and execution have moved beyond these basic automation levers.

Vivek Lohia, Managing Director, Jupiter Wagons Limited (an Indian private manufacturer of railway freight wagons, passenger coaches, wagon components) gives a peek into how automation in manufacturing is moving decisively into areas once thought too complex for machines. "In global rail systems, for instance, a 650-metre freight train that traditionally requires a 24-hour halt and four to six hours of manual brake checks can now be cleared through fully-automated brake testing systems. This dramatically improves turnaround time and eliminates human risk. With its rapidly expanding freight corridors, India is taking great strides in adopting these practices."

"For India, embedding such intelligent systems into wagons and bogies will be as transformative as electrification once was.

- Vivek Lohia
Managing Director, Jupiter Wagons Limited

> Intelligent cameras liberate the factory from hassles of installation, integration, software and expensive budgets that IoT requires.
>
> **- Suhani Gambhir Dey**
> Chief Customer Success Officer, Presence 360

An Indian manufacturing plant of one of our customers has recently tried a better, lesser expensive and simpler alternative to IoT, tells Suhani Gambhir Dey, Chief Customer Success Officer, Presence 360. "We are trying to use intelligent cameras for defect detection through new advancements of the AI agent manufacturing module. These cameras do not just give the advantage of visualisation for spotting defects, but they also liberate the factory from hassles of installation, integration, software and expensive budgets that IoT requires. They can give real-time prompts and also help in machine-upkeep."

Consider how AI-powered robots will optimise product design via real-time simulation and enable flexible assembly lines, Dai points out. "Predictive maintenance through agentic analytics will anticipate failures and cut downtime. Cobots will improve uptime through adaptive task handling. And humanoid robots will facilitate automation of repetitive and dangerous tasks with reduced operational costs and errors."

Condition monitoring is another frontier, Lohia illustrates. "Internationally, wagons already carry integrated diagnostic modules that continuously track axle health, braking efficiency, load distribution, and even handbrake status. The result is safer, more reliable operations with far lower maintenance overheads. For India, embedding such intelligent systems into wagons and bogies will be as transformative as electrification once was."

Predictive maintenance like fixing machines before they break can greatly improve factory uptime, Krishnamoorthy seconds. "It can reduce unexpected breakdowns and cut maintenance costs. This leads to big improvements in equipment performance and protects profits."

FACTORIES ARE FIDDLING WITH

- Cobots and smart assembly lines
- Intelligent maintenance
- Cameras for defect-detection
- Low-latency connectivity
- M2M, AI-assistance and Digital Twins
- CAD, BIM and 3D modelling

And smarter equipment maintenance is just one part of this big swing of the pendulum. The needle has moved towards the more initial stages of a factory already. Like design.

True competitiveness in manufacturing now hinges on integrating automation right from the design stage and not just on the assembly floor, indicates Krishnamoorthy. "By connecting CAD environments with robots friendly jigs, manufacturers can reduce programming times by 30 per cent, speeding up product launches and boosting agility in responding to market demands."

You can now walk around a plant inside your computer- thanks to the power of modelling technology. "In brownfield set-ups as well, 3D scans

> Robots are moving from being isolated machines behind safety cages to becoming collaborative partners on the shop floor.
>
> **- Sivakumar Krishnamoorthy**
> Sr. GM, Sales and Marketing, Epson India Pvt Ltd.

> In Industry 4.0, LiFi Fixed Wireless Access (FWA) is specifically used for highly secured, high bit rate communications between production machines and ceiling-located network access points.
> **- Marc Fleschen**
> Chairman, Light Communication Alliance

can do a lot of modelling. Once all that is in place, sensors and IoT can be installed easily. A lot of plant surveillance can happen in 3D models and there is no need for people to be deployed on watching and reporting faults or maintenance issues. Even the maintenance inventory parts can be improved a lot- one can just see which ACs and where they need compressor replacements- and do the needful. For any business, time is money- and that can be saved here- a lot." Explains Anil Sivadas, Chairman and CEO, Enventure.

SOME NEW SESAME SEEDS AND POPPY SEEDS

If you thought it's just chic robots that we can expect walking around in our factories, well, there's more. Like better connectivity tools, cobots and smart sensors to add to all that.

Marc Fleschen, Chairman, Light Communication Alliance told us in an interview how new advancements are creating new advantages in manufacturing applications. "Think of how LiFi and 5G/6G, when combined, can create robust and comprehensive communication networks that leverage both RF and Visible Light Communication (VLC) or Infra-Red (IR) technologies. For instance, in Industry 4.0, LiFi Fixed Wireless Access (FWA) is specifically used for highly secured, high bit rate communications between production machines and ceiling-located network access points."

These leaps are necessary as the current industry 4.0 paradigm demands solutions offering diverse services, massive connectivity, easy capacity upgrades, ultra-low latencies for deterministic services, and Machine-to-Machine (M2M) communication. "Here, a ring optical network, supporting 10 Gbps access points with a 100 Gbps path-through for M2M communications, serves as the backbone. This is combined with Wi-Fi for global coverage, LiFi FWA for highly-secured, high-bit rate communications between production machines and ceiling-located network access points, and OCC for accurate robot geo-localisation. The optical ring network provides a sustainable backbone for fixed-mobile convergence and enables M2M communications, vital for industrial automation." Fleschen explained.

Krishnamoorthy adds how robots are moving from being isolated machines behind safety cages to becoming collaborative partners on the shop floor. "AI integration is making them more adaptive and responsive, allowing manufacturing systems to adjust to real-time changes in demand, supply, and processes. This makes factories not only more productive but also more resilient to global disruptions. Using advanced robots like Epson 6 axis and SCARA Robots on the assembly line, helps increase output and maintain consistent quality."

Sachin Arora, Head of Connectivity & IoT, Giesecke+Devrient (G+D), India shines a light on how IoT is playing its part. "Secure IoT connectivity is significantly transforming automation and efficiency in the Indian manufacturing sector by enabling real-time data exchange, facilitating predictive maintenance, and minimising downtime."

HOW THE NUMBERS STACK UP

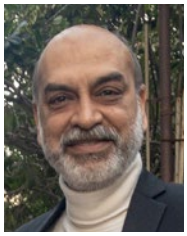
There were 4,281,585 units operating in factories worldwide – a jump of 10%, as per a World Robotics report, September 2024.

Region-wise, 70% of all newly deployed robots 2023 were installed in Asia, 17% in Europe and 10% in the Americas. The annual installation figure of 541,302 units in 2023 is the second highest in history (After 2022).

Source: International Federation of Robotics

- India's robot density is low at just 7 units per 10,000 workers.
- The robotics market worldwide is expected to grow from $71.8 billion in 2025 to over $150.8 billion by 2030.

Source: Various Experts



> Automation in Indian manufacturing is not about replacing jobs but about augmenting human capability enabling consistency, speed, and safety while keeping people at the heart of operations.
> **- Manish Patel,** An automotive industry CIO

NOT JUST NEW YORK'S ANYMORE

When it comes to India, we have both a special context and a unique appetite with automation here.

Let's ask Manish Patel, former CIO of MG Motor India Pvt Ltd (who has made many remarkable strides in the automotive landscape) about the specific Indian context of automation in manufacturing. He distills his experience well when he tells that automation in Indian manufacturing is not about replacing jobs but about augmenting human capability enabling consistency, speed, and safety while keeping people at the heart of operations. "Our automation journey must be modular, cost-effective, and scalable, so that MSMEs as well as large enterprises can adopt Industry 4.0 without leaving anyone behind."

The country, as Dai sees it, has substantial strengths in a range of areas, such as warehouse automation, logistics cobots, and affordable industrial robots and drones.

India's position in the global automation landscape is evolving, says an upbeat Krishnamoorthy. "In 2023, India ranked 7th globally in annual robot installations, deploying 8,510 new Robots. India is among the fastest scaling automation adopters worldwide, even outpacing several mature economies. Growth opportunities are coming in areas like automobiles, electronics, electricals and precision assembly, where using automation can give companies a strong edge over competitors."

As assessed by a report from the International Federation of Robotics in 2024, India is one of the fastest growing emerging Asian economies. Robot installations have seen a rise of 59 per cent to 8,510 units in 2023, a new high. Specially noteworthy is how the demand from the automotive industry rose to 3,551 units - a 139 per cent spike and both car manufacturers and suppliers contributed to this development.

There is a lot that we need to put on the front-burner, though. "India still needs to catch up in core components like AI chips and actuators, as well as high-precision manufacturing robots. Accelerating R&D partnerships with policy support will be critical next steps." Weighs in Dai.

India's robot density still remains low at just 7 units per 10,000 workers compared to the global average of 126. This gap should be viewed as a massive opportunity, suggests Krishnamoorthy. "Even within the automotive sector, the density is 148 Robots per 10,000 employees, which falls short of South Korea's 2,867, Germany's 1,500, and China's 772. These contrasts underline the vast headroom India has for automation-driven growth." India must focus on three levels: localising critical robotics component supply chains, investing in workforce skilling at scale, and channelling targeted capital into automation across diverse sectors.

He tells how Seiko Epson Corporation is also developing its first collaborative robot, planned for launch in FY2025. "While initial releases will focus on Japan and Europe markets, a phased rollout to the Indian market will follow."

Lohia points out our strengths lie in scale, engineering talent, and proven frugal innovation;

> India still needs to catch up in core components like AI chips and actuators, as well as high-precision manufacturing robots.
> **- Charlie Dai**
> VP and principal analyst at Forrester

> India is rapidly adopting robotics in manufacturing, positioning itself as a potential leader in intelligent manufacturing. This shift is reshaping industrial culture, boosting resilience, and redefining global competitiveness beyond just efficiency gains.

though to catch up, we must focus on reskilling workers, enforcing stricter safety protocols, and managing the turbulence of integrating automation into legacy facilities.

THE BLACK HOLE BAGEL?

As attractive and revolutionary this advent of automation is, some holes still remain to be looked into. Like labor replacement, robot taxes, turbulence in brownfield facilities and accidents due to automation changing so much in the factories.

Dai avers that automation may displace low-skill jobs but will address labor shortages. As to Robot taxes, they will become a norm in the long term amid the rise of robotics to balance innovation and social disruption. "Robotics governance is becoming increasingly critical to ensure security, privacy, ethics, and regulatory compliance." He feels.

Lohia opines that while debates on robot-taxes may arise, the more urgent priority is ensuring that the efficiency and safety gains of automation translate into new opportunities for the workforce and shared gains.

Krishnamoorthy views these issues with similar optimistic beats. "By assigning robots to repetitive, hazardous, or heavy tasks; manufacturers free human talent to focus on higher-value, creative, and supervisory roles. Admittedly, integrating automation into brownfield facilities brings its own set of challenges, especially when aligning with legacy processes. However, with careful planning, phased implementation, and a strong focus on upskilling, companies can ensure a smooth transition, enabling both technology and people to thrive together."

Notwithstanding these challenges and evolution-points, the future looks tantalising.

"The future of robotics in manufacturing is about more than efficiency gains—it is about reshaping industrial culture, building resilience, and redefining global competitiveness. India, with its rapid adoption and supportive ecosystem, is not just catching up but positioning itself as a potential leader in this next era of intelligent manufacturing." Captures Krishnamoorthy.

We might soon come to a point where automation and robots move everything in our factories to a new era altogether. Well, everything but the kitchen sink.

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Forging a Future: How AI Reshapes Metal Procurement

AI-powered conversational tools are reducing lead-to-quote cycles by 60% at Enlight Metals, showing how human–machine collaboration is reshaping procurement in Industry 5.0.

By Aanchal Ghatak

The global metals market is projected to grow from USD 4.23 trillion in 2025 to USD 4.97 trillion by 2029, fuelled by rising demand from cleantech, infrastructure, and electronics. At the same time, base-metal inventories are tightening, with London Metal Exchange zinc and aluminium stocks at multi-year lows. In this context, speed and accuracy in procurement have become critical.

To address these pressures, Enlight Metals has deployed a 24×7 conversational AI "digital colleague" that handles customer queries, accelerates quoting, and modernises interactions. The initiative reflects how Industry 5.0 is evolving through the partnership of human expertise and intelligent systems.

According to Dhananjay Goel, Director, Enlight Metals, this AI-driven approach has cut response times by more than 60%, transforming the procurement process and reshaping the customer experience in the new Industry 5.0 era.

Enlight recently announced the integration of conversational AI for metal procurement. What was the core problem you were trying to solve, and how does AI fit into that journey?

In the metals business, every second matters. The first company to respond with a clear, competitive offer usually wins the order. Before AI, we were losing valuable hours—sometimes even days—just capturing basic information from incoming inquiries, verifying specifications, and following up for missing details.

We realised that if we could automate the initial layers of interaction without compromising personal rapport, we could change the game. Conversational AI became that solution. It integrates seamlessly with multiple touchpoints—whether an inquiry comes via WhatsApp, our website, or over the phone.

DHANANJAY GOEL
Director, Enlight Metals

The AI captures the requirement instantly, asks the right follow-up questions if something is missing, and ensures only qualified, complete leads reach our sales team.

> With AI co-pilots managing inquiries and drafting quotes, Enlight Metals has cut response times by 60%, proving how human judgement and machine efficiency can coexist in Industry 5.0.

The biggest win is consistency and speed. We now have what I call a "24×7 digital colleague" who never gets tired, never forgets, and never misses a lead, allowing our people to focus on value-driven work rather than administrative loops.

Industry 5.0 is all about human–machine collaboration. How is your AI solution designed to work with your procurement teams or customers—not just replace them?

Our philosophy is clear: AI is here to amplify human capability, not replace it. In our setup, the AI acts as a co-pilot. It handles repetitive tasks—recording precise specifications, matching them to our supplier database, drafting initial quotations, and flagging potential best-fit vendors.

This frees up our teams to focus on what humans do best: building trust, negotiating terms, understanding nuanced client needs, and making judgment calls that go beyond data points. Every quote, price commitment, and delivery promise still has a human sign-off.

This balance ensures two things: speed, because AI does the heavy lifting instantly; and credibility, because final decisions always have a human stamp. It's a partnership where technology drives efficiency and humans preserve the trust factor.

Enlight Metals is not a tech or IT company in the traditional sense. What motivated your team to adopt AI-first thinking in a domain like industrial metal aggregation?

Industrial metal aggregation has not seen much digital disruption. For decades, it has been built around phone calls, handwritten notes, manual ledgers, and physical follow-ups. That works locally, but if you want to operate at PAN-India scale with dozens of product categories and hundreds of suppliers, the old methods hit a wall quickly.

We took an honest look at our growth ambitions and realised that the traditional approach would not take us where we wanted to go. AI-first thinking was not about chasing the latest tech trend; it was about building the foundation for a future-ready metals supply chain.

By adopting AI, we could shorten decision cycles, remove inefficiencies, and help our teams focus on high-value problem-solving instead of administrative tasks. In many ways, we are setting a precedent for how an old-world industry can reinvent itself and compete on a modern playing field.

Can you walk us through a typical AI-powered interaction—for example, how a customer or partner might use the conversational interface to place or manage orders?

Picture this: a customer sends us a message on WhatsApp saying they need 100 tonnes of HR coils of a particular thickness and grade. In the past, this would trigger a chain of back-and-forth calls or emails—first to confirm dimensions, then to check stock availability, then to source supplier quotes—often taking two to three days.

Now, the AI kicks in immediately. It understands the requirement, prompts the customer for missing details, and routes the complete request to our sales team within minutes. Once the sales team approves, the AI's procurement module scans our supplier database, identifies the best matches, prepares a draft quotation, and sends it for human verification.

Within a few hours—sometimes even the same morning—the customer has a verified quote in their inbox or WhatsApp. Throughout the process, both our team and the customer have complete visibility of the status. It's speed and transparency rolled into one.

What kind of impact have you observed so far in terms of efficiency, response time, human workload, or client satisfaction?

The results have been very encouraging. Our average response time to qualified inquiries has dropped by more than 60%, which is a significant competitive advantage in metals trading. Lead-to-quote cycles that previously took two or three days now often finish in less than 24 hours.

From a workload perspective, our teams have seen over a one-third reduction in repetitive administrative work. This means they can handle more opportunities without burning out—

> From WhatsApp to web forms, Enlight Metals' 24×7 conversational AI transforms raw inquiries into verified leads, freeing humans to focus on trust, negotiation, and strategy.

effectively increasing our sales capacity without adding headcount.

On the client side, faster and more accurate quotes naturally lead to higher conversion rates. Customers feel they are dealing with a company that respects their time and operates with precision, which strengthens long-term relationships.

How have your internal teams responded to this shift? Did it require reskilling or a change in workflows?

Any change in workflow requires some adaptation, and AI was no different. We restructured certain processes so that AI outputs became the starting point for human work rather than the other way around. This meant conducting short, focused training sessions to help teams interpret and act on AI-generated insights effectively.

The adoption curve was surprisingly short because the benefits were visible from day one. People saw how much time they were saving, how many fewer follow-ups they had to chase, and how much more headspace they had for strategic discussions. Instead of fear or resistance, there was genuine excitement.

Trust and transparency are key in B2B supply chains. How do you ensure that AI-driven interactions maintain reliability and relationship-building?

In our business, trust is as valuable as the metal we trade. That's why we have built strict guardrails into our AI systems. No quote generated by AI is ever sent to a client without human review and approval.

We also maintain complete audit trails—every interaction, data point, and quote is logged and accessible to both internal teams and, where relevant, customers and suppliers. This shared visibility removes ambiguity and builds confidence.

The AI might be invisible to the customer, but the speed and accuracy they experience are backed by our commitment to accountability at every stage.

What's next for Enlight Metals in its Industry 5.0 journey?

The journey is just beginning. We are working on AI-driven pricing intelligence that can respond to market shifts in real time, enabling us to adjust offers within hours instead of days.

On the logistics side, we are developing AI-enabled tracking to give customers a live view of their shipments down to estimated arrival times and route progress. For sustainability, we are exploring tools that can measure and report the carbon footprint per order, helping both us and our clients meet evolving compliance norms.

Our vision is an end-to-end intelligent supply chain where every stage, from inquiry to delivery, is transparent, efficient, and environmentally conscious.

For other traditional industries considering AI, what advice would you give?

Forget the hype and focus on the pain point. Don't start with "We want AI"—start with "We need to solve this specific problem." In our case, it was wasted hours on unqualified inquiries.

Pick one problem that directly impacts customer satisfaction or your bottom line. Solve it well, show quick results, and make sure your team sees those wins firsthand. Keep human oversight in the loop to build trust and confidence in the system. Once you have proven the value, scaling AI to other areas becomes a natural next step.

Lastly, do you see Enlight Metals emerging as a digital leader within the industrial supply chain ecosystem?

Yes, and we are building toward it very deliberately. We have moved from being a company that uses digital tools to one that thinks digitally. Our operations are becoming data-first, workflows are redesigned for automation, and our people are trained to work seamlessly with advanced tools.

We are not simply transferring old processes into a digital format—we are reimagining them entirely for speed, scalability, and sustainability. In the next decade, digital-first operations will be the baseline in our industry. We intend to be remembered as the company that proved metals could be traded faster, more transparently, and more responsibly at a national scale.

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Why context, not just data, will define the future of AI in finance

AI's raw intelligence isn't enough. Intuit's **Jayanth Saimani** reveals why context, domain expertise, and human judgment are crucial for building responsible AI.

By Shrikanth G

Artificial intelligence may be getting faster, sharper, and more powerful by the day, but power without perspective can be dangerous. In the world of personal finance, where trust and accuracy define livelihoods, raw data alone is not enough. What really matters is context, the ability to understand not just the numbers but the story behind them.

In this conversation with Dataquest, Jayanth Saimani, Distinguished Software Engineer and Director, Intuit, reflects on why domain expertise and human judgment must be woven into AI's very fabric. From rethinking the role of engineers in the GenAI era to placing humans at the heart of machine learning, he argues that the future of responsible AI will be shaped less by scale and more by wisdom. Excerpts.

AI is becoming smarter, but is it becoming wiser? What's the cost of building powerful models without sectoral context, especially in something as sensitive as personal finance? Is that what you mean when you say, 'context at the core of AI'?

Raw intelligence in AI and its ability to crunch numbers and process data is only one part of the equation. What it fundamentally lacks is wisdom, which comes from context. In areas like personal finance, building powerful models with deep domain knowledge is critical. The challenges range from misinterpretation of data to regulatory oversights that directly affect value for customers. That's why at Intuit, we put "context at the core of AI."

This means moving beyond generic datasets to build specialised Financial Large Language Models (LLMs) trained on decades of anonymised financial expertise. It's about understanding the interconnected journey of our customers across our ecosystem—from the freelancer managing invoices in QuickBooks to that same individual filing taxes with TurboTax, to them monitoring their financial health on Credit Karma. This deep integration of context transforms our AI from a reactive calculator into a proactive financial assistant. For example, in our work with QuickBooks'

JAYANTH SAIMANI
Distinguished Software Engineer and Director, Intuit

> Our AI agents automate complex financial tasks, working alongside human experts to provide real-time insights and improve cash flow.

financial data Q&A, we found that training on generic datasets was insufficient as it often lacked subtle accounting nuances.

When we integrated deep domain knowledge, defining terms like COGS, revenue, or net profit margin, the system's accuracy and reliability improved dramatically. Our AI doesn't just see a transaction; it understands the "why" behind a customer's financial goals, helping them make smarter decisions to power their prosperity. For us, context transforms AI from being just "smart" to being genuinely useful to the customers we serve.

You speak the language of code and the language of context. Which is harder to teach AI? As someone deeply involved in building AI-native platforms like GenOS, where have you seen the biggest friction—technical constraints or the challenges of encoding human, domain-specific judgment into machines?

Intuit is in a unique position to deliver exceptional value to our customers by combining human intelligence and artificial intelligence. We leverage our vast data assets, extensive network of human experts, and advanced AI capabilities to create AI-native "Done-for-you" experiences.

Our AI agents automate complex financial tasks, working alongside human experts to provide real-time insights and improve cash flow. This synergy of human and machine intelligence helps businesses grow by handling workflows across accounting, payments, and financial analysis, saving them up to 12 hours a month. This approach is highly effective, with 78% of customers saying our AI makes it easier to run their business.

Teaching code to AI is relatively straightforward. Machines can quickly master syntax, process massive datasets, and automate workflows with remarkable efficiency. These technical challenges, while complex, are largely solvable through engineering innovation and computational power. The real difficulty, however, is teaching AI the language of context. This is the language of human experience, where the greatest friction lies in encoding deep, domain-specific judgment into a machine. Unlike code, context isn't binary; it requires experience, interpretation, and the ability to navigate ambiguity in ways that AI struggles to emulate.

This is possible because we focus on teaching AI the language of context, not just code. While coding is straightforward for machines, encoding human judgment and navigating ambiguity is much harder. Our AI-native platform, GenOS, was built to solve this. It serves as a bridge between machine intelligence and human expertise, allowing our domain experts to embed their real-world understanding directly into the AI's core logic. This ensures our AI is not only smart but also practical, responsible, and genuinely trustworthy.

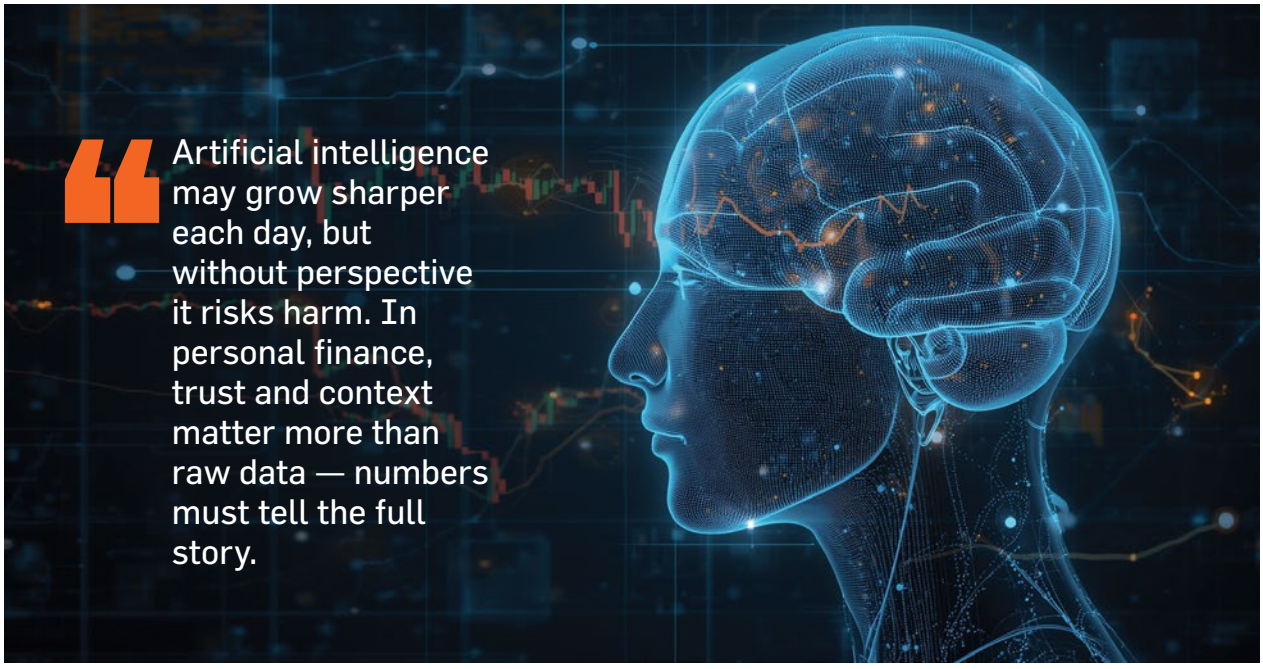
We often hear about the 'human in the loop,' but is that loop truly closed? For instance, when building automated systems in regulated industries, how do you ensure that domain experts don't just second the outputs, but actively shape and challenge the system's logic and values?

At Intuit, we're evolving the concept of a 'human in the loop' into a 'human at the heart,' fostering a true partnership between human and machine. This vision transforms passive oversight into active collaboration, where our domain experts are engaged as co-creators from the very beginning. They're central to building responsible, context-aware solutions by embedding their deep financial wisdom into the AI system's core.

These experts are integrated throughout the entire lifecycle of our AI-powered financial tools. They actively guide model training, fine-tune predictions, and stress-test algorithms against sector-specific scenarios in accounting, payments, and cash flow management. This approach ensures our AI isn't just a predictive tool but a customer-centric solution you can trust.

By combining engineering innovation with this profound domain expertise, we create a dynamic cycle of human judgment and machine intelligence. This strategy allows us to deliver exceptional value and recently led to our groundbreaking virtual team of AI agents designed to fuel growth for businesses.

Our teams leverage a suite of AI monitoring and control mechanisms that enable real-time intervention and continuous learning from expert



guidance. This constant dialogue ensures every human interaction makes the entire system smarter, more reliable, and more attuned to customer needs. This is how we ensure our AI systems uphold the highest standards of trust, reliability, and regulatory compliance, delivering practical, high-value outcomes for enterprises.

In the age of GenAI, what does craftsmanship in engineering look like? With tools like GenStudio and GenUX abstracting model development for domain experts, how is the role of engineers evolving? What does 'good engineering' mean when much of the heavy lifting is automated?

In the age of GenAI, craftsmanship in engineering is being redefined. It's no longer just about writing every line of code or building models from scratch, but about architecting robust, extensible systems that empower others to innovate. The very soul of engineering is transcending code to become the art of architecture. The measure of excellence is no longer found in the meticulous construction of every model, but in the visionary design of systems that empower domain experts to innovate.

With tools like GenStudio and GenUX abstracting complexity, the engineer's role isn't diminished but elevated. They evolve from builders of applications to architects of innovation ecosystems. Their modern craft lies in forging the essential guardrails and scalable foundations that make widespread creativity possible.

"Good engineering" today is about more than technical efficiency. It's about anticipating complexity, and creating frameworks that balance speed of delivery with trust, compliance, and long-term sustainability, enabling safe experimentation. Ultimately, today's master engineers are the enablers of a new generation of creators, shaping a future where AI is not only powerful but also profoundly responsible and accessible to all.

If you had to choose—more data or deeper context? Particularly when scaling AI in fintech, what ultimately delivers more long-term value: massive datasets or tightly integrated domain understanding? And are they always complementary?

If I had to choose, deeper context wins every time. More data doesn't guarantee better outcomes if the system doesn't understand the meaning behind it. In fintech, a trillion rows of transactions mean little without the domain expertise to interpret what constitutes revenue, risk, or fraud. Our QuickBooks journey proved this—integrating accounting context turned raw data into accurate, actionable insights. That said, context and data are not adversaries, they're complementary. Large datasets provide breadth, while domain understanding gives depth. It's the intersection of both that delivers AI systems customers can trust and rely on.

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Human creativity and intelligent machines drive Industry 5.0

Electro Waves Electronics automates SMT lines and adds AI-powered inspection for speed and precision in PCB assembly. **Monarch Goyal, CEO of Electro Waves**, explains how robotics, IoT, and upskilling are shaping Industry 5.0.

By Aanchal Ghatak

India's electronics manufacturing sector is projected to reach USD 300 billion by 2026, boosted by the Production Linked Incentive (PLI) scheme which has already drawn USD 2.7 billion in investments and is expected to create more than 90,000 jobs.

In this environment, mid-tier manufacturers such as Electro Waves Electronics are going beyond automation into Industry 5.0—a convergence of intelligent machines and human creativity. Unlike Industry 4.0, which prioritised efficiency and cost control, Industry 5.0 aims to blend AI, robotics, and IoT with human adaptability to deliver productivity, sustainability, and a skilled workforce ready for the future.

Monarch Goyal, CEO of Electro Waves, shares how the company is embracing this transition.

How is Electro Waves integrating AI and automation within its current manufacturing processes?

At Electro Waves, we have invested significantly in automation. Our SMT (Surface Mount Technology) lines are fully automated for high-speed, high-precision PCB assembly. AI-enabled Automatic Optical Inspection (AOI) systems identify critical PCB values early, maximising quality and efficiency.

> Industry 5.0 is not about replacing people with robots, but about making people central to technology adoption.

MONARCH GOYAL
CEO, Electro Waves

We are also implementing robotic welding and soldering systems for through-hole assembly.

Can you share examples of how human workers and machines collaborate in your facilities?
We view people and machines as partners. Machines deliver productivity, repeatability, and accuracy, while humans ensure flexibility, adaptability, and quality. Robots are not replacements but enablers—they enhance our work. We train our workforce to operate and programme these systems, always reinforcing that people come first.

Have you adopted smart technologies such as predictive maintenance, IoT sensors, or digital twins?
Yes. IoT-enabled monitoring and visualisation systems have been deployed at our charger and inverter assembly lines, providing real-time insights and predictive maintenance. This reduces downtime and improves efficiency. We are also exploring digital twins to simulate and test performance in upcoming phases.

How do you ensure that your workforce remains skilled and relevant in this evolving AI–human collaborative landscape?
We conduct regular training sessions on automation tools and recommend external programmes to strengthen technical knowledge. Our goal is to make every employee a partner in technology adoption, while securing their career paths for the Industry 5.0 era.

What sustainability initiatives and energy-efficient practices have you introduced in your manufacturing operations?
Sustainability underpins our growth strategy. We have installed rooftop solar power to generate clean energy, while lean manufacturing practices and energy-optimised production lines minimise waste and reduce carbon emissions. These initiatives ensure efficiency while remaining environmentally responsible.

Have you made any recent investments or technology upgrades that align with your Industry 5.0 vision?
Yes. We have invested in robotic welding and soldering systems to enhance precision and reduce manual strain. Our IoT infrastructure is also being upgraded for stronger real-time monitoring. These upgrades represent our Industry 5.0 vision of human skills and intelligent machines complementing one another.

How do you see the future of intelligent manufacturing evolving for mid-sized companies like yours in India?
Industry 5.0 offers mid-sized Indian manufacturers a global edge through cost efficiency, scalability, and product reliability. The future lies in collaboration: machines will manage scale and repetition, while humans drive creativity, problem-solving, and innovation. Mid-sized firms like ours will be crucial in making India a hub for smart and sustainable manufacturing.

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From gold medals to drones: Agnishwar Jayaprakash on steering Garuda Aerospace into Industry 5.0

In defence, drones will work alongside soldiers, offering real-time situational awareness and reconnaissance, ultimately making operations safer and smarter.

By Aanchal Ghatak

Agnishwar Jayaprakash's journey has taken him from the swimming pool to the skies. A six-time South Asian Games gold medallist, he honed the discipline, tenacity, and focus required to succeed in competitive sports—skills that later powered him into the high-pressure, capital-intensive world of drones and entrepreneurship.

As Founder and CEO of Garuda Aerospace, he has transformed a fledgling start-up into one of India's top drone companies, celebrated for indigenous innovation and profitability in an industry where many struggle to stay afloat. Under his leadership, Garuda developed India's first Drone-as-a-Service aggregation platform, connecting farmers, businesses, and defence with affordable access to premium drone offerings. With operations across 84 cities, Garuda is now preparing for rapid global growth and a future IPO.

Garuda's success has come from balancing vision with execution: focusing on scalable service models over capital-heavy sales, investing in local manufacturing to build resilience, and navigating evolving drone regulations. Looking ahead, Jayaprakash envisions drones not as automated

> From precision agriculture to defence, drones are reshaping industries by combining human judgement with AI-driven insights.

AGNISHWAR JAYAPRAKASH
Founder and CEO, Garuda Aerospace

> Garuda Aerospace shows how local innovation, indigenous manufacturing, and scalable services can turn drones into everyday business allies.

machines but as AI-powered collaborators, working alongside humans to shape the Industry 5.0 era.

From being a six-time South Asian Games gold medallist swimmer to leading one of India's most successful drone start-ups, how did this personal journey shape your vision for Garuda Aerospace?
I began as a swimmer and transitioned into a drone entrepreneur; my journey and Garuda's vision are closely linked. The discipline, focus, and drive to excel in competitive swimming helped me build the company. The lessons of setting ambitious goals, working hard, and overcoming setbacks shaped my belief that with dedication and creativity, we can navigate the complexities of this capital-intensive industry and tackle any challenge.

Garuda has achieved sustained profitability in a capital-intensive sector. What were the toughest trade-offs you had to make to balance growth with profitability?
Focusing on profitability in such a market required tough trade-offs. Instead of spreading resources across speculative R&D, we prioritised high-impact solutions such as agricultural and industrial services that generated immediate revenue. Rather than heavy capital investment in direct sales, we built a scalable Drone-as-a-Service model. With strong emphasis on operational efficiency and indigenous manufacturing, we could pursue growth targets while maintaining a sustainable financial position, even if it meant forgoing quick wins.

Industry 5.0 emphasises human–AI collaboration. How do you see drones evolving from being automated tools to becoming true collaborative partners for farmers, defence forces, and enterprises?
I see drones moving beyond automation to become true partners in Industry 5.0. For farmers, AI-powered drones will analyse crop health and soil conditions, offering insights for precision agriculture while farmers retain decision-making. In defence, drones will work alongside soldiers, providing real-time situational awareness and reconnaissance, making missions safer and smarter. By integrating AI and data analytics, drones will enhance human capabilities, not replace them.

You launched India's first Drone-as-a-Service aggregation platform. How will AI, automation, and data analytics enhance this platform in the Industry 5.0 era?
AI will predict maintenance and optimise flight path planning for efficiency and safety. Automation will streamline service delivery, from ordering to deployment, ensuring a seamless experience. Data analytics will process thousands of missions, offering unique insights into operational trends and stakeholder needs. This will allow us to evolve our services continuously and provide sector-specific solutions for farmers, enterprises, and defence.

How has India's drone policy shaped Garuda's journey so far? What policy changes would accelerate drone adoption in agriculture, logistics, and defence?
India's liberalised drone policies and the Production-Linked Incentive (PLI) scheme created a supportive environment for local innovation and manufacturing. While compliance has shaped our systems, clearer regulations have also enabled us to scale confidently. For mass adoption, I believe policies must encourage skilling and training, provide easier airspace permissions for complex operations, and extend financial assistance for farmers and SMEs to adopt drone technology.

With operations already spanning 84 cities, what are your next steps for global expansion, and how do you plan to compete in international markets?
Global expansion will be phased and partnership-driven. We aim to enter developing economies with similar needs to India, such as Africa and Southeast Asia. Rather than just selling drones, we will export a scalable Drone-as-a-Service ecosystem, tailored to local regulations and market needs.

With global expansion on the horizon, how do you plan to build manufacturing capabilities that can cater to both domestic and international markets?
We are scaling manufacturing through a modular and

> Industry 5.0 will not be about machines replacing people, but about drones and humans collaborating to create safer, smarter ecosystems.

decentralised model. By collaborating with ancillary suppliers and industrial partners, we can increase capacity flexibly without heavy capital risks. This also allows for market-specific customisation of drone models while maintaining efficiency.

Manufacturing in drones often faces challenges with component sourcing and supply chain dependencies. How is Garuda addressing these hurdles while maintaining profitability?

We tackle supply chain challenges by focusing on indigenous manufacturing and building multi-sourcing networks. Designing drones around locally sourced parts and integrating operations—from software to assembly—gives us greater control and reduces exposure to global disruptions. This strategy supports profitability while reinforcing our commitment to "Make in India."

You've spoken about a path to IPO. What milestones are you targeting before taking Garuda Aerospace public?

Our IPO roadmap is tied to specific milestones. We want to expand global operations, materially scale our Drone-as-a-Service platform, and achieve critical mass in key sectors such as agriculture, logistics, and defence. Alongside consistent profitability, we aim to demonstrate business maturity and readiness to operate as a public company.

What kind of investment or partnerships are you seeking to fuel the next phase of growth?

We are seeking strategic investors who bring not just capital but also global networks and expertise in scaling tech companies. Partnerships with defence and technology players are also a priority to co-develop new applications and accelerate R&D, cementing our leadership in the global drone ecosystem.

Looking at FY25–26, what are Garuda's top three priorities to cement its position as a leader in the drone ecosystem?

Our top three priorities are: expanding our global footprint, scaling manufacturing to meet domestic and international demand, and advancing R&D in AI and automation to enhance our Drone-as-a-Service platform. These will keep Garuda at the forefront of the industry.

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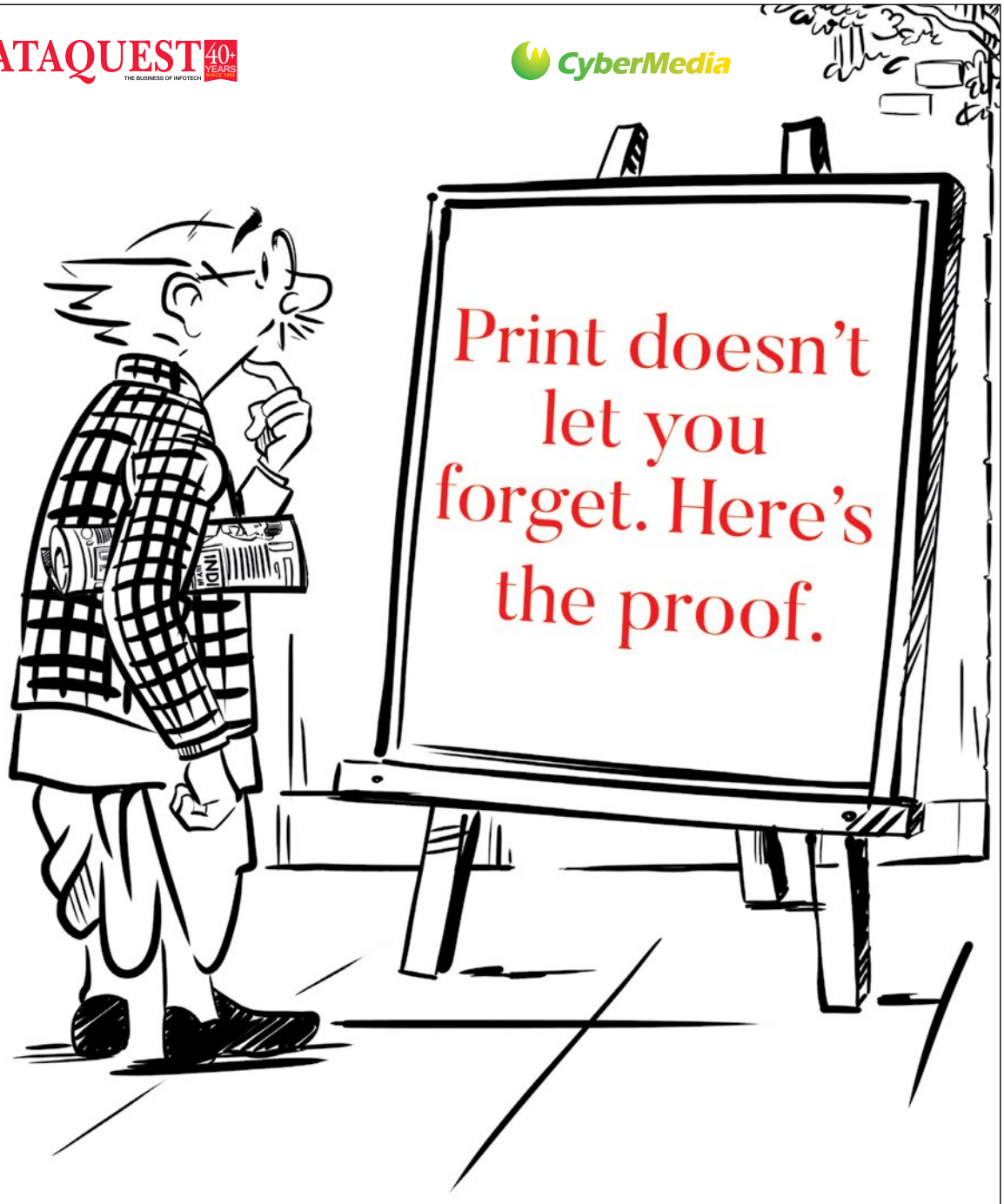

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Source: Study by TrueImpact (A Canadian neuromarketing firm)

INS
THE INDIAN NEWSPAPER SOCIETY

Why Industry 5.0 matters for India's defence and how Aimtron is making it real

India's defence manufacturing is entering the Industry 5.0 era, where machines empower rather than replace humans. By blending AI, robotics, and skilled expertise, the shift promises resilient supply chains and reduced import dependency.

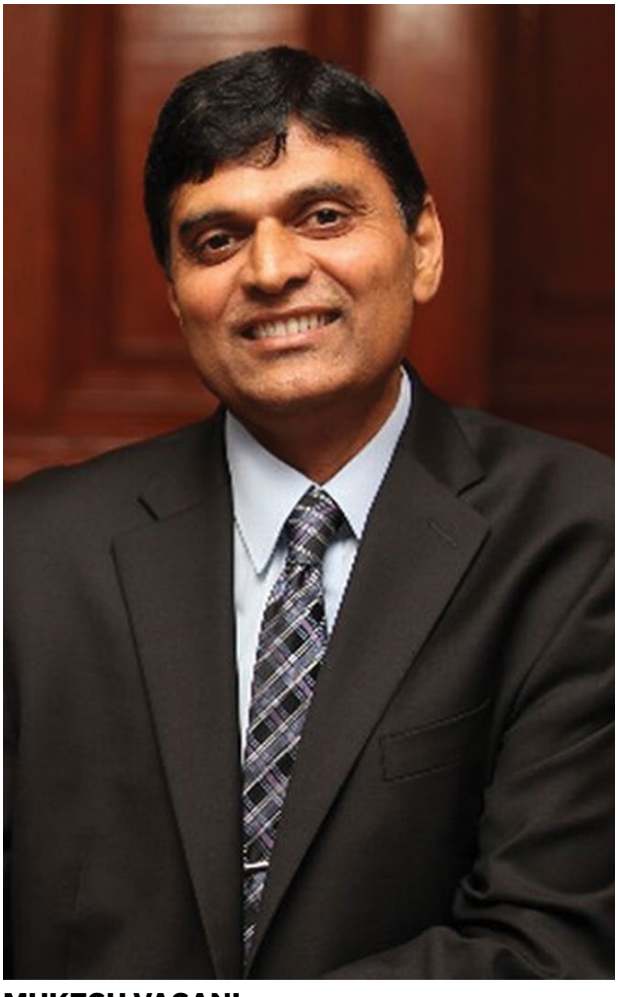
By Aanchal Ghatak

India's defence industry is at an inflection point. With the ambition of achieving USD 25 billion in defence manufacturing by 2025, the urgency for self-reliance could not be clearer. The challenge is not just scaling production volumes but building an ecosystem that can design, prototype, and manufacture mission-critical systems domestically, with minimal reliance on imports.

Industry 4.0 was about automation and efficiency. Industry 5.0 puts people back at the centre of innovation—engineers and skilled professionals working with AI, robotics, and IoT to bring adaptability, speed, and security. For defence, this translates into rapid customisation, predictive maintenance, resilient supply chains, and hybrid production—all embedded in the Make in India and Atmanirbhar Bharat vision.

Founded in 2011 by Mukesh Vasani, Aimtron has grown from low-volume PCB assembly to high-volume prototyping and box builds, replicating US-grade, ITAR-compliant processes in India. With a Rs 100 crore greenfield facility in Gujarat and an R&D hub in Bengaluru, Aimtron balances automation

> "Every system we build locally reduces dependency on imports and strengthens the Atmanirbhar Bharat vision. For us, defence electronics is not just an industry—it's a responsibility.



MUKESH VASANI
Founder & Chairman, Aimtron Electronics

> Resilient supply chains are as critical as resilient weapons. By integrating box-build-to-delivery solutions domestically, we ensure sensitive technologies remain within trusted ecosystems.

with human-led oversight to deliver defence-grade electronics across UAVs, avionics, cyber defence, and tactical communications.

How is Industry 5.0 shaping India's defence manufacturing ecosystem?
Industry 5.0 marks a paradigm shift from Industry 4.0's focus on smart, automated technologies to a human-centric model that prioritises sustainability and resilience. It is about skilled engineers working alongside AI, robotics, and IoT to deliver precision, speed, and resilience. For India, this means accelerated customisation, predictive maintenance, and localised production models that cut import dependency. At Aimtron, we embrace this shift through advanced automation in India and the US, while ensuring human oversight drives adaptability, precision, and security.

What role is Aimtron playing in building indigenous, secure, high-performance defence electronics?
Since 2011, Aimtron has invested in capabilities critical to defence—PCB assembly, system-level box builds, and high-volume prototyping. By replicating ITAR-compliant processes in India, we enable indigenous manufacturing that meets global standards. Our journey from medical and industrial electronics, where tolerance for failure is zero, to defence has been deliberate. Supported by a strong engineering base and a zero-debt balance sheet, we are committed to advancing India's defence autonomy.

What gaps are domestic ESDM players like Aimtron filling amid the USD 25 billion defence goal by 2025?
India faces challenges: dependence on imported subsystems, a limited base of Tier-1 system integrators, and fragmented supply chains. Aimtron is tackling these by investing Rs 100 crore in a greenfield facility with five SMT lines for advanced box-build assemblies, cutting offshore lead times by nearly 40%. Our AS9100-certified processes and competitive cost structures enable scalable, test-ready solutions for defence.

How are you balancing automation, AI, and human expertise at your facilities?
In Vadodara, our Industry 4.0-ready SMT lines deliver automated throughput. In Bengaluru, our R&D hub drives complex prototyping, diagnostics, and mission-specific customisation. Machines drive efficiency, but humans ensure oversight and innovation—capturing the true spirit of Industry 5.0.

How do you meet IPC Class III and export-compliant standards while keeping costs economical?
We meet stringent defence requirements through EMI shielding, GaN-based components, and rigorous testing—AOI, 3D SPI, X-ray, and functional tests. Localised production in Gujarat and Bengaluru, supported by PLI incentives, keeps costs competitive without compromising quality or security.

How are you supporting resilient domestic supply chains in sensitive technologies?
Aimtron reduces vendor dependency by offering integrated box-build-to-delivery solutions within ITAR-compliant frameworks. This accelerates timelines and ensures sensitive technologies remain in trusted ecosystems. With synchronised operations in India and the US, connected via Epicor Kinetic ERP, we ensure uninterrupted planning and production.

What is your roadmap for Industry 5.0: sustainable manufacturing, AI-led design, and human-centric innovation?
In the near term (2024–25), we are commissioning our Rs 100 crore greenfield facility, embedding automation with human oversight. In the mid-term, we will scale AI-led design and rapid prototyping in Bengaluru. Long term, we aim to deepen human–machine collaboration, strengthen domestic supply chains, and drive sustainable defence manufacturing.

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Cloud Sovereignty: Feature. Bug. Feature. Repeat!

Like most big coal-engine moments in the timeline of technology, Cloud is also turning out to be suffixed with a paradox. Are Sovereign Clouds a fair-ask? Are they practically feasible? Is Sovereignty-washing possible? Is that happening? Let's lift some of these clouds today.

By Pratima H

It's slow but it's happening. Cloud roll-backs are now much more than cost saving-attempts or back-to-comfort-zone shuffles. We all heard – in some way- about Basecamp's 37Signals pulling the plug on a big Cloud vendor in early 2023 hoping it will save $7 million in the next five years by going on premise. The figure started touching $10 million recently. But there's more to a Cloud exit than simply eking out dollars these days.

GEICO moved over 600 apps to the cloud over a decade but ended up with 2.5 times higher costs. Now they're moving back to private cloud. Dropbox pulled 90 per cent of customer data off AWS and built their own hybrid system, saving a lot of money. Adobe also shifted major parts of their infrastructure away from public cloud. There are many, many more examples of large enterprises doing the same – as told by Kunal Kushwaha, Field CTO, Civo in a recent interview with Dataquest.

India's own technology players like TCS are also seen dotting headlines like the NOW Telecom-partnered Sovereign Cloud in Philippines or the

> The genie is out of the bottle. Or in more practical terms: Toothpaste can't be squeezed into the tube again.
>
> - **Frank Karlitschek**
> CEO and founder of Nextcloud

RailTel Sovereign Cloud (tagged as the India's indigenous sovereign cloud platform). There is also buzz about Ola's Krutrim's AI Sovereign Cloud for India. In fact, as per some recent BCG estimates, by 2028, as many as 65 per cent of nations are expected to implement a digital sovereignty plan. Sovereign-cloud infrastructure as a service (IaaS) spending is also expected to take a jump from $37 billion in 2023 to $169 billion by 2028. The reason lies a lot in regulatory push- from the European Union's General Data Protection Regulation, France's SecNumCloud rules, to India's Digital Personal Data Protection Act. It also has to do with concerns related to data privacy, data control, cloud control, resilience assurance, security worries and business continuity needs. Everything, as we can decipher now, is boiling down to that counter-intuitive-sounding term- Cloud Sovereignty.

TYPES AND STRIPES OF SOVEREIGNTY

- **Data:** Where data, backups, metadata etc. are within national borders – equipped with encryption and keys that are in the hands of the customer/apt authorities.
- **Operational:** Where day-to-day ops are in the hands of resources who are legally subject to the local jurisdiction and cannot be compelled by foreign enforcement
- **Technological:** A customer can govern, inspect, escrow or replicate a cloud stack without worries of a lock-in or lock-out at the hands of any foreign vendor during contingencies
- **Regulatory:** Major legal and national-concern issues are within the ambit of local laws and jurisdictions

MY CLOUD, MY DATA, MY WAY, MY COUNTRY- WHY?

When the concept of Cloud first emerged, the idea was both path-breaking and why-did-we-not-think-of-it-before' face-palming in its impact. Just skip all the infrastructure headache and let a vendor pool everything up in some Cloud- from where enterprises can use all the IT they want- and on tap. No need to pin up any tent-bolts anywhere, all's available, when needed, as needed, in a Cloud. Simple!

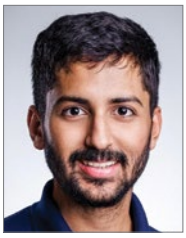
But this ethereal, and magical-sounding, feathery-wispy Cloud still has its behind-the-curtains iron somewhere. The data sits in some place. And that some place – in some circumstances- can confront issues related to actual control, lock-outs, security threats, geo-political arm-twisting and law enforcement by foreign authorities. Hence, the very advantage of a Cloud of being 'up there' became its biggest concern- if only recently. Now enterprises have started asking for, and vendors scrambling to assure them of, sovereign clouds. Yes, a paradox of sorts. But also- a real concern today.

Cloud sovereignty isn't just a buzzword anymore, argues Kushwaha. "It's a real concern for businesses across the world. The pattern is clear. The cloud isn't a one-size-fits-all solution anymore. Companies are starting to realise that sometimes control, cost, and compliance matter more than convenience."

Frank Karlitschek, CEO and founder of Nextcloud elucidates that digital sovereignty means that third parties such as technology providers or foreign governments are not able to control you in your digital decisions. "Customers regularly mention some areas as risks -Digital dependency and vulnerability to blackmailing, costs, vendor lock-in (making it hard to move to another provider) and data protection."

"Companies such as Microsoft have recently increased subscription prices for some of its products by 40 per cent. The Cloud Act grants US authorises access to cloud data hosted by US companies. It does not matter if that data is located in the US, Europe, or anywhere else. Now there are fears of industrial espionage, for example if the DOGE team in the US potentially has access to confidential databases. In addition, customers don't want their data to be used for training of AI models." He explains.

Kushwaha seconds that pattern and echoes that this isn't just a UK thing. "In Europe, we're seeing a clear pushback against the dominance of big cloud



> A lot of people confuse data residency with data sovereignty, but they're not the same thing.
>
> **- Kunal Kushwaha**
> Field CTO, Civo

providers through projects like EuroStack. Over in India, the momentum is strong too. New data protection laws and the RBI's plan to launch its own sovereign cloud show how serious the country is about taking control of its data."

He illustrates how the RBI's announcement is a big deal. "Their upcoming sovereign cloud, set for 2025, will offer affordable cloud services to financial institutions and make sure all data stays within the country. On top of that, India's Digital Personal Data Protection Act from 2023 has strict rules about where data can go. The draft rules released in early 2025 give the government a lot more power over cross-border data movement."

Mitesh Jain, Regional VP of Akamai India notes that this rise of stringent data privacy regulations reflects a growing recognition that data is not just a technological asset but a matter of public trust and sovereignty. "As a result, major cloud vendors are now offering Sovereign Cloud solutions, designed to comply with local legal frameworks, keeping sensitive data within national borders."

Vinay Chhabra, Co-Founder & Managing Director, AceCloud adds the AI context here. "In today's AI-driven world, data is one of the most valuable resources for a nation. As India becomes one of the largest digital economies, the need for a secure and trusted environment to safeguard enormous volumes of proprietary data is critical especially amidst Indian organisations facing around 3291 cyberattacks per week."

WHAT'S SOVEREIGN AND WHAT'S PSEUDO-SOVEREIGN?

A lot of people confuse data residency with data sovereignty, but they're not the same thing, warns Kushwaha.

"Data residency is simply about where your data is stored. Data sovereignty is about who has legal control over it. Even if your data is physically in one country, if the cloud provider is subject to another country's laws, your data can still be accessed from outside. That's a major issue."

In June 2025, Microsoft France told the French Senate that they couldn't guarantee French citizen data wouldn't be sent to the US, even without the French government agreeing to it. That says a lot, Kushwaha weighs in. "Laws like the US CLOUD Act and FISA 702 allow the US government to demand data from any US-based company, no matter where the data is kept. That means a US hyperscaler would need to give access to any data stored on their servers in India. So storing your data locally doesn't protect you if your provider still answers to foreign laws."

As Mayank Verma, Global Head, Data & AI, Xebia also reasons, Cloud sovereignty is no longer defined by where data sits. "It's defined by who controls how systems behave. Across India, Southeast Asia we are working with enterprises that have already met localisation and residency mandates but are now asking the harder questions: who holds access to telemetry, who can escalate and intervene, who governs model observability, and where support workflows terminate. Most cloud-native defaults were built for scale and efficiency, not for jurisdiction-specific control. That's not a flaw- it's a design trade-off that needs to be surfaced and addressed."

The BCG NPI index report's sidenotes also point out at how the Clarifying Lawful Overseas Use of Data Act in the US allows US authorities to subpoena data from any US-based provider – and this can happen even if that data sits in Europe or Asia. That explains why and how a country can use a sovereign cloud to build a jurisdictional firewall.

That's why people are calling out big cloud providers like Microsoft, AWS, and Google. They talk a lot about digital sovereignty, but they're still US companies. US laws still apply, clarifies Kushwaha. And this brings us to the next big item in the IT laundry-list - Sovereignty Washing.

PUBLIC CLOUDS OR PUBLIC LAUNDROMATS- SOVEREIGNTY-WASHING

Here, it might be helpful to take a quick glance at how vendors, specially hyperscalers, are trying to address

> The need for cloud sovereignty is accelerating, particularly among clients in Europe and India.
>
> **- Goutham Parcha**
> VP, Application Development, Pegasystems India

this new gap. They, as explained by an BCG analysis, can take two routes – a Hyperscaler Cloud with sovereignty features and another one- a Sovereign Cloud with hyperscaler software. The former is where the capex is borne by the hyperscaler and the latter is where the capex comes from the local/joint venture entity/ies. In the first case- a country's data may still fall under a foreign jurisdiction if the cloud infrastructure is owned by the hyperscaler. In the second case- all national data is governed by the local law/ownership.

But as Kushwaha contends, real data sovereignty means full legal and operational control. It's not just about storing data in a certain location. "You need jurisdictional separation and customer-controlled encryption keys. Without that, the sovereignty claims don't mean much."

Prof. Nityesh Bhatt, Director, Institute of Management and Professor of Information Management Area, Nirma University concurs. It is an incremental improvement in the positive direction, however, not completely immune from the risks in the current geopolitical environment. It is an attempt to safeguard the market share and business interests of the leading tech titans, largely from USA. Partly a marketing gimmick too."

Goutham Parcha, Vice President, Application Development, Pegasystems India also observes that Sovereignty must be embedded in architecture, proven through control, and maintained with accountability. "Yet, there is a significant gap between what many cloud providers market as sovereign infrastructure and what true sovereignty demands."

Verma illustrates that most enterprises the company works with have already implemented data residency. "This ensures that customer or regulated data is stored within national borders, typically through in-region cloud zones. Some have also achieved localisation, which enforces legal control over whether that data can leave the country. But neither of those provides sovereignty. Sovereignty is not about location. It is about operational authority."

HYPERSCALER CLOUDS WITH SOVEREIGNTY FEATURES

- Netherlands National Cyber Security Centre-Microsoft pilot
- Sweden Government with Atea and Microsoft
- Smart Nation and Digital Government Group-AWS, Singapore
- UAE Public sector with G42 and Microsoft
- Italy- Leonardo-Microsoft for public admin and local governments

Source: A BCG Analysis

Mehul Bavishi, Customer Technology Advisor – Financial Services, Kyndryl India assesses that Sovereignty-washing is when cloud providers exaggerate or mislead about their ability to ensure sovereignty. "They might overstate their compliance with local laws or the level of control they offer to a country or an enterprise. This usually occurs when any variant of their cloud services continues to fall under the laws of their country of origin meaning that data from India can still surreptitiously be accessed by foreign law enforcement and intelligence services, even if generated/processed outside of their political boundaries. That's not sovereignty."

While providers often highlight local data hosting, they frequently fall short on delivering legal autonomy, operational independence, and architectural control. Without these core elements, many so-called sovereign solutions amount to little more than 'sovereignty-washing' in practice, reckons Parcha. "This problem stems from a narrow view of sovereignty. Placing data in a local region is not sufficient. If enterprises lack clear authority over access policies, control over encryption keys, and the ability to enforce compliance frameworks, their sovereignty is compromised. Infrastructure that appears compliant on paper often fails to deliver real legal and operational assurance."

> Data sovereignty cannot be fully achieved through data residency or localisation alone.
>
> **- Mitesh Jain**
> Regional VP, Akamai India

Bavishi advises that enterprises must critically evaluate their options to ensure that the services they choose meet their sovereignty needs/regulations.

WHO'S ON THE 180 NOW?

Cloud sovereignty has become a critical priority for enterprises operating in regulated environments or facing geopolitical uncertainty. The conversation now extends beyond cost and scale to focus on control, compliance, and trust, tells Parcha.

Right now, government and healthcare are leading the charge when it comes to sovereign cloud. And AI is making the whole thing even more urgent, explains Kushwaha.

"For government, it's not just about tech anymore. It's about national security, legal control, and who actually owns the data. These are sensitive systems, so trust really matters. Even Civo's on the UK G-Cloud list now, which shows how seriously people are starting to take this."

Healthcare's moving fast too, adds Kushwaha. "Cloud adoption in that space is growing like crazy. With the NHS aiming to digitise all patient records by 2026, there's real pressure to get this right. But with strict privacy laws like GDPR and HIPAA, they've got to be super cautious about how and where patient data is stored. Finance is another big one. About a quarter of the UK's cloud market is in banking and financial services. And in India, the RBI has straight up said banks should use sovereign cloud. Their data and risk rules are tight, so local control really matters there."

Is lifting-and-shifting that easy though? Ask

THINKING ABOUT SOVEREIGN CLOUDS? HERE'S A CHECKLIST

1.	Start by figuring out which of your data and apps are actually under foreign laws. A lot of companies don't even realise how much exposure they have until they look closely.
2.	Then decide what level of control you really need. Is it enough to just store data locally, or do you want full legal and operational control too? There's a big difference.
3.	Watch out for fake sovereign cloud claims. Some providers slap the word 'sovereign' on their marketing but are still tied to foreign laws. Pick ones that are actually independent and transparent about how they work.
4.	Use sovereign cloud setups for your most sensitive stuff. That's where it really counts.
5.	Don't forget your team. Start training them now to work with sovereign cloud environments and handle multi-cloud strategies. The sooner they get familiar with all of this, the smoother the transition will be.
6.	Ask the hard questions: who holds access to telemetry, who can escalate and intervene, who governs model observability, and where support workflows terminate.
7.	Sovereignty is having full visibility into, and the ability to restrict, how the system behaves—who can access logs, who can initiate remediation, and who can override provisioning logic.
8.	True data sovereignty requires comprehensive control: who can access data, under what circumstances, and through which legal jurisdictions.
9.	Without strong governance, encryption, transparency, and auditability, enterprises remain exposed to external risks, even if data is stored locally.
10.	Companies should mutually agree on theirs viz a viz the cloud providers' responsibilities and adopt appropriate security controls to protect their data/assets from foreign access even if it is law enforcement agencies.

Source: As advised by industry players like Kunal Kushwaha, Mayank Verma, Mitesh Jain, Mehul Bavishi and others

> The cloud promised freedom. Today, that means control. Businesses shaping digital futures must watch hyperscaler contracts and foreign laws. Sovereignty is key to building safely in a fragmented world.

Karlitschek and he points out that migration is not an insurmountable challenge – it's a manageable process. "We offer migration support. Nextcloud is an integrated platform but has a modular design. Customers can start with Files to edit and share documents and then later use Groupware for managing emails, calendars and contacts, and then Nextcloud Office or Talk for chat and videoconferencing."

Roll-back from a hyperscaler environment are simple lift-and-shift processes and straightforward if the architecture, design, build and operational needs were designed agnostic of the vendor, opines Bavishi. "However, it can also be very costly/complicated, especially if architecture or the contract has vendor lock-ins for e.g. a use of proprietary hyperscaler services and toolings, impractical contractual agreements, etc."

But making the switch is still a mental-shift. "For a switch from Microsoft365 or Google, user acceptance is often the biggest challenge. For example when an app is in a different colour than what they are used to." Karlitschek shares.

CLOUD SOVEREIGNTY- A CHIMERA?

All things considered, one is tempted to wonder- Can true digital sovereignty ever be achieved? Is the idea not a tad counterintuitive to the very DNA of technology- is it not paradoxical in the globalised age-accelerated and facilitated by technology- that businesses and entrepreneurs have finally come to enjoy?

Kushwaha assures that true digital sovereignty is absolutely achievable. "But it demands moving beyond the false choice between global connectivity and local control. It also requires significant investment from both the private and public sectors in every country it is pursued.

The internet promised borderless freedom, yet 2025's geopolitical realities are sanctions, tariffs, and extraterritorial laws. These demand that businesses prioritise sovereignty to protect their growth, data, and customers."

Cloud sovereignty is increasingly critical due to the evolving geopolitical scenario, government and industry-specific regulations, and vendor lock-ins with heavy reliance on hyperscalers. The concept has gained momentum and will continue to do so because technology has become pervasive and critical for running a state/country and any misuse by foreign actors can cause major repercussions, the way Bavishi sees it.

Prof. Bhatt captures that true digital sovereignty is a distant dream and achieving this requires a robust ecosystem for decades (humongous investment in enabling technologies, progressive policy, education etc.)

This isn't counterintuitive; it's evolution, as Kushwaha epitomises. "The cloud's original promise was one of freedom. Today, when it comes to the cloud, freedom means more control. Businesses investing heavily in digital futures can't afford to ignore the fine print in hyperscaler contracts or the reach of foreign laws. Sovereignty is the foundation for building safely in a fragmented world."

Organisations have recognised the risks of digital dependencies and are looking for better options. There is no turning back, Karlitschek underlines.

This may, indeed, be not counterintuitive; but evolution. Remember those times when some cultures considered the very act of bathing dangerous – because they thought toxins could inject human bodies through pores, thus, opened. How far have we come! Just like how public bath-houses (once popular in many ancient civilisations and even in modern times with Sento in Japan) realised that hygiene could matter more than the comfort of community or a social institutional ritual. As long as we don't do a King Henry VIII mistake (who closed all public bath-houses fearing spread of sickness) and throw the baby with the bath-water this time, sovereignty could mean another big mark on IT's own Darwin-curve. A curve that's slow, but always happening.

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In the age of AI, what it really means to be a software professional

As AI reshapes coding, Great Learning reveals why soft skills, real-world problem-solving, and strategic thinking now define the future of tech careers.

By Shrikanth G

DR. PAVANKUMAR GURAZADA
Associate Director,
AI/Data Science at Great Learning

In the rapidly evolving world of technology, AI is rewriting the rules of the game. Given the new ways of learning and working, what it means to be a software professional? The shift is far deeper than swapping one tool for another. As automation takes over routine coding, the real currency is no longer just syntax mastery but the ability to solve problems, architect solutions, and lead execution. In this wide-ranging conversation with Dataquest, Dr. Pavankumar Gurazada, Associate

The deeper value proposition for aspiring coders lies in building end-to-end capability, understanding how to frame problems, architect solutions, and drive outcomes.

Director, AI/Data Science at Great Learning, unpacks how soft skills are becoming a force multiplier in an AI-first world, why relevance in tech education comes from real-world grounding rather than hype, and how learning models must adapt to the time and financial constraints of professionals outside big-city tech hubs.

From the changing nature of the developer's role to the disciplined process Great Learning uses to integrate emerging tools like AI agents and low-code platforms, Dr. Gurazada offers an unvarnished, practical perspective on building future-ready talent. This isn't about chasing buzzwords—it's about blending technical rigor with the human skills that AI can't automate. Excerpts.

The push for soft skills is being hailed as the new secret sauce for tech careers. But let's be honest, can communication or critical thinking really offset shrinking demand for core coding roles in an AI-first world? What's the deeper value proposition here for coders?

The growing emphasis on soft skills isn't about replacing technical expertise; it's about redefining what makes a technology professional effective and future-ready. As AI begins to automate routine coding tasks, the demand is shifting toward professionals who can go beyond execution—those who can understand context, solve complex problems, and contribute to cross-functional teams.

We have observed this shift closely. While coding fundamentals remain essential, what increasingly sets learners apart is their ability to think critically, communicate effectively, and make strategic decisions in real-world environments. These are not peripheral skills; they are core to thriving in modern tech roles where AI is a collaborator, not just a tool.

The deeper value proposition for aspiring coders lies in building end-to-end capability, understanding how to frame problems, architect solutions, and drive outcomes. Our programs are designed to support this through a combination of technical rigor, structured problem-solving, and collaborative learning. Learners work on capstone projects that mirror real industry challenges, applying both technical and soft skills in a setting that demands analytical thinking, team coordination, and clear communication of outcomes.

In a world where AI can generate code, the true advantage lies in knowing what to build, why it matters, and how to lead its execution—and that's where soft skills become a force multiplier, not a fallback.

Almost every edtech platform today says it's preparing learners for the AI era. But we also hear growing fatigue around a lot of buzzword overload. How does Great Learning ensure its courses stay relevant—and more importantly, credible—in a fast-shifting AI landscape?

You have highlighted a significant challenge in education today. The sheer volume of hype around AI can be overwhelming. To counteract this, we've built our curriculum design around a core principle: grounding our content in proven, real-world application.

Our in-house team of data scientists and academicians continuously maps the AI landscape, but they don't do it in a vacuum. A key source of insight comes from our extensive enterprise training programs. By teaching the workforce of leading companies, we gain invaluable, real-time understanding of their operational needs and strategic goals. These practical learnings are systematically distilled back into our course design, ensuring our public curriculum reflects how AI is actually being applied in practice, not just in theory.

This brings me to a crucial point about credibility. While a course must be relevant, its true value is measured by its impact. That's why we constantly solicit feedback from our alumni well after they've completed their courses. This helps us gauge whether our programs are delivering measurable career impact—are our graduates getting promoted? Are they leading new projects? This post-course validation is essential.

Combined with the guidance from our top-tier university and enterprise partners, these feedback

> Developers need to understand how systems work under the hood and be able to spot when AI-generated code needs tweaking or a complete rethink.

loops allow us to separate the reliable trends from the hype. We don't just teach AI; we build a learning ecosystem that evolves with it, always anchored to academic credibility and proven career outcomes.

We keep hearing that 'continuous learning' is the answer. But that's easier said than done, especially for working professionals in Tier 2 or Tier 3 cities juggling jobs, finances, and family. How do we address that harsh reality?

Time constraints are a challenge for working professionals across the globe, regardless of their city or location. We recognized this even before starting Great Learning and built our entire learning model around solving this issue. Over the past six months, 54% of the demand for our courses has come from learners in Tier 2 and Tier 3 cities, underscoring the widespread need for flexible, effective learning solutions.

Addressing Time Constraints: At Great Learning, we recognized this challenge early and built our entire learning model to address it head-on. Pure self-learning often fails due to lack of structure and support, while full-time programs are simply not feasible for most working professionals. That's why we created a mentored learning model using the flipped classroom approach: conceptual learning via pre-recorded videos from top faculty, followed by live weekend sessions with industry mentors, bringing both flexibility and personalization to even the busiest learners.

Addressing Affordability: Academic research and our own experience have consistently shown that robust learning outcomes require far more than just high-quality content. Learners also need timely doubt resolution, project guidance, hands-on support, and career assistance to truly succeed. However, delivering these essential elements at scale has traditionally been expensive, making such programs inaccessible for many.

To solve this, we've leveraged our AI-powered learning assistant, GLAIDE, to bring these high-impact components to learners in a more cost-effective and scalable way through our newly launched Great Learning Academy Pro.

The return on investment for upskilling is still a gray area for many learners. Beyond completion certificates,

> The growing emphasis on soft skills isn't about replacing technical expertise; it's about redefining what makes a technology professional effective and future-ready.

what does real career impact look like in your view, and how does Great Learning track that over time?

We design our programs with this deeper impact in mind. The rigor of our curriculum, combined with its practical, industry-aligned nature, equips professionals to contribute more effectively in their roles. For many of our learners, particularly those with a decade or more of experience in mid-to-senior-level roles, the outcome isn't just technical upskilling but enhanced decision-making capabilities, greater executive presence, and the ability to lead teams and initiatives with confidence.

We see ourselves as career enablers, not just course providers. Over time, many of our learners have transitioned into more strategic roles, taken on leadership positions, or pivoted to high-growth domains—outcomes we track through ongoing alumni engagement and career support initiatives.

A testament to this long-term value is that many of our alumni choose to return as mentors, guiding future cohorts. It reflects both the trust they place in the platform and the tangible impact the learning experience has had on their own professional journeys.

With AI automating entire workflows, the nature of coding itself is changing, from hands-on execution to more strategic oversight. What does this mean for the traditional idea of a software developer? Are we heading toward a world where 'basic coding knowledge' is enough?

AI is definitely changing the way we develop software. With automation handling more of the routine coding, like generating boilerplate or writing tests, developers are spending less time typing every line and more time thinking about the bigger picture. It is becoming less about hands-on coding and more about guiding AI tools, designing systems thoughtfully, and making sure everything works well, securely, and at scale. So, rather than replacing developers, AI is shifting their role toward being strategists and problem solvers.

As for whether basic coding skills will be enough going forward, it really depends on what you want to do. For some roles, especially those outside core engineering, knowing the basics plus using AI tools can be enough to get a lot done. But for anyone building real, complex systems, deep technical knowledge is still critical. Developers need to understand how systems work under the hood and be able to spot when AI-generated code needs tweaking or a complete rethink. In the end, AI is not making coding obsolete; it is just changing what good developers focus on.

Finally, how are your own course design teams staying ahead of the curve? Do you have a built-in process to refresh content based on emerging tools and roles like prompt engineering, AI agents, or low-code architectures?

That's a crucial question, as it gets to the heart of how to build a truly effective tech curriculum. Our process is built on the understanding that course design must be stable conceptually while remaining current tool-wise.

First, we establish a robust foundation. Our in-house team of academics and data scientists designs the core curriculum around timeless principles. This ensures that the learning is not tied to a single tool that might become obsolete.

Second, we have a structured process for tool refreshes. We don't chase every new trend. Our teams are tasked with this as a key performance indicator—to constantly test and evaluate emerging tools, such as new AI agent frameworks or low-code platforms. We integrate them into the curriculum only after we've validated their stability and industry adoption. This prevents our learners from wasting time on fleeting fads.

Finally, we use our network of industry mentors as a dynamic, real-time resource. These professionals join live sessions to provide specific, on-the-ground insights. For instance, while the curriculum teaches the fundamentals of prompt engineering, a mentor can demonstrate a brand-new technique or tool they just adopted at their company. This layered approach ensures our content is always rigorous, relevant, and directly aligned with the evolving needs of the industry.

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Architects, Designers, Vendors and Project Managers — On the same table now

From paper-doodles to AR tours and from 2D to CAD/BIM drawing boards – seems like bricks and concrete can not just be arranged but also assessed for their challenges and wastage – and way before they touch a real site.

By Pratima H

And from guess-work to sure-footed buildings. Gone are the days when a lot of work was done when the horses were out of the stables. We have now moved to horses-for-courses designs with BIM, digital twins, AI and advanced 3D/CAD tools making proactive, carbon-conscious, productive, fast and wastage-reducing designs possible and practical. Anil Sivadas, Chairman and CEO, Enventure sketches a picture of this new world for us in this chat where we understand how technology is not just empowering architects, designers and engineers but also creating new what-ifs for creativity, the entire ecosystem, construction industry and even for blue-collar labour. Step on.

Your company has been doing a lot of work in plant engineering, building management and product engineering and MRO. How has technology changed what you do?

We do a lot of work on Autodesk tools. A bulk of our projects gained from advanced capabilities. We see a lot happening in the USA and it's time for some of it to come to India. This industry has evolved a lot with technology. In the past, an architect's office had

> A hotel would earlier only carry pre-made wash-basins to be fitted on the site. But now modular bathrooms can be constructed somewhere else and transferred to be assembled at the site.

ANIL SIVADAS
Chairman and CEO, Enventure

> An architect here can do 70 per cent of the design and the rest can be done by the user himself/herself. The technology is already here but it is not being used that much.

drawing boards. Then in the late 90s, 2D designs made the same thing possible on computers. Then with 3D, mock versions became possible – and not just the sketches but the wires and moulding etc. for a non-engineer it is hard to tell what a design is by looking at 2D mock-ups. But a 3D model made a lot of it easy. Most importantly, technology has made multiple agencies to be able to co-ordinate with each other. Cloud has added a new strength to this collaboration. And now one can also draw bill of quantities and plan material procurement in a much more wastage-reducing way and with time-plus-resource savings than what was done earlier.

How much does BIM help- after the design?
The technology-driven designs help a lot in on-site stages – saving on all the rework and concrete usage which would, earlier, cause cost and schedule burdens. With BIM, 2D and 3D have gone to new levels of sophistication. An entire building can now be designed in BIM. India is still moving ahead in this journey because the entire ecosystem has to accelerate together.

What holds the ecosystem back?
While architects and designers use 3D and AutoCAD, all the people in the chain have to move in that direction. A lot of government projects can also gain with technology and take advantage of money-savings. This has become a de-facto-standard in the USA but we are still in the transition phase. It is not just a mindset issue but an actual difficulty of awareness and readiness.

Why do construction projects in India- as, often and rightly, criticized by citizens- drag for so long? Can technology be an answer?
It can be an answer to some extent, yes. Technology is one part so if we solve that part we can shrink the delay by that much factor for sure. Specially, in the area of rework. However, there are many reasons for a project's delay.

If you were to explain it to an average Joe/Jane, what real jumps have happened between 2D and 3D and between 3D and digital twins/BIM/AI-assisted designs?
The way engineers view and understand design is through plan and elevation. With AutoCAD, the same can be done in a computer. With 3D prototypes it becomes more precise, more fast and more easy. With digital twins, the building can be equal to the model thanks to the replica. AI tools can come at all these levels. I have now even seen robots gathering scans by walking inside building sites.

Can all this precision also affect the use of manual labour in construction?
We can already see that happening in areas like brick layering, blasting, modular construction etc. I have seen customers taking entire electrical panels and containers directly on the site and doing final assembly with connectors. A hotel would- earlier- only carry pre-made wash-basins to be fitted on the site. But now complete modular bathrooms can be constructed somewhere else and transferred to be assembled at the site. In India and the USA, labour shortage is substantial and it takes a lot of hard work and delays as per project timings. So automation in construction can help. It will be pushed not just by the design side but also with new equipment on the construction side.

What's about plant engineering? Where does technology jump in- and how easily when we think of brownfield facilities in particular?
Most companies are now doing models of plants. You can now walk around a plant inside your computer. In brownfield set-ups as well, 3D scans can do a lot of modelling. Once all that is in place, sensors and IoT can be installed easily. Now an AC or motor can capture a temperature-change or vibration in real-time and send alerts for action. A lot of plant surveillance can happen in 3D models and there is no need for people to be deployed on watching and reporting faults or maintenance issues. Even the

maintenance inventory parts can be improved a lot- one can just see which ACs, and where they, need compressor replacements- and do the needful. For any business, time is money- and that can be saved here- a lot.

Can the same strength also help in sustainability action as well?

Yes, material-waste and resources shrink with these designs. Also energy planning can be optimised a lot. The sun gives light, but also heat. So buildings can be designed with that curve and positioning in mind. Technology also makes it easier to do carbon footprint analytics, achieve caps and reduce emissions. In the USA, costs as far as 10 years ahead can be calculated. India is still moving on this path – ecosystem and awareness being some challenges for now.

With advanced and precise designs, where does the human go in the loop? Do architects and designers now become generalists of specialists?

The tools add a lot to productivity, and architects and designers gain a lot here. With the baseline taken care of by technology, they become specialists and can move to high levels of expertise.

So would creativity come from the pen or from the mouse? And would that be different?

Architects, most ones, still design from pen. But it works on a digital slate now. The biggest change is the bridging of distance between architects and customers. They can also move to real co-creation and visualization for users.

Co-creation? How?

Today we have glasses for showing and explaining designs to users. A user can walk inside a model and change the colour of the chair or design of a carpet during that AR/VR walk-through. An architect here can do 70 per cent of the design and the rest can be done by the user himself/herself. The technology is already here but it is not being used that much.

What excites you about the next two to three years?

Digital Twin as a technology would open up in a big way. Also construction-side automation will also bring in a lot of efficiency. Companies like Autodesk are playing a role there. We are moving beyond design automation to construction automation- like with construction clouds.

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Epam Systems CEO Balazs Fejes: Engineering, AI, and the road ahead

Engineering is evolving, not disappearing. AI, client focus, and modernisation are reshaping how enterprises build and transform in the digital era.

By Shrikanth G

EPAM Systems is a leading digital transformation and product engineering company. On 1 September 2025, Balazs Fejes formally took over as CEO and President, marking a new chapter in the company's journey.

A two-decade veteran of EPAM, Fejes has worn many hats—from CTO to CRO—bringing a rare blend of deep engineering expertise and client-focused business outcomes.

In a wide-ranging conversation with Dataquest, he reflects on EPAM's evolution since its founding in 1993, the disruptive power of AI, the company's global footprint (including India's growing role), and his priorities as he leads EPAM into its next phase of growth. At the core of his vision lies a conviction: while coding tools may evolve, engineering remains the bedrock. And EPAM's sweet spot is helping enterprises build complex, scalable, business-driven solutions in an increasingly AI-first world. Excerpts.

BALAZS FEJES
CEO & President, EPAM Systems

EPAM has often described itself as an "engineering-first" organisation. How does this DNA shape the way you are approaching the AI revolution?

At EPAM, we have always believed that engineering is at the heart of everything we do. Coding tools will keep evolving . I agree that AI will change how people write code, but engineering as a discipline does not disappear. If anything, it becomes even more critical. Enterprise solutions are becoming more complex because AI demands strong foundations: cloud migration, clean and structured data, scalable platforms. Without this groundwork, AI projects fail.

> I agree that AI will change how people write code, but engineering as a discipline does not disappear.

Given this backdrop, what we are doing is doubling down on both fronts: training our engineers to use new AI tools effectively, while also focusing on building the cloud, data, and architectural foundations that make AI adoption successful. Ultimately, we want our clients to move beyond experimentation and deliver business outcomes. That means ensuring solutions are not only innovative, but also scalable, maintainable, and aligned with real business cases.

Looking back to 1993, EPAM has navigated multiple technology waves. Right from the early internet to cloud and now AI. Do you see the current moment as a fundamental reset?

In many ways, in my perspective, what we are seeing now with AI feels similar to the early days of the internet. The mid-1990s was a defining period. It's a fact that new technologies have created entirely new business models. But AI is unfolding at a much faster pace and on a much bigger scale. The technology stack we have today is far more advanced, and industries are deeply interconnected, so the impact is more immediate.

AI will reshape business models, customer engagement, and even internal processes. But it's not just about deploying a new tool, it's more about leading a full business transformation. That is why EPAM's mix of engineering, consulting, and product innovation is so important. For me personally, my CTO background helps me separate hype from reality, because I still work with technology at the ground level. At the same time, my CRO experience gave me the ability to focus on what clients actually need. Bringing those two perspectives together is essential as we step into this new wave.

You have spoken about client-centricity. What has changed in enterprise buying behaviour in the last few years?

The biggest change is that technology is no longer confined to IT or the back office. With digitalisation, systems of engagement, the platforms customers actually use, have become front and centre. That means technology decisions now involve CEOs, CFOs, CMOs, and business heads alongside CIOs.

Each stakeholder comes with a different perspective: CFOs focus on ROI, CMOs want customer experience, CEOs think about growth, and CIOs manage architecture and security. Our role has expanded from being a technology partner to being a broker across these stakeholders. We bring different interests together and ensure the final solution is cohesive, integrated, and business-driven.

India has become a strategic hub for global enterprises through GCCs. How do you view India's role in EPAM's operations?

India plays the role of a delivery engine serving our global clients. But now, with the rapid growth of Global Capability Centres (GCCs), the dynamics are changing. GCCs are no longer just extensions of the parent company, they have local budget holders, decision-makers, and innovation agendas.

For us, this means two things. First, we are working directly with India-based leaders who are responsible for strategy and execution. Second, we are helping these GCCs transform themselves — modernising processes, adopting AI, and building new capabilities. Many of the older GCCs were not designed with AI in mind, so we help them re-train employees, redesign processes, and implement tools that make them future-ready. This is not just about scaling talent, it is about building transformation capacity, and India is central to that.

Which verticals are seeing the strongest traction for EPAM, especially in an AI context?

Financial services remains one of our largest verticals, but AI adoption is happening across the board. Segments like business information and learning are moving faster because their core business models are under direct threat from AI disruption. They need to transform quickly, and that creates opportunities for us.

That said, our client base is broad. We work with leading companies, but also with tech-native firms who are leaders in their own spaces. These companies often need large-scale engineering capacity to build platforms and scale rapidly. Across industries, the common factor is that clients are looking not just for cost efficiency, but for speed, innovation, and resilience in a rapidly changing market.

> AI will reshape business models, customer engagement, and even internal processes. But it's not just about deploying a new tool, it's more about leading a full business transformation.

Legacy modernisation has long been a sticking point, especially in BFSI. How do you see these industries embracing AI while still tied to on-premise systems?

Not all BFSI organisations are the same. Some are leaders in adoption, while others are lagging – often because of regulatory restrictions. What AI is doing is accelerating the need to modernise. For example, decades-old core systems cannot easily integrate with AI unless they are re-architected or migrated.

The positive change is that the cost of modernisation is coming down. Cloud, modern architectures, and automation are making it more affordable to unlock legacy systems. This creates a window of opportunity for even conservative players to modernise. We are already seeing banks, insurers, and healthcare organisations moving towards hybrid models – private clouds, modular architectures, or selective migration – so they can prepare their data and infrastructure for AI. Over time, the leaders will differentiate by using AI not just for efficiency, but for revenue growth and new products.

What leadership values do you see as essential as you guide EPAM into its next phase?

I have always believed in three timeless principles. First, transparency and honesty in communication – whether with employees, clients, or investors. People need to know where the company stands and what we are trying to achieve.

Second, fostering entrepreneurship. EPAM has grown by empowering people to experiment and innovate. Micromanagement kills creativity; we prefer to measure by outcomes and results.

And third, inclusiveness. EPAM is a truly global, distributed organisation. Inclusiveness ensures that every team, regardless of geography, feels valued and engaged. It shapes our culture and helps us stay resilient. Together, these principles give us the ability to adapt, innovate, and grow in an uncertain environment.

Finally, what will be your top priorities in the first 12 months as CEO?

My focus will be on three priorities. First, to ensure that AI adoption delivers real business benefits for our clients, not just experiments. That means aligning AI projects with business cases and outcomes. Second, to keep strengthening EPAM's engineering foundations. As solutions become more complex, our differentiation will come from our ability to build enterprise-grade systems that scale, perform, and evolve.

And third, to nurture an inclusive, entrepreneurial culture. Our people are our biggest strength, and giving them space to innovate is critical. If we can combine these elements – client value, engineering depth, and cultural strength – EPAM will be well positioned for the next wave of growth.

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Pharma's industry 5.0 moment: Human + Machine, smarter together

In this interview, Braj Panda shares how Industry 5.0 is ushering in a future where technology doesn't just optimise—it collaborates, augments, and humanises how affordable medicines are produced.

By Aanchal Ghatak

As the global healthcare industry sprints toward smarter, personalised innovation, new technologies are reshaping pharma at an unprecedented pace. The healthcare AI opportunity alone is projected to touch nearly USD 350–410 billion by 2025, with applications across drug discovery, clinical trials, precision medicine, and operations.

Meanwhile, the market for digital twins—virtual replicas of plants, patients, and processes—is accelerating rapidly, set to expand from USD 1.4 billion in 2025 to nearly USD 6.8 billion by 2032, at a CAGR of 25.7 percent.

Against this backdrop, Braj Panda, Head of Digital, Dr. Reddy's, discusses how generics pharma is evolving from Industry 4.0 efficiencies to an Industry 5.0 reality—where human-centred AI, digital twins, and smart automation converge to produce medicines that are faster, greener, and more affordable, with patients at the core.

BRAJ PANDA
Head of Digital, Dr. Reddy's

How do you define Industry 5.0, and what makes it different from Industry 4.0?

Industry 4.0 was automation and digitisation—using sensors, IoT, robotics, and AI to streamline processes and reduce inefficiencies. In pharma, this meant automated quality inspections, predictive maintenance, and reduced paperwork.

Industry 5.0 is collaborative. Intelligent systems don't replace humans but augment their decision-making. For generics pharma, this translates into:

- **AI-driven formulation design** that lets scientists validate and adjust models instead of manually handling data.
- **Digital twins** that simulate plant improvements or regulatory responses before real-world execution.
- **Hyper-personalised therapies** where automated production scales to demand while human oversight ensures patient-centric outcomes.

> "Industry 4.0 was automation-first. Industry 5.0 is human-first, intelligence-augmented.

In short, Industry 4.0 optimised processes, but Industry 5.0 re-humanises them—producing drugs faster, greener, and more responsibly.

What role do human–machine collaboration and AI play in shaping the future of pharma?

Human–machine collaboration blends computational speed with human judgment. Machines detect patterns in massive datasets, while humans provide ethics, context, and empathy.

For generics, this means:

- **Drug development:** AI predicts bioequivalence, scientists validate results.
- **Manufacturing:** Machine vision ensures micro-level quality, operators decide corrective actions.
- **Supply chain:** AI forecasts demand, planners refine with regulatory insights.

The outcome: faster formulations, lower cost per pill, and broader access.

How is Dr. Reddy's aligning its digital transformation with Industry 5.0 principles?

We are combining intelligent automation with human-centric design. Digital twins, AI-driven quality analytics, and smart supply chains are being deployed—always keeping scientists, operators, and clinicians at the heart of decisions. Our focus is on efficiency, sustainability, resilience, and patient access.

What core technologies will be most critical to Industry 5.0 success?

- **AI/ML** for predictive formulations, quality analytics, and supply chain modelling.
- **Robotics** for sterile manufacturing, packaging, and inspection.
- **Digital twins** to simulate plants, processes, and regulatory scenarios.
- **Edge AI** for real-time analytics at shop floors, labs, and distribution points.

The real power lies in orchestrating these technologies for consistent quality, rapid scale-up, and responsible delivery of affordable medicines.

How can Industry 5.0 help pharma balance innovation, compliance, and patient safety?

Industry 5.0 fuses automation with human oversight. AI and digital twins accelerate R&D and manufacturing, but humans validate decisions to ensure compliance with FDA and EMA standards. Advanced analytics provide real-time visibility, reducing risks and improving audit readiness. This keeps patient safety at the centre while enabling faster approvals and broader access to safe medicines.

What new skills and mindsets will the workforce need?

The future workforce must be digitally fluent and human-centric. Beyond technical skills, people need:

- Data literacy and cross-functional problem-solving.
- Digital-first quality management.
- Agility, continuous learning, and sustainability thinking.

Operators will evolve into "digital operators" interpreting AI insights, while scientists become "augmented innovators" leveraging computational models. The workforce of Industry 5.0 thrives by combining technical expertise with ethics and empathy.

How does Industry 5.0 contribute to sustainability and supply chain resilience?

Industry 5.0 creates intelligent, adaptive supply chains. AI-driven planning reduces waste and energy use, while digital twins simulate demand–supply scenarios for proactive response to disruptions. Robotics and edge AI minimise errors and rework. Human oversight ensures ethical sourcing. For generics, this ensures medicines reach patients reliably, even during crises, while meeting green manufacturing goals.

Looking ahead, what is your vision for the next 5–10 years of Industry 5.0 in pharma?

Pharma will become a human-centric, intelligence-driven ecosystem. AI and quantum simulations will accelerate discovery, while digital twins make operations predictive and adaptive. Manufacturing will go greener with circular economy principles. Compliance will be proactive, with transparent data flows trusted by regulators and patients alike.

Above all, patients will remain central—with affordable generics delivered faster, more reliably, and more responsibly. The focus will shift from scale-driven efficiency to responsible innovation at scale.

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Cloud-Rolls. The Big Mid-Air Plane Swap!

Roll-backs make for great headlines. Cloud repatriation makes for delicious IT media ink. But there is so much that goes before, and during, this U-turn that we seldom get a glance of. Who better than the horse-whisperer's mouth to give a peek of why, and how, Cloud shifts are happening. **Frank Karlitschek, CEO and Founder of Nextcloud** takes us into the trenches. Or shall we say, 30,000 feet up there.

By Pratima H

What has been your traction- so far- in giving enterprises alternatives to hyperscaler environments- how do you address performance, functionality and reliability needs here? Is it easy for enterprises to lift-and-shift from major Cloud set-ups?
In the first five months of 2025, demand for Nextcloud has more than tripled. We are seeing the greatest demand for a secure and reliable collaboration platform from European countries. But we are also seeing a significant increase in global inquiries, for example from Canada, Latin America and even the US.

Anything in India?
Interest from India has also increased significantly. Many organisations we talk to are specifically asking for a migration from their Microsoft or Google platform.

How does this work? Is the jump easy?
The customer decides where to host Nextcloud: on their own server in a private cloud or with a trusted provider. Nextcloud is designed for scalability and already serves major enterprises and public institutions.

Migration is not an insurmountable challenge – it's a manageable process. We offer migration support. Nextcloud is an integrated platfrom but has a modular design. Customers can start with Files to edit and share documents and then later use Groupware for managing emails, calendars and contacts, and then Nextcloud Office or Talk for chat and videoconferencing.

For a switch from Microsoft365 or Google, user acceptance is often the biggest challenge. For example when an app is in a different colour than what they are used to.

FRANK KARLITSCHEK
CEO and Founder, Nextcloud

> A cloud can only be sovereign if it is operated and controlled independently. Anything else is sovereignty washing.

Any examples of rollbacks (companies going back from cloud to on-prem, or to private cloud) that you cite from Europe and India?

Due to the sales cycle for software in large organisations, it usually takes several months before inquiries actually convert into user numbers. Customers often have to adhere to lengthy decision-making and procurement processes.

I can cite what Florian Zinnagl, Chief Information Security Officer of the Federal Ministry for Economy, Energy and Tourism in Austria said - As a governmental organisation, we not only have the highest requirements in terms of digital sovereignty, information security and resilience when selecting our ICT solutions, but also want to work with a cost-effective, user-friendly and modern platform. Also- The German state of Schleswig-Holstein started their journey for digital sovereignty in November 2024 when they announced their Open Innovation and Open Source Strategy. Nextcloud is proud to be part of it. (However, this is not a cloud repatriation).

The IT cooperative of Dutch education and research institutions SURF has announced to roll out Nextcloud broadly across the organisation in June 2025.

What's your view of the sovereignty claims made by major Cloud vendors- how much of it is sovereignty-washing? How much is serious effort/pivots being made?

Digital sovereignty means that organisations have full control over their data, infrastructure, and underlying technology. When a US corporation promises to guarantee sovereignty for organisations in Europe, India or elsewhere, it remains a contradiction: the legal dependencies, proprietary architecture, and lack of transparency remain. A cloud can only be sovereign if it is operated and controlled independently. Anything else is 'sovereignty washing'.

Where do you come in here? In terms of the new needs of sovereignty?

Nextcloud is open source software. Anyone can view and work with the source code. Every user retains full control over their data and can store it wherever they want: in their own data center or with a trusted cloud provider. Nextcloud also works with open standards and data formats. This means that all data is interoperable and can be transferred to other software at any time.

Why is sovereignty so crucial today?

Digital sovereignty means that third parties such as technology providers or foreign governments are not able to control you in your digital decisions. Customers regularly mention the three following points as risks – digital dependency, costs and data protection.

Explain the first one please- with an example.

Digital dependency and vulnerability to blackmailing is a concern. Organisations are afraid that US services are simply be shut down on a presidential order or due to sanctions. If these were shut down from one day to the next, it would have enormous consequences. Even if the data is located in a data centre outside the US, customers would, for example, not get security updates.

What's the cost angle?

In addition to the chaos regarding tariffs, customers are also risking a vendor lock-in, making it hard to move to another provider. Companies such as Microsoft have recently increased subscription prices for some products by 40 per cent.

And what about data protection?

The Cloud Act grants US authorities access to cloud data hosted by US companies. It does not matter if that data is located in the US, Europe, or anywhere else. Now there are fears of industrial espionage, for example if the DOGE team in the US potentially has access to confidential databases. In addition, customers don't want their data to be used for training of AI models.

Will the idea last beyond 2025?

The genie is out of the bottle. Or in more practical terms: Toothpaste can't be squeezed into the tube again. Organisations have recognised the risks of digital dependencies and are looking for better options. There is no turning back.

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Real sovereignty - not just marketing fluff

Sovereign Cloud, Sovereign AI and real control are going to matter more than inflated promises and flashy tech-chops. Because...

By Pratima H

As we combed through some recent findings unfolded by a Civo paper on Cloud sovereignty in regions like UK, we asked Kunal Kushwaha, Field CTO, Civo about the technological, political, eyewash-y, practical, financial and roll-back sides of the word 'Sovereignty'. Turns out data residency is not data sovereignty, and just promising a sovereign cloud has to be more than a marketing ribbon. Kushwaha argues with some data and problems felt in the enterprise trenches as he challenges us to look at this word from more than one prism- hinting why sovereignty cannot be just a new brochure or a bolted-on feature. Let's understand why.

How crucial is the idea of Cloud Sovereignty today? Your findings about UK region say a lot- do they echo in regions like India and Europe too?

Cloud sovereignty isn't just a buzzword anymore. It's a real concern for businesses across the world. Our research in the UK found that 84 percent of IT leaders are worried about geopolitical risks to their data. Even more interesting, 68 percent want full ownership of their data when it comes to AI.

And this isn't just a UK thing. In Europe, we're seeing a clear pushback against the dominance of big cloud providers through projects like EuroStack. Over in India, the momentum is strong too. New data protection laws and the RBI's plan to launch its own sovereign cloud show how serious the country is about taking control of its data.

The RBI's announcement is a big deal. Their upcoming sovereign cloud, set for 2025, will offer affordable cloud services to financial institutions and make sure all data stays within the country. On top of that, India's Digital Personal Data Protection Act from 2023 has strict rules about where data can go. The draft rules released in early 2025 give the government a lot more power over cross-border data movement.

What's wild is how fast this space is growing. The global sovereign cloud market was around 96 billion dollars in 2024. By 2033, it's expected to hit nearly 649 billion. That's a crazy 23.8 percent growth rate every year.

KUNAL KUSHWAHA
Field CTO, Civo

Is Data sovereignty an area that can be adequately addressed with data residency and localisation?

How much part of the sovereignty-claims offered by major Cloud players can be put in the bracket of Sovereignty-washing?

A lot of people confuse data residency with data sovereignty, but they're not the same thing.

Data residency is simply about where your data is stored. Data sovereignty is about who has legal control over it.

Even if your data is physically in one country, if the cloud provider is subject to another country's laws, your data can still be accessed from outside. That's a major issue.

In June 2025, Microsoft France told the French Senate that they couldn't guarantee French citizen data wouldn't be sent to the US, even without the French government agreeing to it. That says a lot.

Laws like the US CLOUD Act and FISA 702 allow the US government to demand data from any US-based company, no matter where the data is kept. That means a US hyperscaler would need to give access to any data stored on their servers in India. So storing your data locally doesn't protect you if your provider still answers to foreign laws.

That's why people are calling out big cloud providers like Microsoft, AWS, and Google. They talk a lot about digital sovereignty, but they're still US companies. US laws still apply. This is what people mean by "sovereignty washing."

Real data sovereignty means full legal and operational control. It's not just about storing data in a certain location. You need jurisdictional separation and customer-controlled encryption keys. Without that, the sovereignty claims don't mean much.

Your paper strongly argues how Cloud migration decisions are being driven/affected by political factors? Is it right/practical for IT to be defined by geo-political factors instead of cost/innovation/integration/security factors?

Cloud decisions aren't just about tech specs or pricing anymore. Sure, cost, performance, and security still matter, but now geopolitics is right there in the mix too. Businesses have to think about all of it together. That's just the reality now.

With Trump's new tariffs, shifting regulations, and all the legal risks tied to foreign jurisdictions, cloud has become way more than just a budget or tech decision. It's now a business risk decision too.

Of course, innovation and ease of integration still play a role. But cloud strategy today has to fit into a much bigger picture that includes political and legal factors.

So what's the situation in the UK?

A lot of IT leaders are clearly paying attention. 83 per cent are worried that global political issues could impact their control over data. 61 per cent now rank data sovereignty as a top priority. And over 60 per cent think the UK government should reduce its reliance on US-based cloud providers.

Any roll-back examples that you can cite? Is it easy for any enterprise to lift-and-shift from a hyperscaler environment?

Cloud decisions aren't just about cost or performance anymore. Geopolitics, regulation, and legal risks are forcing companies to rethink everything, and that's driving a major trend in cloud repatriation.

According to recent data, 83 per cent of enterprises are now planning to shift workloads from public cloud back to private or on-prem setups. That's almost double the number from 2021. In fact, 94 per cent of IT leaders say they've already worked on some kind of cloud repatriation project. In the UK, one in four organisations has moved at least half of their workloads back on-prem.

And it's not just smaller players. Big names are doing the same. Like GEICO and Dropbox.

60 per cent cite data access guarantees as a key motivation. This means ensuring they can retain unbroken access to critical information amid geopolitical uncertainty – is it easy to believe this in view of how many tech companies are succumbing to DEI and environmental U-Turns under the new US administration?

This is a tricky topic, but it makes sense why so many companies are now pushing for stronger data access guarantees. Around 60 percent say it's a top priority, and honestly, that's fair. With all the geopolitical uncertainty going on, no one wants to risk losing access to their own data. For most organisations, uninterrupted access is mission-critical.

But there's another side to this too. With the way US politics are shifting and the kind of pressure big tech companies are facing on things like DEI and environmental issues, some of them might start tweaking how they operate just to keep certain governments happy. That could affect what services they offer, which customers they support, and even how much access or control users get over their own data.

This is why it's getting harder to separate cloud strategy from global politics.

> Very few actually trust Big Tech with that data. That's why sovereign AI is becoming a huge deal. India's got Sarvam AI. Europe's working on OpenEuroLLM. Everyone's trying to build their own thing now.

What new concerns have emerged here?

The US CLOUD Act and FISA 702 still let the US government demand access to data from US-based companies, no matter where the data is stored. Throw in trade tensions and the whole thing gets even more complicated.

Because of all this, more companies are now asking for actual sovereignty. Not just marketing fluff. They want providers that are fully independent from foreign legal systems. They want everything to run locally. They want to hold their own encryption keys. And they want clear, solid contracts that back all of that up.

It's no longer just about cloud performance or cost. It's about control.

Only 35 per cent of organisations have full visibility into the jurisdictions where their data is stored and governed - a dangerous blind spot in an era of regulatory complexity and geopolitical tension- are hyperscalers going to take note of this big gap? Is it a big opportunity for Sovereignty solutions?

The hyperscalers see this gap but remain bound by U.S. laws like the CLOUD Act and FISA, making true sovereignty all but impossible for them outside of the U.S..

This is where providers like Civo have the advantage. In India, our infrastructure is entirely local: staffed, maintained, and governed in-region. Data never leaves the country and is subject only to Indian laws, no foreign legal exposure. It's worth highlighting that most countries, including the UK, do not have laws comparable to the US CLOUD Act. That distinction is critical. The hyperscalers can't offer what their business model undermines. Real sovereignty requires architectural and legal independence, not just promises.

Would AI push this need further or offer solutions – would verticalised LMs, SLMs, anonymised LLMs, home-grown LLMs flip the script here?

AI is accelerating all of this. Around two-thirds of companies say they want full control over what their AI uses and creates. But very few actually trust Big Tech with that data. That's why sovereign AI is becoming a huge deal.

We're seeing new developments like industry-specific AI tools built for things like medical records, legal research, and finance. These smaller models are easier to manage and can run locally, closer to where the data is actually created.

India's got Sarvam AI. Europe's working on OpenEuroLLM. Everyone's trying to build their own thing now.

Why does all this matter? Because with sovereign AI and cloud, you get more control, better compliance with local laws, tools that work in your language and culture, and faster response when regulations change.

What has been CIVO's traction so far in light of these new needs? Both in terms of solutions and customer adoption?

In both the UK and India where customer value sovereignty, choice and do not want to be locked in to a vendor, we have significant uptake of both new business to the cloud - start ups, SMBs, but also established companies recognising change is needed.

It's not just about being compliant though. Civo is also way more affordable, up to 66 percent cheaper than the big providers. On top of that, it's faster too. Clusters launch in 90 seconds compared to the 25 minutes it takes on some other platforms.

But the biggest deal is that it's actually sovereign. That's a major plus for anyone serious about data sovereignty.

Any outcomes you can share?

Customers are already seeing major benefits. Some have cut costs by 80 percent while getting better performance. There are case studies from all kinds of industries, from fast-moving AI startups to large enterprises.

Civo's quickly becoming a go-to option as more organisations look to move away from the big cloud vendors. The timing couldn't be better either. With around 60 percent of organisations starting to diversify their cloud providers, Civo's in a strong position to grow.

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How Kyndryl is shaping the new metrics for GCC–IT collaborations

Beyond cost-efficiency, partnerships between GCCs and IT service providers should be evaluated on metrics that capture strategic value, innovation, and talent development.

By Shrikanth G

In this exclusive conversation with Dataquest, **Manjula Ramaswamy, VP and GCC Head, Kyndryl India,** shares how the tectonic plates beneath India's tech ecosystem are shifting. Global Capability Centres (GCCs), once viewed through a lens of competition, are now emerging as strategic collaborators – reshaping the very foundation of how digital transformation is delivered.

With a significant number of digital initiatives being powered through GCCs, the narrative is no longer about cost or scale alone. It's about co-creation, speed, and strategic depth. As GCCs evolve into nerve centres of innovation, they're turning to IT service providers like Kyndryl to bring in advanced capabilities – be it in IT infrastructure, cloud, or digital workplace transformation.

"These partnerships are not transactional – they're transformational," says Manjula. By combining global scale with local agility, Kyndryl enables GCCs to stay focused on the future – while seamlessly managing the complexity of today.

This synergy is not just driving operational efficiency; it's unlocking new pathways for growth, innovation, and competitive advantage – marking a bold new chapter in India's digital leadership story. Excerpts.

MANJULA RAMASWAMY
VP & GCC Head, Kyndryl India

What's prompting IT companies to view GCCs as strategic partners in digital transformation, and how are both sides navigating overlapping capabilities to build genuine, win-win partnerships instead of competing?

India's GCCs are no longer just offshore support arms – they've become the nerve centres of digital transformation for global enterprises, leading advances in AI, cloud, analytics, and more. But as

> With a significant number of digital initiatives being powered through GCCs, the narrative is no longer about cost or scale alone. It's about co-creation, speed, and strategic depth.

the demand for speed and scale grows, so does the need for deeper expertise. That's where IT services firms step in. With the ability to scale quickly, deploy cross-functional talent, and deliver complex technology at pace, they're becoming trusted partners rather than competitors in the GCC growth story. Start-ups and IT firms associated with GCCs gain the ability to scale their operations and solutions globally, leveraging the networks and resources of MNCs.

This shift is giving rise to collaborative models of joint talent development, managed services for operational tasks, and co-creation of solutions in advanced technologies. Together, GCCs and IT firms deliver faster innovation, address talent shortages, and enable efficient transformation for global clients.

In a tightening global economy, can partnerships with GCCs effectively offset revenue pressures in traditional IT markets?

According to NASSCOM, India is home to over 1,700 operational Global Capability Centres as of 2025. EY reports a projected market size of US$110 billion from approximately 2,400 GCCs by 2030. These centres employ close to 2 million professionals and are driving innovation across key sectors such as technology, BFSI, pharmaceuticals, and manufacturing. This highlights India's growing importance as a strategic hub for MNCs looking to relocate critical R&D and technology functions for cost efficiency and faster time-to-market. Recent years have seen a consistent CAGR of almost 10% in IT/BPM sector revenue attributed to GCCs, with a robust projection of reaching US$143 billion in direct output by 2030, as noted by a report from Dun & Bradstreet.

For Indian IT services companies, GCCs now represent a significant and growing revenue stream, proving to be a crucial symbiotic relationship. According to Everest Group estimates, IT and business process service providers generate around US$20 billion in revenue from GCCs globally, with Indian GCCs contributing the majority share. Amid slowing technology demand and disruption from GenAI and automation, IT firms are increasingly partnering with GCCs to support setup, provide staff augmentation, and drive digital transformation. This collaboration is helping Indian IT firms not only stay resilient but also increase the share of domestic business in their overall revenue mix.

Could you provide real-world examples of how partnerships between GCCs and IT service providers — such as Kyndryl — have successfully tackled complex challenges, particularly involving AI, cloud, or data analytics?

Partnerships between GCCs and IT service providers have been instrumental in solving complex enterprise challenges, especially in the realms of AI, cloud, and data analytics. Today, GCCs across IT, BPO, engineering, and product development are moving up the value chain by delivering complex, business-critical work. They've established strongholds in BFSI, software, telecoms, and semiconductors, with rising focus in aerospace, automotive, energy, and healthcare sectors. One sector that has seen tremendous growth is real estate services. The proliferation of GCCs has not only spurred growth in real estate services but also significantly boosted services exports, contributed to economic expansion, generated employment opportunities, and facilitated rapid revenue escalation for these firms.

Kyndryl is collaborating with a leading OEM partner to act as a catalyst in the growth of GCCs. Drawing on its decades of deep expertise, Kyndryl enables seamless integration of advanced solutions that align with GCCs' evolving business goals. This partnership fosters co-innovation, empowering GCCs to accelerate digital transformation with greater agility and impact.

How is India's role evolving — from primarily operational support to strategic decision-making — in global IT transformation agendas?

This shift is palpable and is indeed driven by the growth of GCCs that leverage India's vast talent pool and technological advancements to spearhead innovation and digital transformation. According to a BCG report, artificial intelligence – especially advanced use cases such as generative AI, Natural

Language Processing (NLP), and AI agents – is emerging as a key driver of GCC maturity. While leading organisations have successfully moved beyond pilots and are embedding AI into core business workflows, the majority of GCCs remain stuck in early-stage experimentation.

Among global locations, India, Mexico, and the US lead in GCC maturity. India stands out not only for its scale but also for consistency in performance – nearly 30% of its GCCs are classified as mature, while only 6% fall into the underperforming category. This reflects India's rare balance of size and sophistication in the global GCC ecosystem, adds the report.

New GCCs are being designed to build cutting-edge capabilities – beyond cost and scale – to support parent companies in global market expansion, local partnerships, and innovation. Technologies such as AI, big data, cloud, and mobility are further accelerating this shift, enabling Indian teams to co-lead critical digital agendas and deliver differentiated value at the enterprise level.

Besides cost-efficiency, what metrics do you consider most valuable when assessing the success of GCC–IT service provider partnerships?

Beyond cost-efficiency, partnerships between GCCs and IT service providers should be evaluated on metrics that capture strategic value, innovation, and talent development. Key areas include business impact (such as revenue growth and market expansion), digital maturity (measured through technology adoption and automation levels), and talent readiness (including upskilling, reskilling, and future-oriented capabilities). These metrics provide a more holistic view of how such collaborations drive long-term value and competitive advantage for the parent organisation – far beyond just cost savings.

Kyndryl drives AI-led transformation by embedding advanced AI capabilities across its cloud services, IT modernisation, cyber security, and data management solutions. Kyndryl Bridge, an AI-powered open integration platform, provides enterprises with real-time operational insights by leveraging AI-driven automation and predictive analytics. We recently announced an enterprise-grade Agentic AI framework that orchestrates and dispatches a portfolio of specialised, self-directed, self-learning AI agents that dynamically respond to shifting conditions and keep humans in the loop for oversight.

We leverage our strategic hyperscaler partnerships to help GCC customers accelerate their AI adoption. Our collaboration with Microsoft helps enterprises modernise their IT landscapes through Microsoft's RISE with SAP migration programme. Our work with NVIDIA supports organisations in scaling AI adoption by integrating NVIDIA's advanced AI technologies with Kyndryl's expertise in managed services, driving innovation in automation and analytics. Kyndryl strengthened its partnership with Amazon Web Services (AWS) through a multi-year agreement to co-develop generative AI and machine learning solutions via the Kyndryl and AWS Innovation Factory – driving digital transformation and operational efficiency.

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Veeam leaders on cyber resilience, ransomware shifts, and the future of data recovery

Veeam leaders share how Suraksha aligns with Bharat's digital vision, tackling ransomware trends, CISO priorities, and data recovery challenges.

By Shrikanth G

Cyberattacks today are not just about breaching systems—they're about testing the very resilience of organisations. With ransomware getting smarter, extortion attacks rising, and even backup data coming under fire, the battle has moved from prevention to preparedness. The question is no longer whether an attack will happen, but how ready an organisation is to bounce back.

For Veeam, data resilience is more than a business strategy. The company's leadership underscores this message strongly and a pivot to building a Cyber-Surakshit Bharat. Through initiatives like Suraksha and Sakshamta in India, the company is working to strengthen both capability and awareness, ensuring resilience becomes a cultural mindset, not just a technical process.

SANDEEP BHAMBURE
Managing Director & VP,
India & SAARC

DAVID ALLOTT
Field CISO,
APJ

KEITH SNG
Field CTO,
APJ

> A CISO's role is to be an enabler for the business. They are spending a lot of their time trying to understand where the threat landscape is heading.

In this conversation with Dataquest, on the sidelines of the VeeamON India Tour 2025 – Bengaluru Edition, leaders from **Veeam Software, Sandeep Bhambure, Managing Director & VP, India & SAARC; David Allott, Field CISO, APJ; and Keith SNG, Field CTO, APJ** share insights into ransomware trends, the evolving role of CISOs, and how organisations can rethink backup, recovery, and resilience for the digital-first era. Excerpts.

To start, could you explain the idea behind Suraksha, how it aligns with Veeam, and its role in advancing cyber resilience in India?

Sandeep Bhambure: Veeam is a leading company in data resilience space. Veeam Software is widely regarded as a leader in data resilience. The scale we've achieved in India is a reflection of our global track record.

However, the larger goal is not just about revenue, but about helping Bharat achieve its mission of becoming a Viksit (developed) and Cyber-Surakshit Bharat. This cannot be achieved in a single day by simply educating people or investing in technology—it's a journey and a continuous process.

Within this mission, two pillars are critical: Cyber-Sakshamta (capability) and Cyber-Saksharta (awareness/education). As the number one player, and with over a decade of commitment to India, we've invested heavily here. Our software development centres in Bengaluru and Pune reflect our Make in India commitment.

Through Suraksha and Sakshamta drives, we are working with universities to integrate data resilience into curricula and offering best practices, frameworks, and whitepapers for organisations. In short, our mission is to make Bharat both cyber-capable and cyber-aware—a blend of education, strategy, awareness, and capability.

You also released a ransomware report recently. What stood out for you in this year's findings compared to last year?

David Allott: The first big change is the shift towards cyber extortion. Attack groups are finding more value in pure extortion over traditional ransomware.

Second, we're seeing more targeted attacks—sometimes a mix of extortion and ransomware, sometimes purely extortion.

The good news is ransomware payments are declining as organisations invest more in resilience. But challenges remain—particularly in aligning people, processes, and capabilities to strengthen defences.

How has the role of the CISO evolved in response to these threats? And how do "AI for security" and "security for AI" come together?

David Allott: A CISO's role is increasingly that of an enabler. They're balancing AI-assisted attacks with AI-driven defence. They also act as referees internally, ensuring accountability across business units.

At the same time, regulatory pressures are mounting, making boards and leaders more accountable. CISOs must ensure organisations are both compliant and resilient in the face of evolving threats.

A CISO's role is to be an enabler for the business, and I think they're spending a lot of their time trying to understand where the threat landscape is heading. They're dealing with both AI-assisted attacks and AI-driven defense tactics – it's a constant cycle of adapting and staying ahead.

When it comes to backup and recovery, what are some of the challenges you're seeing and how are organisations addressing them?

Sandeep Bhambure: While ransomware attacks have slightly reduced, infiltration attempts are on the rise. Groups like LockBit being disrupted has helped, but 70% of customers still faced ransomware in the last 12 months.

A worrying trend is that 90% of these attacks targeted backup data, and in 34% of cases, attackers succeeded in corrupting repositories. Paying

> Cyber resilience is no longer just about backup and recovery—it's about awareness, speed, and staying ahead of attackers as threats and perception gaps grow.

ransom doesn't help—70% of those who paid were attacked again.

Another issue is the resilience perception gap. While 70% of organisations rated themselves highly resilient, only 8% were truly best-in-class. This gap is what attackers exploit.

From Veeam's perspective, how do you translate these challenges into opportunities for customers?

David Allott: We launched the Data Resilience Maturity Model (DRMM), co-developed with McKinsey. It provides a roadmap for organisations to benchmark resilience and measure progress.

Keith SNG: We follow DRMM with one-on-one workshops, helping customers adopt features like immutability and inline malware scanning to improve resilience.

Sandeep Bhambure: Customers take two approaches—self-managed via the Veeam Data Platform (VDP) or fully managed SaaS via Veeam Data Cloud (VDC). Many adopt a hybrid approach. Within VDC, offerings like Microsoft 365 backup are growing at record pace, protecting over 23.5 million users. Together, these deliver end-to-end resilience across preparedness, incident management, and recovery.

Finally, recovery time objectives (RTOs) are becoming a hot topic. Are these now part of SLAs and KPIs?

Sandeep Bhambure: Veeam is a pioneer in recovery speed. According to IDC, our recovery is up to five times faster than competitors. Instant Recovery enables massive restores in minutes, not hours. Being hardware-agnostic gives customers flexibility and cost savings.

Keith SNG: On Veeam Data Cloud, Vault Storage will soon allow instant recovery to Azure in under five minutes. We're also enhancing Continuous Data Protection to extend beyond VMware to physical workloads—accelerating replication to the cloud.

Key Takeaways from the Conversation

Cyber resilience today goes far beyond backup and recovery—it's about awareness, capability, and speed. From the rise of extortion-based threats to the widening resilience perception gap, enterprises must move faster than attackers. Veeam's message is clear: building a Cyber-Surakshit Bharat demands a mix of education, preparedness, and innovation, where recovery becomes a measure of business strength, not just IT efficiency.

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Why Perplexity's new Comet Plus browser feels like a rethink of the internet

Comet Plus blends AI assistance, licensed premium content, and a user-first design to reimagine browsing as purposeful, clutter-free, and fair to publishers.

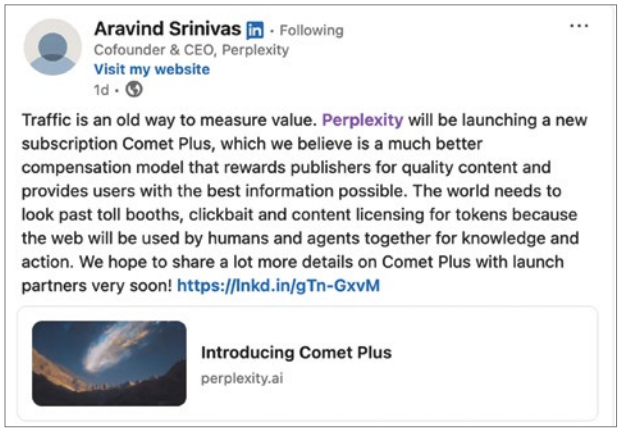
By Shrikanth G

The browser battlefield is hotting up. For decades, browsers have been our windows to the web. But let's be honest, not much has really changed. You open a browser, type a query, and you're bombarded with ads, pop-ups, and an array of links that don't always get you to what you want. That's the old model.

And now, the new kid on the block, Perplexity, is trying to challenge the status quo and even had the audacity to bid for Google Chrome recently. Close on the heels of launching its AI-native browser, Perplexity AI is shaking things up again with Comet Plus. And it's not just "another browser feature." It's almost a provocation. It's an attempt to ask: what if your browser didn't just show you the web, but actually worked with you to make sense of it?

A BROWSER THAT WANTS TO BE YOUR RESEARCH PARTNER

That's what Comet Plus pitches itself as. It blends premium access with AI research tools and revenue-sharing, aiming to reshape browsing into a purposeful, user-friendly, and fair web experience.



It's not simply about getting past paywalls; it's about rethinking the entire relationship between readers, creators, and the platforms that connect them.

BEYOND PAYWALLS: REAL ACCESS, NOT JUST HEADLINES

Have you ever searched for something, clicked on a promising result, and then you hit a paywall?

Frustrating, right? Google can show you a snippet, maybe a paragraph if you're lucky, but the real story is often hidden.

It is in this context that Perplexity Comet Plus takes a different approach. Because it's built on actual deals with publishers, it can surface the full article or research paper right there in your search flow. Perplexity says: "No endless sign-ups. No dead ends." You get the story, the context, the data. And here's the deal: publishers aren't being short-changed. They're getting paid for your access.

IS COMET PLUS A RESEARCH PARTNER SITTING IN YOUR BROWSER?

Looking at what Comet Plus promises to deliver, it's akin to having a colleague who's great at digesting information sitting right next to you. Comet's built-in assistant can pull together summaries, line up perspectives from different outlets, or even automate those dreary tasks like copying data into spreadsheets.

For instance, if you're working on a report and don't have hours to wade through ten dense PDFs, the assistant can condense it all for you. Are you a researcher, a student, a journalist? This feels less like a tool and more like a sidekick that saves your sanity.

WHY PUBLISHERS ARE SAYING YES TO COMET PLUS

A lot of publishers see AI as the enemy, as they end up losing the crux of the content through summaries and get nothing in return. Comet Plus flips that narrative. Eighty percent of subscription revenue goes back to publishers who opt in, and the payments are tied to how their content is actually used.

Think about it: every time you read, cite, or pull from an article inside Comet, the publisher is compensated. It's a rare case where the technology isn't taking away from journalism; it's helping fund it.

WHY GOOGLE CAN'T DO THIS (YET)

You might be thinking: why doesn't Google just do the same thing? The answer's simple. Google's entire model is built around indexing and linking, not licensing. Paywalls, technical blocks like robots.txt, and legal restrictions mean Google can only ever show you the tip of the iceberg—like headlines, previews, and snippets.

Comet Plus is different because it's subscription-driven. The $5 you pay each month (or nothing extra if you're on Perplexity Pro or Max) goes into a pool, and 80% of that flows back to publishers. Google isn't set up that way. At least not yet.

COMET PLUS: PRICING AND POSITIONING

At $5 a month, Comet Plus is pitched as affordable but powerful. If you're already on Perplexity Pro or Max, you don't pay extra as it's included. That means subscribers get premium content, integrated AI tools, and a familiar browsing experience without adding another line item to their digital budgets.

It's built on Chromium, so if you're used to Chrome, the switch feels natural. You can run the same extensions, but with less clutter and more intelligence built into the workflow. In other words, it's like Chrome, but with the volume of distraction turned down and the depth of research turned up.

WHY PREMIUM CONTENT STAYS HIDDEN ELSEWHERE

It's worth asking: why don't you see premium reports and full articles in your usual searches? There are plenty of reasons. Paywalls are there to protect revenue. Licensing agreements lock down who can show full content. Publishers deliberately block crawlers to keep their content on their own sites.

In other words, it's not that the information doesn't exist; it's that you're not supposed to see it without paying. Comet Plus, instead of sneaking around those rules, signs contracts and cuts cheques. That's why it can give you access where others can't.

THE BIGGER PICTURE: A MORE PURPOSEFUL WEB

It's tempting to think of this as just a "browser feature," but there's more at stake here. It's about what kind of internet we want. Are you okay with a web where your attention is monetised with ads, and where credible information is harder to get than clickbait? Or would you rather have a space where depth and trust are the default, and the people who create that content are actually rewarded?

Comet Plus feels like a small but significant shift toward the latter. For curious minds, it means faster access to depth. For publishers, it means revenue that keeps good journalism alive. And for everyone else, it's a glimpse of what browsing could look like if the economics and the technology lined up differently.

It's not perfect, of course. But it is a bold statement: that browsers don't have to be passive windows. They can be partners in the way we learn, research, and think.

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AWS Hosts India Storage & Data Resiliency Day 2025: Building Resilient, Scalable Data Futures

AWS India Storage & Data Resiliency Day 2025 brought leaders together to share strategies on cloud modernisation, compliance, and cyber resilience for enterprises.

By Shrikanth G

AWS India Storage & Data Resiliency Day 2025 united IT leaders to explore cloud storage, backup, cyber resilience, and data modernisation powering India's digital future. The event was hosted by CyberMedia's flagship publciation, Dataquest, in partnership with AWS, recently in Bengaluru, brought together technology leaders, innovators, and enterprise practitioners to address the future of data. From cloud storage modernisation to compliance under DPDPA, from ransomware recovery to AI-driven data platforms, the one-day conclave was a deep dive into how Indian organisations can secure, scale, and future-proof their digital core.

> Resiliency is the new enterprise currency—without it, innovation and compliance cannot scale in an always-on digital economy.

A DAY DEDICATED TO THE FUTURE OF DATA

As India's enterprises accelerate their digital journeys, the twin imperatives of data resilience and cyber security are reshaping IT strategies. Traditional storage and backup systems are proving inadequate against the scale of modern workloads, the demands of GenAI, and the sophistication of cyberattacks. It was against this backdrop that CyberMedia and AWS convened senior IT leaders, cloud architects, and industry visionaries for the India Storage & Data Resiliency Day 2025—a customer-focused platform to exchange ideas, share innovations, and reimagine what secure, scalable, cloud-first data architectures look like in practice.

The event opened with a welcome address by Biswajit Das, Head – Data & AI, AWS India, who reminded the audience that data is the lifeblood of enterprises. He underlined AWS's commitment to helping Indian organisations modernise their storage infrastructure while embedding resilience at the heart of their operations.

FROM BYTES TO BRILLIANCE: AWS STORAGE AS THE FOUNDATION

The first deep-dive session, From Bytes to Brilliance, set the stage with Marc Trimuschat, Worldwide Director – Storage and Data Protection, AWS, who described how Amazon S3 has evolved into the foundation of modern data strategies. From simple object storage to powering AI/ML, analytics, and external data marketplaces, S3 today drives performance, cost efficiency, and governance at scale.

Adding to this, Hiren Chandiramani, Principal Go-To-Market Specialist Storage, AWS, explored how AWS storage solutions help enterprises scale seamlessly, secure workloads, and drive innovation, embedding resilience across digital-first enterprises.

WHEN CHAOS STRIKES: RESILIENCY IN ACTION WITH COMMVAULT

With ransomware becoming one of the most pressing business continuity issues, the session When Chaos Strikes, Be Ready struck a strong chord.

> From ransomware defense to AI-ready storage, every conversation today reinforced a single truth: resilience must be baked into every layer of the enterprise IT stack.

Balaji Rao, Area VP – India & SAARC, Commvault, and Woon Ho Jung, CTO – Cloud Native, Commvault (Co-founder of Clumio) showcased how the combined strengths of Commvault and AWS deliver advanced resiliency. Their focus on air-gapping, clean rooms, and rollback capabilities demonstrated how organisations can withstand disruption while keeping mission-critical operations running.

VOICE OF THE CUSTOMER: DATA AT SCALE

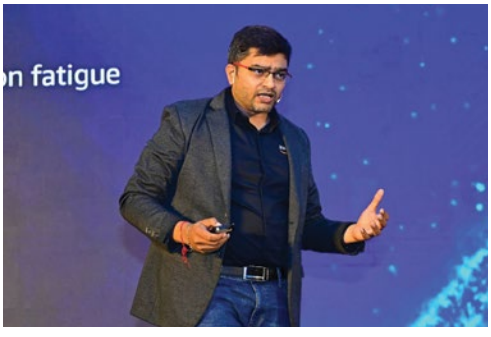
Scalability took the spotlight in the Voice of Customer session with Sandeep A., Solutions Architect, AWS India, and Rajath Gowda, Founding Engineer – Data Engineering, e6data. Together, they demonstrated how enterprises can unlock the full potential of Amazon S3 with e6data's high-performance lakehouse engine, enabling faster queries, smarter insights, and more resilient data platforms. For industries reliant on real-time analytics, this session offered a glimpse into how performance and resilience can go hand in hand.

ACCELERATING CLOUD JOURNEYS: AWS AND NETAPP

Modernisation is not just about moving workloads—it is about migrating them with confidence. The session Accelerate Your Cloud Journey featured Christian Smith, Worldwide Cloud Storage & Data Migration Leader, AWS, Puneet Gupta, MD & VP, NetApp, and Robbie Cameron, FSxN Specialists APAC, NetApp, who explained how Amazon FSx for NetApp ONTAP bridges enterprise-grade storage with cloud elasticity. Their discussion showed how enterprises can modernise without compromise, combining resiliency and performance at scale.

NAVIGATING DPDPA: FROM COMPLIANCE TO TRUST

India's new Digital Personal Data Protection Act (DPDPA) framed one of the day's most engaging panels. Lalit Kumar (AWS India), Maheswaran S. (Varonis), Kuldeep T. (Games24x7), and Hemanth Kumar Mangalore (Angel One) spoke about moving beyond tick-box compliance to building privacy-first innovation. Their message was clear: embedding



> India's digital future hinges on resilient data foundations—scalable, secure, and cloud-first architectures that empower innovation without compromise.

privacy into digital transformation is not just about regulation—it is about customer trust, competitive advantage, and long-term resilience.

BUSINESS CONTINUITY AND ZERO-TRUST SECURITY

Keeping mission-critical workloads always-on was the focus of Sachin Bawse, AWS India, who shared practical strategies for migration, disaster recovery, and IT resiliency. Building on this, Sabith Venkit, Sr. Worldwide Specialist SA Storage, AWS, introduced the audience to Zero-Trust backup frameworks using AWS RAM and Multiple-Principal Access (MPA). These tools, he explained, empower enterprises to ensure cross-account protection and compliance in the face of modern threats.

BANKING ON DATA: REINVENTING FINANCIAL SERVICES

Financial services are among the most data-intensive industries, and Pritish Mhatre, Head – Data & Analytics, AWS India & South Asia, highlighted how data modernisation is driving efficiency, compliance, and customer-centric innovation in Indian banking. His keynote line, "Data is the genesis for innovation", captured the essence of how banks must leverage modern platforms to compete and thrive in a digital-first economy.

DEFENSE-IN-DEPTH: SECURITY WITHOUT GAPS

Security cannot be a single line of defense in the cloud. Tejas Sheth, Sr. Security Specialist Solutions Architect, AWS, presented a comprehensive framework for Defense-in-Depth, highlighting the importance of layered, adaptive, and proactive protection. He detailed how preventive controls, advanced detection, and automated remediation ensure that enterprises remain secure even as threats evolve.

CLOSING KEYNOTE: STORAGE INNOVATION WITH AWS MAP

The day concluded with Tanmay Dubbey, India Storage Service Lead, AWS, who spotlighted the AWS Migration Acceleration Program (MAP). He explained how the three-step journey—Assess, Mobilise, and Migrate & Modernise—helps enterprises accelerate their move to the cloud with confidence. He also previewed OLA Assessments, showing how agentless storage evaluations and automated data collection can deliver major cost savings and make migration simpler than ever.

A BLUEPRINT FOR THE FUTURE

Across the day's sessions, a consistent theme emerged: resiliency is the new enterprise currency. Whether it was securing against ransomware, embedding privacy-first frameworks, or modernising with AI-ready storage, the conversations reinforced that resilience must be baked into every layer of the enterprise IT stack.

India Storage & Data Resiliency Day 2025 was more than a technology showcase. It was a collaborative platform where AWS and its partners—Commvault, NetApp, e6data, Varonis, and more—outlined a roadmap for Indian enterprises to secure, scale, and innovate in an always-on digital future.

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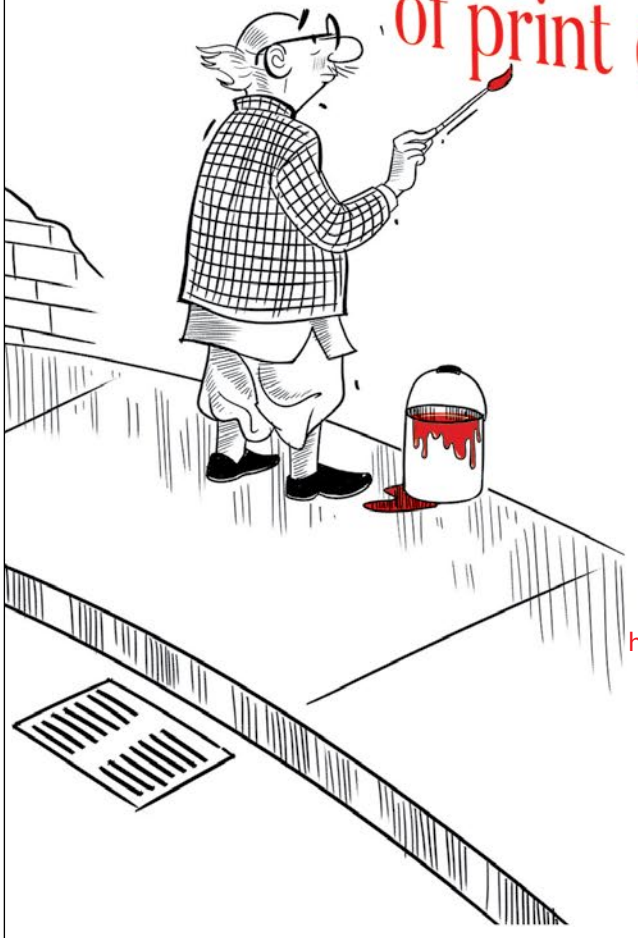

That's the power of print. In addition to 70% higher recall, according to neuroscience research it's proven that print content is 21% easier to understand and more memorable than digital media. That is why, print content connects with our brain more efficiently and effectively. So, choose to read newspapers.

Source: Study by TrueImpact (A Canadian neuromarketing firm)

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