THE NEXT BIG THINGS IN DEEPTECH

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ROCKET BOYS

In end-May, Srinath Ravichandran (right) and Moin SPM led Agnikul Cosmos to the successful launch of India's first 3D-printed rocket engine. The next goal: To go into orbit

PLUS
Digantara:
The Space Sentinel

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The space race is hotting up in India, with a bunch of entrepreneurs eyeing the final frontier

Space is the Place

Perhaps one feature that fell through the cracks in our recent edition on luxury tourism was space travel. You'd be tempted to ask, 'But which Indian operator offers this?' to which the simple answer would be that borders are hardly enough to rein in India's superrich space enthusiasts. In May, 30-year-old India-born aviator and entrepreneur Gopi Thotakura became part of a global elite set of space tourists on Jeff Bezos-owned Blue Origin's rocket called New Shepard.

Orbital and lunar space tourism—missions that orbit the Earth, and the moon and which may eventually even land on it—are still a work in progress. What's on offer now are suborbital trips to the edge of space from providers like Richard Branson's Virgin Galactic and Blue Origin.

In April, the United States' Space Exploration and Research Agency (Sera), which was founded to build a global community dedicated to space exploration, announced a partnership with Blue Origin for a spaceflight programme for citizens of nations that lack space access. Sera's website points out that over 80 percent of all astronauts have come from just three nations.

Meanwhile, pushing the envelope to the limit is Elon Musk, whose vision is to make humans an interplanetary species by taking them to Mars. Starship, a reusable rocket ship, is an orbital-class vehicle being built to do longer trips, like to the moon and back and, eventually, to the Red Planet. In early June, on its fourth test flight into space, Starship returned successfully to Earth; Musk has hinted of a fifth sojourn in late July.

Tourism would be the fun part—at least to the layman and potential plush passenger—but there are many more deeptech private sector ventures taking shape in areas like communications, remote sensing and navigation. All this activity translates into a rapidly burgeoning space economy which McKinsey estimated a year ago is resulting in "nearly 7,500 active satellites" orbiting Earth and about "50 on average taking to the skies every week"; many of these operate as part of multi-satellite constellations serving commercial applications.

As spacetech evolves rapidly and costs drop, a rash of startups has joined the race to innovate in a wide range of areas. These go beyond launching spacecraft and satellites to actually creating an ecosystem that includes collision avoidance technologies, satellite refuelling stations and telecom systems for small satellites.

In India, a bunch of entrepreneurs are eyeing the final frontier. On the cover are Srinath Ravichandran and Moin SPM, co-founders of aerospace startup Agnikul Cosmos, which in end-May successfully launched India's first 3D-printed rocket engine.

In this deeptech special, Forbes India's Technology & Innovation Editor Harichandan Arakali identifies seven startups in this nascent sector that have the promise to achieve size and scale in a decade or so. Agnikul is one of them, and another is Digantara, which is building data-led infrastructure to make space operations safer.

Arakali points that these early ventures have already overcome phenomenal odds in developing products that are almost ready for the market. However, the road ahead will present a fresh set of challenges on the execution, commercialisation and fundraising fronts.

Arakali also spoke to Rajan Anandan, MD at Peak XV, who leads the firm's Surge programme for early and seed investments. Anandan's investments include innovations in semiconductors, green hydrogen and spacetech. He reckons that deregulation of the space sector was a "real game-changer. This policy shift opened the door for private enterprises..." Read more about these enterprises in the deeptech package that begins on page 20.

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STORIES TO LOOK OUT FOR





Moin SPM (left) and Srinath Ravichandran, co-founders of aerospace startup Agnikul Cosmos; (from left) Tanveer Ahmed, Rahul Rawat and Anirudh Sharma, co-founders of Digantara



Brian Carvalho
Editor, *Forbes India*

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Best,

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ON THE COVER



Moin SPM (left), co-founder & COO, and Srinath Ravichandran, co-founder & CEO, Agnikul

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AGNIKUL: SKY'S NOT THE LIMIT

Srinath Ravichandran and Moin SPM are a step closer to their dream of building a private space exploration company from India

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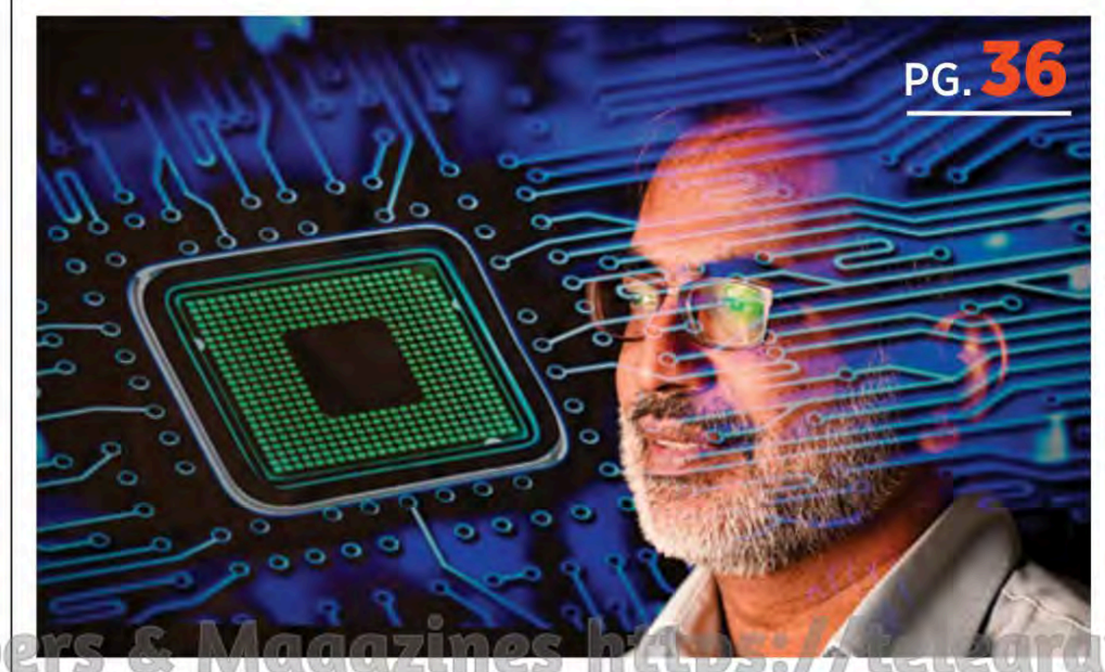
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GS Madhusudan, founder of InCore Semiconductors



The Aerostrovilos Energy team: (From left) Rohit Grover, Pradeep Thangappan, and Satyanarayanan Chakravarthy

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(From left) Yashas Karanam, and Rohan Ganapathy, co-founders of Bellatrix Aerospace



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ECONOMY

FM's Budget Focus

Fiscal consolidation has improved as has capex push, but the government needs to balance financial aid for allies with meeting fiscal deficit targets

AS THE BJP-LED NDA TRIES TO fulfill its mandate after winning the general elections, the focus is on how Minister of Finance (FM) Nirmala Sitharaman will, in the Union Budget, balance sustained economic growth with arresting fiscal deficit and boosting jobs and rural demand.

Although India's pace of growth is 8.2 percent for FY24, unemployment is rising and private final consumption (PFCE) expenditure is at a multi-year-low. An erratic monsoon in 2024 could threaten crop sowing and output.

Sitharaman, in her second full term as FM, besides providing the impetus to capital expenditure, will try to boost manufacturing jobs, rural demand and income generation to help improve PFCE.

Much of the focus will shift to government-led capital expenditure, which the BJP has been driving, to ensure that corporate India increases its hiring to build roads, railways, ports, telecom, aviation and construction activity.

Sitharaman is likely to present the budget in July-end.

"As the government will now have to take allies on board for major decisions, there will be some differences from the previous terms. However, we do not expect deviation

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Finance minister Nirmala Sitharaman is expected to focus on boosting manufacturing jobs, income generation and consumption demand, in the upcoming budget

SANJEEV VERMA/HINDUSTAN TIMES VIA GETTY IMAGES

from the stated fiscal deficit target for FY25," says Anubhuti Sahay, head, South Asia Economics Research (India), at Standard Chartered Bank. Fiscal prudence, job creation and managing inflation have been issues the government has discussed with economists in pre-budget consultations.

A major comforting factor for the government will be the Reserve Bank of India's (RBI) record dividend transfer of ₹2.11 lakh crore to the central government, approved by its board in May. Sahay says the transfer—emerging as surplus revenues of 0.2-0.3 percent of GDP—"is likely to offset any higher government spending on, say, rural areas [such as farmer income schemes] or financial assistance to the states of alliance parties."

Sitharaman hopes to retain the fiscal deficit target for FY25 at 5.1 percent of GDP, as announced in February's interim budget.

REPORT CARD: SCORING WELL

Voters, the media and psephologists have debated on how the Modi-led government fared during the previous two terms and what led to the weaker-than-expected performance of the BJP. Economists we spoke to suggest the government and Sitharaman have fared well in both managing the fiscal deficit and widening the tax net and collections at large. These areas will remain in focus, with the Goods and Services Tax (GST) Council aiming to continue with tax reforms, which could include waiver of interest or penalties on tax notices between 2017 and 2020 and a monetary limit to pursue disputes at the GST Appellate Tribunal.

There is clearly unfinished agenda in the form of boosting employment, providing incentives to production-linked incentives (PLI) schemes and taking a decision on whether it needs to sell its stake in profitable government-owned undertakings, to ensure divestment and privatisation.

"There has been a massive clean-up in terms of financial health of banks and tax collection efficiency," an investment banker tells *Forbes India* on condition of anonymity. GST collections, which for months ranged between ₹70,000-80,000 crore, crossed the ₹2 lakh crore mark in April.

A snapshot of BJP's report card

ACCOMPLISHMENTS

The BJP government scores heavily in maintaining fiscal prudence; the fiscal deficit as a percentage of GDP continues to improve, particularly in recent years

Improved tax collections became a huge trump card for the BJP's pre-election campaigns, with direct tax collections rising to ₹19.58 lakh crore in FY24 compared to ₹9.45 lakh crore in FY21

GST collections have continued to soar in recent years: In May 2024, GST collections stood at ₹1.72 lakh crore from ₹70,391 crore in May 2021

Budgeted capital expenditure of the Modi government continues to rise—to a proposed ₹11.11 lakh crore for FY25 from ₹5.92 lakh crore for FY22

Data: GST Council, Controller General of Accounts, RBI, Indian budget documents

CONCERNS

Job creation, underemployment, lack of job security and income generation have all impacted private consumption demand, which is at a multi-year low. The government needs to bring in stronger policies to ensure secure jobs, maybe with assistance from the private sector

The share of manufacturing in GDP needs to pick up further, it has been rangebound for years. Creation of jobs and incentives to production-linked incentive (PLI) schemes is a must

Of the 14 PLI schemes announced, only a handful (including the mobile manufacturing and specified electronic components), have emerged as successful, led by more investments. **The government needs to incentivise the other schemes or introduce new ones**

India needs to go back to the drawing board for its privatisation/divestment plan--**having missed targets for five successive years.** It needs to re-assess whether a moderate target needs to be set for FY25 and beyond or it needs to sell stakes in not-too-profitable PSUs

Data: CMIE, Trading Economics

SOURCE Forbes India

"The finance minister has done a commendable job both in consolidating the fiscal deficit and ensuring a better quality of fiscal consolidation. The expenditure mix is better with rising share of capex versus revenue expenditure, and subsidies are better targeted. The rising tax-to-GDP ratio, driven by better compliance, better integration of GST is also notable," she said.

Economic activity slowed down in May, with the Jefferies Economic Indicator down by 0.55 percentage points month-on-month, at 5.2 percent year-on-year. Markets turned volatile in early June when election results turned out to be different from exit polls, but have recovered since. The BSE Sensex has recovered 7.5 percent from a low of 72,079 on June 3 to touch a record close of 77,478 points on June 20.

CAPEX, MANUFACTURING PUSH, PLI INCENTIVES

Nomura economists Sonal Varma and Aurodeep Nandi wrote, in a note to clients on June 5, the recent election outcome "could result in some reorientation of spending towards revex [revenue expenditure] from capex". But they do not foresee "a dismissal of macro prudence". "We do not expect any slip of the interim budget target of 5.1 percent of GDP, but if the government deems reflationary policies as a political necessity, then that could mean slower consolidation," they wrote.

Sakshi Gupta, principal economist with HDFC Bank agrees that Sitharaman will "continue with the roadmap they have for fiscal consolidation". Earlier, after the RBI dividend was announced, economists thought the government could have some space to be more aggressive (towards fiscal consolidation). But having indicated that they would like to retain the fiscal deficit estimate at 5.1 percent of GDP and use the fiscal elbow room they have—due to the RBI dividend—they could allocate resources to certain welfare schemes.

INFOGRAPHICS: MUKESH SINGH

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This means the outlay towards housing, water, sanitation and health care is likely to be increased. It is most likely that the government "could use resources to divert funds towards the PM-Kisan or MGNREGA schemes. The government could continue their focus towards addressing some of the structural issues and announcing reforms that are more pro-cyclical in nature," says Gupta.

Rajasthan's apex industry body, the PHD Chamber of Commerce and Industry, in a pre-budget discussion with Sitharaman on June 20, identified key reforms that need to be introduced. These include enhancing the manufacturing share in GDP to 25 percent by 2030, expanding PLI schemes beyond 14 sectors by adding labour-intensive sectors, change in classification norms of MSMEs for non-performing assets from the 90-day limit to 180 days, and rationalising direct taxes for the middle class.

"A host of actions and measures will be required to increase the share of manufacturing to GDP to employ a younger population. India needs to add 10-12 million jobs a year," Sahay says. "The success of the PLI scheme for, say, mobile phones is encouraging. But it needs to be streamlined for other sectors to attract more investments. Non fiscal measures like easing the process of doing business will be important to further boost manufacturing."

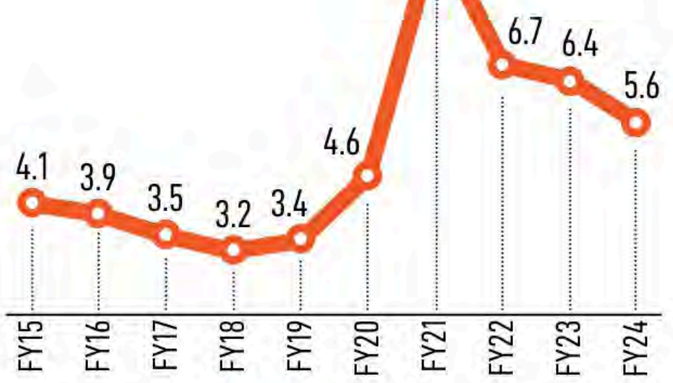
The murmur from industry bodies to expand the scope and base of PLI schemes is getting louder. So far, incentives worth ₹6,800 crore were disbursed among eligible beneficiaries in FY24, according to data from the Department for Promotion of Industry and Internal Trade (DPIIT).

The government needs to spend more on vocational training and skilling to make youth employable. "Only 4-5 percent of our labour force has formal vocational training, versus 50-70 percent in other countries," Sahay says.

Despite promises and efforts such as 'Make in India' and several PLI schemes, data shows that the manufacturing sector's share in India's GDP has been between 13 and 17 percent for years. Governments have been unable to improve the situation, which according to Dr Himanshu, associate professor at Jawaharlal Nehru University, suggests a "gradual de-industrialisation of India's economy, which will have implications not just for output growth, but also employment and income growth".

India's unemployment rate in FY24

Unemployment rate (in %)



SOURCE CMIE, media reports

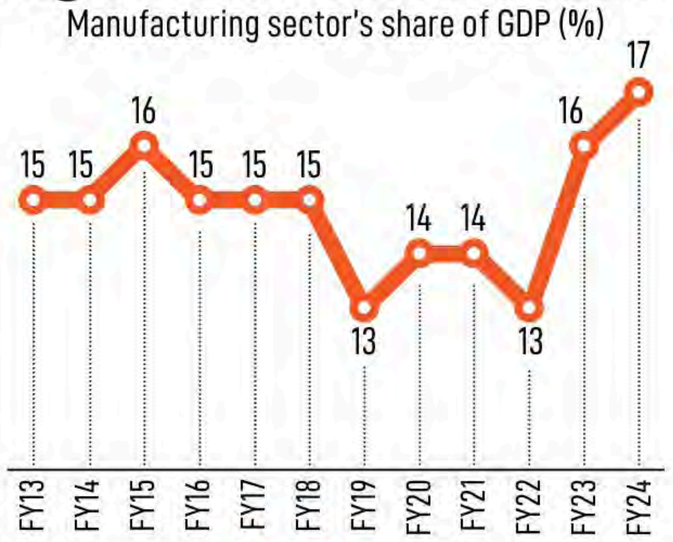
Fiscal deficit as a percentage of GDP

Fiscal deficit as a % of GDP

SOURCE Controller General of Accounts
Figs: Budget estimates

Stagnating manufacturing sector's share of GDP

Manufacturing sector's share of GDP (%)



SOURCE Statista, Trading Economics

THE BUGBEARS

Even as most economists expect policy continuity in the NDA's third term, there are concerns that need to be resolved. Sahay says there needs to be clarity on "the size and timeline of disbursement of financial assistance to states of allies' parties". There should also be clarity on how the government plans to reach the fiscal deficit target of 3-3.5 percent of GDP in the medium term without compromising on capex.

For long, several governments have failed to complete reforms in the agriculture, land and labour sectors during each term. Economists say agri output over last 2-3 cropping cycles has weighed on demand. Around 65 percent of India's population is rural; 45 percent of the labour force is dependent on agriculture, while 37 percent of income for a rural agricultural household comes from sale of agricultural produce, Sahay says. "Unless we drive agri reform and get export competitiveness up, job creation in the manufacturing sector is not going to be possible," she adds.

How much does Sitharaman choose to discuss divestment/privatisation and asset monetisation of PSUs is anybody's guess. Experts believe that as long as fiscal deficit is being reigned in and government spending is not sacrificed, this part of the piece could well not be a priority for the government, for the near term.

The government has done much of the hard work in the second term. Now Sitharaman will continue on the path to gradual fiscal consolidation, while pushing for manufacturing jobs and widening the tax net.

• SALIL PANCHAL

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The total amount raised by eight NGOs listed on the Social Stock Exchange



SHUTTERSTOCK

DOING GOOD

Swades Foundation Files Draft Prospectus at SSE

The issue size of ₹10 crore is said to be the highest by any non-profit so far on the National Stock Exchange's Social Stock Exchange

SWADES FOUNDATION, founded by Zarina and Ronnie Screwvala, has filed a fundraising draft at the Social Stock Exchange (SSE) to raise ₹10 crore. The philanthropic non-profit that works on rural development and poverty alleviation has claimed that it is the highest issue size so far by an NGO at the National Stock Exchange (NSE)'s SSE segment, and it is expected to list in July.

Screwvala, in an interaction with *Forbes India*, says the SSE institutionalises giving back, and lends a stamp of credibility to non-profits to raise funds and be accountable for how they are used and the impact they create.

Non-profits listed on the SSE will raise funds through zero coupon zero principal (ZCZP) bonds, which is essentially a donation certificate. It is meant for investors looking to create social impact without seeking financial returns.

The minimum issue size on the SSE, which was ₹1 crore earlier, was reduced to ₹50 lakh by the regulator, Securities and Exchange Board of India (Sebi), in 2023, and the minimum application size was cut down from ₹2 lakh earlier to ₹10,000. The ZCZP bonds can be issued only for specific projects and diversification is not supported.

The investors in the SSE can be everyday retail investors, as well as philanthropists who want to make larger donations. Sebi has sent a proposal to the government to amend corporate social responsibility (CSR) rules in the Companies Act, 2013, to include donations made by companies through SSEs, *Livemint* has reported.



Zarina Screwvala (in pink kurta) and Ronnie Screwvala (in blue T-shirt) at a community meeting in a village near Nashik where they work with the community

Currently, companies can donate to the social sector off-market through their CSR initiatives. *Forbes India* had reported in July 2023 that CSR was being kept out of the SSE ambit as a measure to prevent a possible cannibalisation of existing funding routes to non-profits.

The SSE at the National Stock Exchange, which listed its first non-profits in December 2023, has since seen eight NGOs (excluding Swades) make their listing debut. These have collectively raised more than ₹11 crore, says a *Fortune* report dated June 14.

Swades will raise funds via the SSE for projects in three specific areas of sanitation, livelihoods (through livestock rearing and skilling), and education (through scholarships), says Screwvala, who runs edtech venture upGrad and production company RSVP Movies.

Forbes India had reported in March that the non-profit, which operates in Nashik and Raigad districts in Maharashtra, is exploring various sources of fundraising for geographical expansion. Swades, earlier known as Society to Heal, Aid, Restore and Educate (SHARE) and in operation since 1983, was renamed in 2013. It works with rural communities towards poverty alleviation, livelihoods and empowerment. In the last decade, it has impacted about three quarters of a million people across villages in these two districts, the Screwvalas had told *Forbes India*.

• DIVYA SHEKHAR

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INTERVIEW

‘India is a Factory For The Future’

Dassault Systèmes CEO Pascal Daloz on creating three new universes, India as an innovation hub, deploying ‘costly’ AI for the right use-cases, and more

PASCAL DALOZ, WHO TOOK over as CEO of Dassault Systèmes in January after Bernard Charlès stepped down, takes pride in calling the company a “catalyst for human progress”. It creates virtual twin experiences of the real world with their 3DEXPERIENCE platform and application.

Virtual twins are digital representations or twins of a real-world product, process or system in structure, context and behaviour. These can generatively design and manage entire product lifecycles, from past to future, enabling data and decision continuity.

Dassault Systèmes has been present in India since 2007. “When we launched our India operations, it was a way for us to access qualified talent at a lower cost. That is not the case anymore. We are now looking at India as an innovation hub,” says Daloz. In India, it has clients such as Havells, L&T Energy-Hydrocarbon, Dixon Technologies, Tata Consultancy Services and more.

With a focus on manufacturing, life sciences and infrastructure, the company is present in over 150 countries, with more than 350,000 customers. Globally, the company’s annual revenue for 2023 was $6.44 billion. Life sciences has been a growth driver for Dassault. “About seven years back, the sector was only 5 percent of our total revenue. Today it is 25 percent, almost equal to the auto sector,” says Daloz. For life sciences, it serves customers such as Sanofi Vaccines and Lambda Therapeutics, among others.

During his first visit to India, Daloz spoke exclusively with *Forbes India* about the country becoming a major revenue contributor to the global business, focus on generative AI and more. Edited excerpts:

Q What are some strategic changes that you are looking to bring about?

I have defined the next vision for the company, up until 2040. The idea is to create an equivalent of three Dassault Systèmes universes: Manufacturing industries; life sciences and city and infrastructure. Now, to do so, the virtual twin concept isn’t enough. In the next 20 years, the concept would have evolved to how these different twins are connecting with each other. For



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$6.44 bln

Dassault Systèmes's annual revenue for 2023



AFP

instance, a manufacturing company will be connecting the twin of the product with the twin of the plant.

Going forward, our vision is to connect these three universes. Now to make this happen, we will need to move to the cloud. This will help connect the virtual and real, hence not only deliver services in a different way, but also collect the data.

Q How significant is the Indian market for you? And what is the potential for growth here?

India is one of our growing markets... we are growing double digit year-on-year, and that momentum is going to continue for some time. The target for the India business is to touch $1 billion in revenue by 2030. It is also extremely strategic for us from a capacity standpoint, since we have almost 25 percent of our workforce sitting out of India, and we operate in close to 140 countries.

While India has the right talent, the infrastructure is not there yet. We can contribute in transforming the Indian economy by investing in the right infrastructure that will not only serve the Indian market but also the world.

Even from a geopolitical perspective, it is a little tricky as a global company to serve the US and China. To an extent, we do not have this constraint with India. So, we believe India has a lot more potential for growth.



Pascal Daloz, CEO, Dassault Systèmes, says they are now lookng at India as an innovation hub

Q What are some of the largest revenue drivers for the India business?

The transportation and mobility sector is leading the pack, followed by industrial equipment. But we feel there is a lot of potential to grow in life sciences. We have a massive footprint outside India already. All energy sectors, including renewable energy, can be scaled up immensely.

Building a virtual twin of a city can help in designing the city better

Q And to what extent are you working with governments?

We are working with them in three areas. The first is skill development. The state governments are looking to build a strong workforce for the future. They are looking at how we can bring in the virtual world in giving certain domain expertise.

Second, we are helping various state governments with project management systems. There is a lot of activity happening around infrastructure development. There is a need on how they can access a single dashboard to look at the project's process—integration of all vendors, timeline etc.

Lastly, building on virtual twins of cities. This helps in the engineering element to understand the impact of building a certain flyover or how much energy can be generated by adding solar panels on each house. Building a virtual twin of a city can help in designing the city better.

Q What kind of innovation is being done with generative AI?

Currently, we are seeing a lot of generative AI around the consumer side, but when it comes to B2B, it is still emerging—that is a massive prospect for us. This is because there is more data coming from the industrial world than from the consumer. We have access to large sets of industrial data. That is why we have built an architecture where we can put all this data, and train our AI engines. That is a big differentiator for us.

Second, AI is costly. To run a prompt, it costs an average of 50 cents to more than $1. So, it is necessary to use this expensive technology for the right use-cases, otherwise you will destroy its value. One way to minimise cost is by making it hybrid. There is no need to treat everything with an AI-based approach. If you look worldwide, the only one making money with AI right now is NVIDIA. Because it has built the infrastructure for this. Modelling and simulation are much more affordable ways to do this.

Q What makes India a different market compared to the rest of the world?

It's an innovative country because you are managing the contradictions—to have to put everything at scale without having the resources to do it. You need to challenge the status quo, this in my view is the unique part of India. You call it 'Incredible India', for me, it's one of the places where imagination has no borders—I would say India is a factory for the future.

• NAINI THAKER

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TECHNOLOGY

Salesforce Launches Public Sector Division

At a recent event, the software giant also announced a platform to digitally approach consumer lending



Arundhati Bhattacharya, CEO and chairperson, Salesforce India

DURING ITS ANNUAL WORLD Tour Essentials Mumbai event on June 19, software giant Salesforce announced that India is expected to create 1.8 million jobs and $88.6 billion in new business revenue by 2028. It also announced the launch of its public sector division in India to cater to the government and public sector organisations. They also launched a digital lending solution to provide banks and lenders with a platform to digitally approach consumer lending. Salesforce in India has been growing 35 percent year-on-year across industries, as per the latest earning call announcing the FY24 results.

PUBLIC SECTOR DIVISION

Salesforce wasn't present in the public sector earlier, since many governments didn't have cloud policies. "But since then, people have realised that cloud is a safe venture, and there can be a lot of applications on the cloud," Arundhati Bhattacharya, CEO and chairperson, Salesforce India, said at the event. "In fact, a number of government applications, the India public stack, much of it sits on the cloud. So, to that extent, the public sector companies have become open to the solutions that we bring to the table."

The solutions within this division will be designed to help government agencies serve people faster. Generative AI could unlock a $1.75 trillion productivity opportunity annually across many functions and levels of government. "Building a 360-degree view of citizens to deliver services based on a unified data platform with trust at the core and deep industry expertise will unlock tremendous potential for government organisations," said Arun Kumar Parameswaran, managing director - sales & distribution, Salesforce India.

DIGITAL LENDING SOLUTION

This will provide banks and lenders with a platform to digitally approach consumer lending, while potentially reducing the cost and burden to maintain disconnected, outdated platforms. It will exclusively serve customers within India.

It will be a unified platform for intake, underwriter review, and pre-disbursement operations for applications for home, auto, and personal loans. It will ensure faster time-to-value and reduction in loan processing time. "Digital lending is reaching the hinterlands of Bharat, reshaping how borrowers access funds, making lending more convenient, efficient, and accessible than ever before," said Rajendra Bisht, VP—technology and digital, Bajaj Finance Limited Auto Finance.

JOB CREATION

The global leader in CRM also announced insights from an IDC study, which indicates that the Salesforce economy in India, led by AI, will create close to 11.6 million jobs globally, of which there will be 1.8 million new jobs in India. Currently in India, among the companies that use AI today, 79 percent use AI-powered CRM solutions and 80 percent use Enterprise AI software platforms. In the next 12 months, AI-powered cloud solutions are expected to impact organisations, with 58 percent citing increasing need for workforce AI skills. However, the biggest challenges of implementing AI-powered cloud solutions are: Trustworthiness or bias in data, lack of skilled employees, and AI governance and risk management.

• NAINI THAKER

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1974

Hello Kitty's debut year. Since then, she has been become synonymous with the Japanese 'Kawaii' culture



SHUTTERSTOCK

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Social media influencer Chixpudding at Hello Kitty's 50th anniversary event in London in January

POP CULTURE

Hello India, Says Hello Kitty

Sanrio has appointed Dream Theatre as its licensing agency in India to launch content, products and cafes based on the Japanese pop culture icon

HELLO KITTY, JAPAN'S BELOVED pop culture icon, turns 50 this year and debuts in India. Created to promote friendship, kindness and inclusivity, she has come to represent the Kawaii culture of all things cute and endearing. Sanrio, its parent company and owner of the intellectual property, has appointed India-based Dream Theatre, a licensing and merchandising agency that represents other cartoon characters such as Pokemon, Ninja Hattori and Little Singham. Hello Kitty is present in 130 countries, with a global valuation of $3.8 crore as of 2022. *Forbes India* spoke to Silvia Figini, CEO, Sanrio GmbH (EMEA, Oceania and India) and Mister Men Limited (worldwide), and Jiggy George, founder of Dream Theatre, about the collaboration.

Q What makes India an important market for Hello Kitty? Why did it take 50 years to enter India?

Silvia Figini (SF): Hello Kitty and Friends has been globally successful. It represents the Kawaii culture, which has also entered India. In many ways, it is connected to the manga world, which is a trend, even in India. We were waiting for the right time and investment to make the brand relevant with the right culture, and the right elements, to make it consistent with the Indian culture.

Q What kind of potential do you see for Hello Kitty in India?

Jiggy George (JG): It's a unique brand. I see many opportunities for it in India. First, is the brand perspective. The beauty of the brand is that it is always recognised. Second, it has a unique positioning for Kawaii, which started in the 1970s and is seen across categories such as food, architecture, make-up and cosmetics. And third, Sanrio, which started as a brand for girls, now transcends age.

Q What investments is Sanrio planning to establish Hello Kitty in India?

SF: The brand is recognisable here, but we want to give fresh content to reach all target audiences. We also need to be present on all platforms that are relevant for each target. Another important investment will be strong collaborations with Indian retailers and local licensees. India is a diverse market, so penetration is going to be complex. We are starting a Hindi YouTube channel, while our English channel will also be promoted. In 2025, we will start Telugu and Tamil channels. Our Instagram account will be ready soon. We have plans for Hello Kitty's 50th birthday, with events in India too.



Jiggy George (left) of Dream Theatre with Sanrio's Silvia Figini

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Q What kind of products can Indian consumers expect?

SF: We plan to offer all products, including toys, apparel and back-to-school items. We will have content with an Indian flavour, restaurants, cafes and entertainment centres. The character and personality won't change, but you might get more Indian colours and flavours.

Q What are the challenges that you foresee in India?

JG: One of the major challenges is licensing because it is an unorganised market and organised retail is just about growing. Fake or pirated products are a challenge as well, but we believe consumers will end up choosing the real thing.

SF: The Indian market is big, and changes from the north to the south. In two years, our goal is to be one of the most relevant brands in the marketplace.

• ANUBHUTI MATTA

INTERVIEW

‘Combine Physical and Digital Domains to Unlock Value’

Venkat Venkatraman, author and information systems professor, on how to leverage the power of real-time data and AI



VENKAT VENKATRAMAN IS THE David J McGrath Jr Professor in Information Systems at the Questrom School of Business, Boston University. He is also the co-author of *Fusion Strategy: How Real-Time Data and AI Will Power the Industrial Future*. He explains why industrials will need to combine what they do best with what digitals do best. Edited excerpts:

Q What are the fundamentals of fusion strategy? Why is it imperative to adopt it now?

The fundamentals of fusion strategy are that opportunities for value creation and capture lie at the intersection of physical and digital domains, hence the word ‘fusion’. Since the introduction of smartphones, we have digitised information-rich, asset-light products such as music, movies, advertising, financial services (payments), newspapers, etc. The next wave of digital shifts will be in asset-heavy, information-rich sectors such as transportation, agriculture, trucking and logistics, construction and buildings, healthcare, energy, etc.

Why now? Faster and cheaper computing makes sensors and software affordable at price points, making industrial products digital (fusion) products. Tesla is designed as a computer on wheels connected to the cloud with the functionality of over-the-air (OTA) software updates to improve the car’s performance long after it has been designed and delivered to individual drivers. Every automaker must develop a roadmap where their machines are designed to resemble computing architecture more than industrial combustion machines. The same logic can be extended to tractors (John Deere, Case IH, Mahindra). The next decade will see such shifts in many other areas, but companies must start now.

Q What do asset-heavy companies need to do differently in order to win?

Asset-heavy industrial companies must think beyond the attributes that made their products leaders in the analogue world. Reliability, quality, cost, and related attributes differentiated physical products (trucks, tractors, trains, aircraft, construction equipment, buildings). These are necessary today but insufficient; they are table stakes, not differentiators. They must think about products-in-use data and create the capability to understand how their products perform for individual customers.

Observing products in use across diverse conditions helps industrial companies to develop hyper-personalised recommendations based on collective learning. In the past, asset-heavy companies mastered their physical value chain—from inputs to processes to outputs—to lead. They must also master the data value chain from descriptive analysis (what happened) to diagnostic analysis (why did it happen) to predictive analysis (what could happen) to prescriptive analysis (what should be done). They can become fusion strategy leaders when they simultaneously integrate product value chain with data value chain.

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6.8%

India's GDP forecast for the current fiscal by S&P Global Ratings. The RBI has projected growth at 7.2 percent



AFP

Q Where will India be positioned in the fusion future?

India is on a trajectory to go from being the fifth-largest economy in the world today to becoming the third by 2030. I believe manufacturing's share of the country's GDP, roughly 17 percent, must increase to 25 percent or more. This should happen with advanced manufacturing practices that combine physical and digital infrastructure. India's manufacturing might have been stereotyped as "low cost, low quality, human-intensive". An oft-leveled criticism is that India produces thousands of engineering graduates and IT software professionals yearly who contribute to global firms. Still, it hasn't created significant industrial machinery and equipment breakthroughs.

India's manufacturing renaissance is right in front of leaders who would seize this moment to transform from its historical reliance on analogue infrastructure to becoming digital leaders. Many underlying pieces are already in place—for example, a renewed focus on 'Make in India', increased inflow of global financial capital into Indian companies, a vibrant startup ecosystem, including entrepreneurs and venture capitalists, and rapidly digitising infrastructure in payments, logistics, roadways, ports, rail, and airports.

"The role of corporate leaders (and policymakers) is to distinguish between zones of automation from zones of augmentation."

Q What are the attributes of a fusion leader?

A fusion leader sees value creation at the intersection of physical and digital domains, combines industrial engineering principles with the possibilities of information sciences, rejects past definitions of functional boundaries and accepts the fact that the future is not a linear extrapolation of the past.

I see a fusion leader as one who accepts that digital technology will unlock significant value trapped in analogue, siloed ways of working and is prepared to lay the foundation for an industrial company to become 'post-industrial' with digital technologies.

Q Augmented Intelligence versus artificial intelligence (AI)...

I believe that the role of corporate leaders (and policymakers) is to distinguish between zones of automation from zones of augmentation. Automation is where machines carry out activities with limited human oversight. Much of factory and knowledge work can be automated. Augmentation is where advanced computing machines do the 'heavy lifting', but humans make the final decision. Health care is a prime example of how physicians could be more effective with AI acting as intelligent interns, but the doctors still have the final say.

A successful company will have effectively identified the automation zone and rapidly adopted AI to manage those activities efficiently while freeing scarce human talent to work collaboratively with newer AI tools to unlock new value.

Q Three must-dos for organisations that embrace a fusion approach...

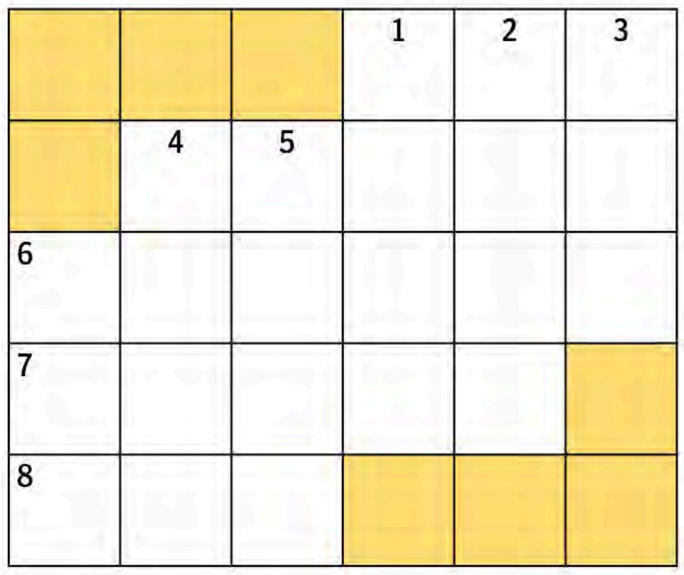
One, go beyond thinking about your products as designed and manufactured to understand how your products operate in customer locations in real-time. Two, think beyond narrowly defined functions. Where does R&D end, and where does digital begin? Where does marketing end, and where does analytics begin? Where does your firm end, and where do partners begin? Three, attract human talent fit for the fusion future.

• ANITHA MOOSATH

Forbes India Crossword No. 6

BY MANGESH GHOGRE

Solve a customised puzzle with each *Forbes India* issue that holds clues from the worlds of Indian business and culture, themed around this fortnight's magazine. This issue's theme, for instance, is deeptech science

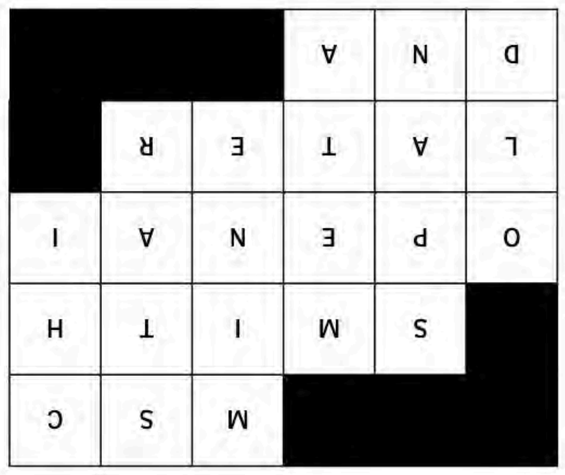


ACROSS

1. MA : Arts : ___ :: Science
4. Heavy metal fan?
6. AI-company whose logo is monkey's fist knot
7. "Until next time!"
8. Gene-editing tool CRISPR: Family of ___ sequences

DOWN

1. Make Bitcoin, say
2. ___ Trek: Inspo for many high-tech space gadgets
3. Ho _____ Minh: City in Vietnam
4. Word after time or attention
5. Facebook owner
6. How new technology starts to feel



Mangesh Ghogre is the first Indian to have constructed crosswords for The New York Times. *A Mumbai-bred investment banker, Ghogre recently moved to the US on an Einstein visa, acquired for his crossword skills. He will be making bespoke crossword puzzles for* Forbes India, *which can be solved in under five minutes.*

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INTERVIEW

‘More Jobs Can Be Created In The Green Energy Economy’

The World Economic Forum’s Espen Mehlum discusses the progress India has made in clean energy transition, and what more needs to be done



India ranks 63rd on the World Economic Forum’s report titled Fostering Effective Energy Transition 2024. It was 67th a year ago. On top is Sweden followed by Denmark and Finland

THE WORLD ECONOMIC FORUM (WEF) has released a report called Fostering Effective Energy Transition 2024, and the latest edition of the Energy Transition Index (ETI), which benchmarks 120 countries on the performance of their energy systems, in view of energy security, equity and sustainability.

India ranks 63rd on the index, up from 67 a year ago. On top is Sweden, followed by Denmark, Finland, Switzerland and France in the top five. China is ranked at number 17.

India is the fourth-largest renewables market in the world, with renewable energy and biomass comprising around 42 percent of its total power generation capacity. “With annual investments nearing $10 billion, India is driving the adoption of electric vehicles (EVs), and the production of green hydrogen,” says the report. “However, the significant dependence on coal in both China and India continues to be a major factor in their emission intensity.”

Espen Mehlum, head, energy transition intelligence and regional acceleration, Centre of Energy and Materials at the World Economic Forum, speaks to *Forbes India* about the factors that set India apart from other countries as far as clean energy transition is concerned. Excerpts:

Q India ranks 63rd out of 120 countries in the energy transition index. It was 67th last year. What kind of progress has India made in transitioning to clean energy over the past two years?

The Fostering Effective Energy Transition report is in its 14th year, and it benchmarks energy systems of 120 countries in a holistic way, of not only [energy] sustainability, but also equity, security and readiness for transition on 46 indicators. India is one of those countries that has made a lot of progress over those years. Some of the efforts that the country is doing will only show on the index in subsequent years. I have highlight a few: What’s been achieved on the universal access to electricity and the remarkable progress on access to clean cooking through the LPG network and direct support to households. It’s impressive also by international standards. Also leveraging some of these opportunities to create income for households and small businesses.

India has been quite successful, for instance, with the rooftop solar programme. Some of the more macro targets, like committing to net-zero by 2070, and coupling those concrete targets, like 500 GW of renewables capacity by 2030. The annual targets have been set for tendering 50 GW a year to get there. That’s been among the success factors for India so far.



Espen Mehlum, head, energy transition intelligence and regional acceleration, Centre of Energy and Materials at the World Economic Forum

Q The transition readiness score of India, which is the extent to which an enabling environment can be created for energy transition, is at 42.8. Is that a low score or a cause for concern?

ABHISHEK CHINNAPPA / GETTY IMAGES

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250 GW

India's peak electricity demand on May 30. The main causes for this are rising temperatures and heatwaves



SHUTTERSTOCK

So the enabling environment [score] is looking into different factors such as skills, policy environment, availability of capital, innovation, technology etc. In comparison to the advanced economies, there is room for improvement, but compared to where India was coming from, and some of the emerging and developing economies, this is a fairly good score.

The education system in India is supporting the potential growth as well of jobs in this area. There is more opportunity to create more jobs in the green energy economy, manufacturing etc. Attracting capital, not just domestically, but also internationally, is important. And the cost of capital available pays a role there. But in all, there's a steadily improving enabling environment to support the transition in India, both centrally, but also at the state level, because a lot of progress needs to happen at the state level as well.

WEF Energy Transition Index (ETI) 2024 TOP 10

India ranks 63rd in the Energy Transition Index (ETI) **with a score of 55.3**

The ETI benchmarks 120 countries on the performance of their energy systems, and their readiness for a clean energy transition, keeping in mind energy security, equity and sustainability

China is ranked 17th with a score of 64.1 and the US is ranked at 19 with a score of 64

Top 10 countries

Rank		ETI Score
1	Sweden	78.4
2	Denmark	75.2
3	Finland	74.5
4	Switzerland	73.4
5	France	71.1
6	Norway	69.9
7	Iceland	68.0
8	Austria	67.9
9	Estonia	67.8
10	Netherlands	66.7
63	India	55.3

The Top 10 countries account for only 1% of energy-related carbon dioxide emissions, 3% of total energy supply, 3% of energy demand, and 2% of the global population

Global average ETI scores increased by 6% since 2015, but has showed slower growth in the past three years

SOURCE Fostering Effective Energy Transition report, June 2024, World Economic Forum

Q Moody's Ratings estimated that India would need around $190 billion to $215 billion to build the 500 GW non-fossil fuel capacity by 2030. Will that be a challenge for India?

India has a strong economy and a fairly deep capital base. A lot can be done to also tap into the domestic capital base and using things like the bond market. We see that $1.2 trillion were invested last year in clean energy worldwide, but only 16 percent of that is going to emerging and developing economies. If you take China out of the equation... because China is the biggest investor. Among the emerging, developing economies, together with Brazil, India is also very successful.

There are two challenges for attracting more international capital: One, the cost of capital, and [two] the currency exchange risk that adds to the cost of capital. It's not only for India, but also for other economies. What will drive opportunities are the policies that are put in place so that it is attractive for companies to invest.

Q What would it take to decouple energy demand and GDP growth?

The world needs a double decoupling. The first decoupling is energy consumption from economic growth. The second decoupling is energy consumption from emissions. Right now, India has a fairly low energy consumption per capita, which, at 1.7 tonnes of carbon dioxide per capita, is 60 percent lower than the global average. There is, of course, the need to power the growth of the country, for which more energy will be needed. That's why coal capacity is relied upon to deliver the affordable energy that the country needs. At the same time, it is gearing up on renewables, biofuels, green hydrogen, electric mobility. It's important to be able to decouple future growth from energy consumption, because that will also make the country more energy independent and not rely too much on energy imports.

Q Are there factors that set India apart from other countries when it comes to its energy transition path?

Yes. There are similarities with other countries as well as far as the need to balance energy security, sustainability and equity. India and China are in a special position, with huge populations. A few things set India apart. One is the need to provide affordable access to everybody. Progress has been made in giving electricity access to everybody and clean cooking. Second is the huge labour force, which are looking for opportunities. The energy sector could be among those that can provide those opportunities, if the right policies are in place, along with business investors etc. Third, is the positioning of India in Asia. Asia is the fastest growing region worldwide, when it comes to economic growth, population growth and energy demand growth. A lot of countries are looking to India as a partner, be it on green hydrogen, or to learn from India's experience on how to solve clean cooking or electrification challenge.

• DIVYA SHEKHAR

INFOGRAPHICS: MUKESH SINGH

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On the Cusp of Commercialisation

India's deeptech sector is about a decade away from becoming mainstream, but several promising startups, from robotics to space exploration to biotech, are ready to do business

BY HARICHANDAN ARAKALI

Let's start with a quick update on some of the deeptech startups we featured in our special issue on the sector last year. In the last six months, at Ati Motors, which makes autonomous mobile robots for industrial applications, customers have begun to use the Bengaluru startup's products in every market the venture targeted, including the US, India and Southeast Asia.

"The US traction has especially been very good and we have succeeded in putting a team in place with an office in Detroit," CEO Saurabh Chandra says. The number of Ati's robots deployed has hit the 100-unit mark.

CynLr, another industrial robotics company out of Bengaluru, is running commercial pilots for its "general-purpose visual robotics solution", called CyRo, at General Motors and Denso.

"A pipeline of automotive original equipment manufacturers and Tier I vendors in the US, EU and Japan are evaluating the same for adoption," co-founder and CEO Nikhil Ramaswamy says. CynLr has also set up a subsidiary in Switzerland and expects to open an R&D lab there by September, and another in Michigan, US, by December.



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The Investment Report Card

Top 10 deeptech investments in India in 2023

	Funding Round	Funding Amount ($ mln)
Charge Zone	Series A	54
Sarvam AI	Series A	41
Log9 Materials	Series B	40
Pixxel	Series B	36
Battery Smart	Series A	33
Skyroot	Series B	27.5
AgniKul	Series B	26.7
Exponent Energy	Series B	26.4
SpotDraft	Series A	26
Lohum	Series B	23

Source: Tracxn

Top 10 deeptech investments in India in 2024

	Funding Round	Funding Amount ($ mln)
Battery Smart	Series B	65
Krutrim	Series A	50
Avail	Series A	43
IBC	Seed	35
Newspace Research and Technologies	Series B	33
Avail	Seed	27
Neysa	Seed	20
Charge Zone	Series A	19
Lohum	Series B	14.5
Attentive AI	Series A	7

Source: Tracxn

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Big Money

Funding received by deeptech sector in India in 2023 and so far in 2024

Total Funding ($ mln)

2023
740.1

2024
397.9

Total Number of Rounds

2023
206

2024
72

Eyestem, which is developing a treatment for the dry version of a condition called age-related macular degeneration, has been given a regulatory go-ahead for human trials. The life sciences startup, incubated at the Centre for Cellular and Molecular Platforms (C-CAMP), has teamed up with the LV Prasad Eye Institute to test its proprietary product, named Eyecyte RPE, to see if it can help replace lost or damaged retinal pigment epithelium cells.

"We want to reach a much larger patient base than most cell and gene therapies worldwide," Jogin Desai, founder and CEO of Eyestem, says. The aim is to use this cell therapy platform to develop products for large-scale availability, he says.

At Bellatrix Aerospace, founders Rohan Ganapathy and Yashas Karanam are transitioning their venture from a maker of in-space propulsion systems to a space taxi business for a variety of Indian and multinational customers. They're looking to raise more money, as they move to set up a bigger, state-of-the-art factory in Bengaluru.

These companies aren't outliers. India's deeptech startup sector, while nascent, is seeing several startups a hop, skip and jump away from commercialising their products. And influential decision-makers are taking notice—from experienced venture capital investors to government technocrats at the highest level.

"If you look at the top 50 deeptech companies in India across segments, I would say the technology is developed. There's no tech risk per se anymore," says Rajan Anandan, managing director at Peak XV—formerly Sequoia Capital's India and Southeast Asia unit—who leads the VC firm's deeptech efforts as well as its seed and early-stage programme, Surge. "What is now required is just scaling up commercialisation." And this is reflected in Peak XV's own portfolio startups as well, he says.

For example, at Ethereal Machines, founders Kaushik Mudda and Navin Jain are pioneering on-demand CNC "machining as a service" for multinational customers—out of a factory in Bengaluru (CNC stands for computer numerical control, a precision manufacturing technology).

Mudda and Jain, on June 13 announced raising $13 million in Series A funding, led by Peak XV and Steadview Capital, to build a much bigger plant and add more of the proprietary 5-axis machines they designed and developed in-house.

At Newtrace Energy, founders Prasanta Sarkar and Rochan Sinha have developed a proprietary membrane-less electrolyser to produce green hydrogen for industrial use. They can make about 20 of these in a year for now, each of 1 MW capacity, at a pilot plant in Bengaluru. They're working towards both ramping up sales of these products and building larger, 10 MW electrolysers.

As a nation, we also need to talk a lot more about the work our top deeptech-focussed academic institutions are doing so that a broader audience is aware of their efforts, says Arpit Agarwal, a partner at Blume Ventures, who leads the Bengaluru VC firm's deeptech investments. Such conversations will lead to a wider understanding of what it takes to translate technology from lab to market, he says.

Some of these institutions include the IIT-Madras Research Park, IIT-Bombay's Society for Innovation and Entrepreneurship, the Foundation for Science Innovation and Development (formerly the Society for Innovation and Development) at the Indian Institute of Science, the Venture Center in Pune, C-CAMP in Bengaluru, and in general the work done by the Department of Biotechnology's BIRAC (Biotechnology Industry Research Assistance Council).

Second, "very often, and I think we can't fault the businesses for this, there is a tendency for businesses to buy what is available cheapest and not necessarily where they are able to support local startups", Agarwal says.

A collective effort to make it easier for businesses to support local deeptech startups will also contribute to the development of the ecosystem. And finally, Agarwal would also like to see a greater proportion of graduates from science and engineering colleges joining deeptech startups. "When this happens, there is a full life cycle ahead of them," he says.

"Especially if there are academics or PhDs in science and deep science and deep technology, it's a great time to start up in India," Anandan says. "Our ecosystem is coming together and if you're Indian-origin academic anywhere in the world or you're a scientist (from India) anywhere in the world, come back to India and start up," he adds. "We're excited about what's going on here."

In the pages that follow, we bring you profiles of some of these startups that have overcome phenomenal challenges, and developed products that are almost ready for the market. Like Agnikul's rocket. From this point onwards, deeptech companies that are close-to-commercialisation will face more traditional challenges such as execution and fundraising because they'll need factories, Anandan says. However, if homegrown deeptech is to make a meaningful contribution to India's progress, he adds, "the thing is, we don't need just 50 companies. We need 5,000". F

“Unwavering support and guidance from Isro and IN-SPACe made a huge difference. Agnibaan SOrTeD is only the beginning.”

Moin SPM
Co-founder & COO, Agnikul

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PHOTOGRAPHS: MEXY XAVIER; DIGITAL IMAGING: KAPIL KASHYAP



AGNIKUL: Sky's not the Limit

Srinath Ravichandran and Moin SPM are a step closer to their dream of building a private space exploration company from India

BY HARICHANDAN ARAKALI

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Only a few days before Agnibaan lifted off flawlessly, on its first flight test, the launch had been called off at T minus 11 seconds. Shortly after that aborted event, Vishesh Rajaram, an early investor in Agnikul Cosmos, the company that made the rocket, found himself mulling over a throwaway comment from co-founder and CEO Srinath Ravichandran, whose face had betrayed nothing more than a smile.

“Come tomorrow, we’ll launch,” Ravichandran had said to him. And that was exactly what happened—only a few days later, of course.

Agnikul, a space launch vehicle startup in Chennai, on May 30, successfully tested its first technology demonstrator rocket that showed its one-piece 3D-printed engine worked as intended—on its first attempt. The test made history not

Agnikul Cosmos

FOUNDED: 2017, Chennai

FOUNDERS: Srinath Ravichandran, SPM Moin

CORE FOCUS: Space launch vehicles

FUNDING: **$67 million**

INVESTORS INCLUDE: Celesta Capital, Mayfield, Rocketship, Pi Ventures, Speciale Invest

TEAM: 200

PATH TO COMMERCIALISATION: First orbital flight planned within the next 18 months

Agnikul's Agnibaan Rocket: Some Tech Specs

Agnibaan

HEIGHT: 18m

DIAMETER: 1.3m

LIFTOFF MASS: 14,000kg

MAX PAYLOAD: 100kg (delivered to 700km low earth orbit)

PAYLOAD ENVELOPE: 2m x 1.5m (with the ability to accommodate one or multiple satellites)

FUEL: Liquid oxygen and refined kerosene (or aviation kerosene)



Stage 2

Powered by Agnikul's Agnite engine delivering 25kN of sea-level thrust

The electric pump fed Agnite engine can deliver up to 355 seconds of Isp in Vaccum (Isp is Specific Impulse—a measure of the rocket engine's efficiency)

Stage 1

Agnibaan's first stage is powered by seven Agnite engines

Using electric pump fed engines makes the stage simpler to design and the engine clustering architecture highly configurable

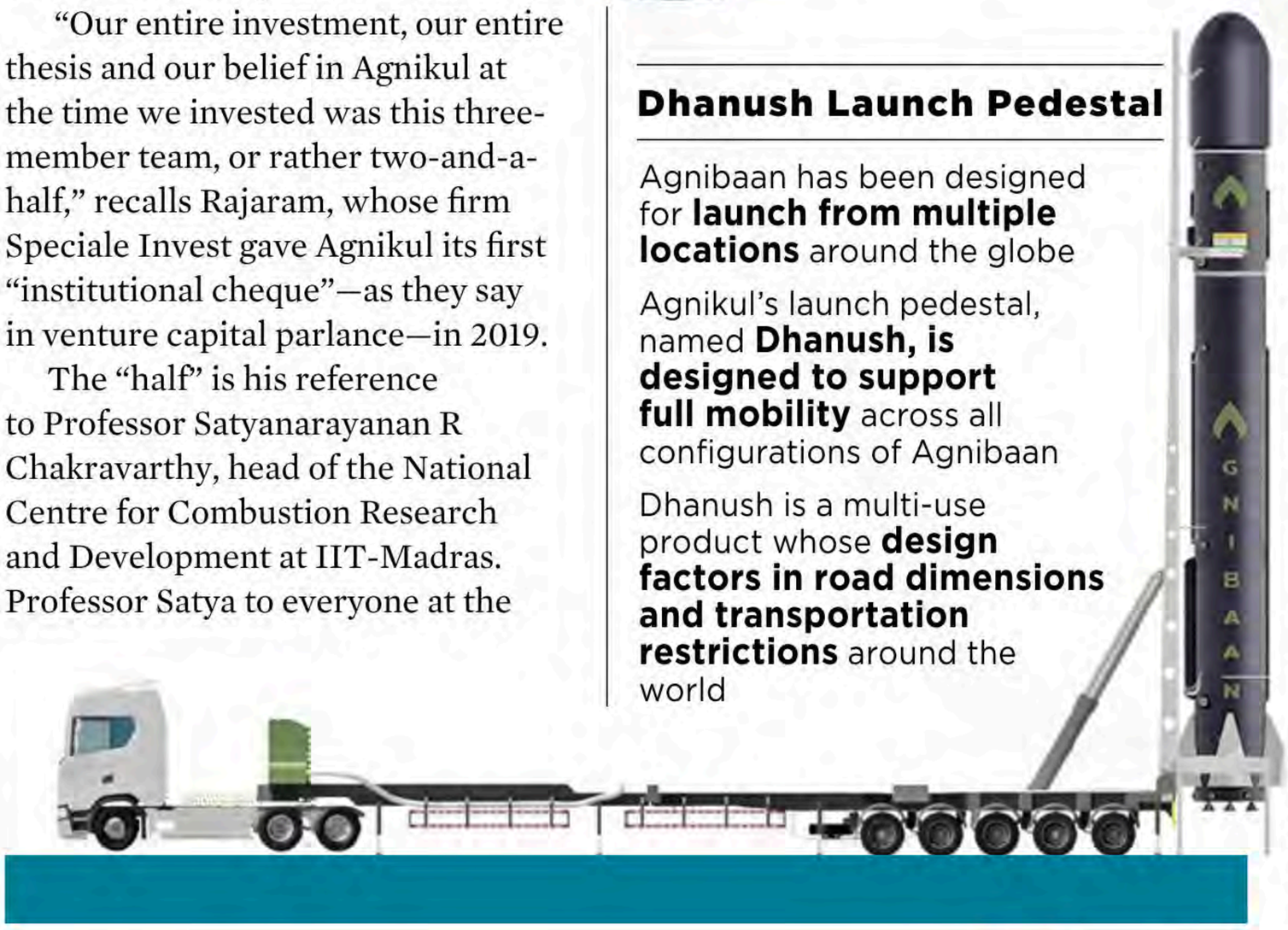
This stage delivers 285 seconds of Isp and the entire combustion section is a single piece 100 percent 3D printed

Dhanush Launch Pedestal

Agnibaan has been designed for **launch from multiple locations** around the globe

Agnikul's launch pedestal, named **Dhanush, is designed to support full mobility** across all configurations of Agnibaan

Dhanush is a multi-use product whose **design factors in road dimensions and transportation restrictions** around the world



SOURCE Company website



"Our entire investment, thesis and belief in Agnikul at the time we invested was this three-member team."

Vishesh Rajaram, founding managing partner, Speciale Invest

only in the private space sector in India, but also around the world.

The test, which lasted not much more than a minute, saw Agnibaan reach a height of about 8 km before it fell back and plunged into the oceans, in the Bay of Bengal.

The successful test, on the rocket's first flight, underscores the perseverance of the 200-engineer team at Agnikul, led by co-founders Ravichandran and cricket buddy Moin SPM.

"Our entire investment, our entire thesis and our belief in Agnikul at the time we invested was this three-member team, or rather two-and-a-half," recalls Rajaram, whose firm Speciale Invest gave Agnikul its first "institutional cheque"—as they say in venture capital parlance—in 2019.

The "half" is his reference to Professor Satyanarayanan R Chakravarthy, head of the National Centre for Combustion Research and Development at IIT-Madras. Professor Satya to everyone at the institute has been a founding advisor to team Agnikul. Rajaram's jest about the "half" is owing to the professor's prolific involvement in founding several other startups as well at the institute, including one of his own—an electric taxi venture.

On four occasions, the team endured the suspense of not knowing if the rocket will lift off and fly; the launch was called off on these four occasions.

Rajaram describes project director K Umamaheshwari as a person with nerves of steel, for, leading up to the automated countdown is a series of complex tasks that need to be coordinated across 20 teams, each with its own countdown; during that time, it rested on Umamaheshwari's shoulders to say go or no go.

On May 30, at 7:15 am local time, the indigenously designed and developed rocket lifted off from Sriharikota, home to the Indian Space Research Organisation's (Isro) Satish Dhawan space port; Agnikul has its own launchpad here called Dhanush, which it set up in 2022.

The rocket was named Agnibaan Sub-Orbital Technology Demonstrator (SOrTeD).

"Humbled to announce the successful completion of our first flight—Mission 01 of Agnibaan SOrTeD—from our own and India's first and only private launchpad within SDSC-SHAR at Sriharikota,"

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Agnikul said in a post on X that day.

"All the mission objectives of this controlled vertical ascent flight were met, and performance was nominal. The vehicle was completely designed in-house and was powered by the world's first single piece 3D printed engine, and it also happens to be India's first flight with a semi-cryo engine," the company said.

"The Department of Space and Isro congratulate Agnikul Cosmos... the success involving many firsts, including 3D printed semi-cryogenic engine, flight control systems etc, demonstrate the prowess of indigenous design and innovation," Isro Chairman S Somanath said in a statement. "It motivates Isro to support the space startups and non-governmental entities for innovation and 'atmanirbharata' to create a vibrant space ecosystem in the country."

The successful launch, "marks a significant moment for private players who are contributing to growing India's space sector", Pawan Goenka, chairman of IN-SPACe, said in a statement. India's space tech innovators are "driving the transformation of the sector" in the country, he added.

Professor V Kamakoti, director of the Indian Institute of Technology (IIT), Madras, said, "very innovative, first time in the world, deep core technology was demonstrated today by Agnikul". This should inspire young students to boldly take the entrepreneurship route and become employers, he added.

Ravichandran and Moin started Agnikul in 2017. The startup was incubated at IIT, Madras Research Park, and so far, the entrepreneurs have raised $67 million in venture capital funding. Investors include marquee names such as Celesta Capital, Mayfield and Rocketship, and well-known Indian deeptech investors Pi Ventures and Speciale Invest that Rajaram and his friend Arjun Rao started.



"Agnibaan demonstrated the world's most integrated single-shot 3D-printed piece. It signals the ability to rapidly assemble rockets that is unparalleled."

Satyanarayan Chakravarthy, professor and head, NCCRD, IIT-Madras

Agnibaan demonstrated "the world's most integrated single shot 3D printed piece. It signals the ability to rapidly assemble rockets that is unparalleled", Chakravarthy said.

There are other important aspects to Agnibaan. One is, it uses aviation-grade kerosene, so "all you need is access to an airport to get this fuel and access to some industrial area with liquid oxygen. That's all it takes to fly this vehicle", Ravichandran says.

The "semi-cryo" refers to how Agnibaan doesn't need to store the components of its fuel mixture at low temperatures and high pressure, which in turn has a salutary effect on the rocket's capability to carry more payload and develop greater thrust.

Agnikul has also set up its own rocket engine factory that is envisioned to turn out an engine in a matter of days, eventually. The company is in talks to supply launch vehicles to commercial customers looking to tap the low-Earth-orbit opportunity.

$8.6 billion
Projected size of global satellite launch vehicle market in 2030

NEXT BIG GOAL

This first test did exactly what its name said: Demonstrate that the tech works. It has also boosted the confidence of team Agnikul. The tools, algorithms and systems they've built all delivered to purpose. For example, "the vehicle was supposed to hold itself at around 2.5 degrees till around 45 seconds and it exactly held itself at 2.5 degrees", Ravichandran says.

"That's actually harder than going vertical", because then the rocket would simply be going vertical. Here, the scientists and engineers had to account for the tendency of the vehicle to rotate, with thrust at the bottom and gravity acting in the middle. And the rocket's "trying to flatten out". And Agnibaan SOrTeD held its position for the first 40 seconds or so, as intended.

"The next big goal is to go to orbit," Ravichandran says. That means going up to about 400 km from mean sea level. The data from this first test has boosted everyone's confidence so much that Agnikul is talking to potential customers to see if it can include some commercial payload straight away in the first orbital launch.

They are also being more aggressive with their timelines now, looking to add certain secondary objectives that were originally planned for much later to the very next orbital mission—as early as April or May next year. In the longer run, building a reusable rocket is also something to consider.

As Agnibaan lifted off, "it was surreal to see in a flash, these three people at mission control, to see how these entrepreneurs have evolved", Rajaram recalls. "They are 200 now and they've done what they've done."

In this case, surely, the best is yet to come. F

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Deep Impact

Multiple factors are coming together to make deeptech entrepreneurship an exciting opportunity in India. Experienced domain specialists are giving up the comfort of high salaries at large companies to chase their dreams, building sophisticated products from India for markets around the world. In the following pages, we bring you profiles of six startups that are beginning to hit the early commercialisation stretch of operations

BY HARICHANDAN ARAKALI



Vineet Dravid (front) and Prashant Kumar Srivastava (back), the co-founders at Oorja Energy

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OORJA ENERGY

Physics + Data for Predictive Analytics

Combining physics-based modelling and machine learning, the startup has garnered customers in India, the US and Europe

BY HARICHANDAN ARAKALI



Vineet Dravid, founder of Oorja Energy, has been in the scientific computing industry his entire adult life, for close to 20 years now. And the idea of building a software product company in the area of computer aided engineering (CAE) came out of that experience.

Be it smartphones or rockets, or potato chips or diapers, the first step today in making the most viable product is running real-life simulations on computers even before building the first prototypes, Dravid says. Today, this is done using an approach called physics-based modelling: Understand the underlying physics of what's happening and use that to build a virtual simulation.

Worldwide, this is a $15 billion industry. Within that, Dravid's company is addressing an opportunity: The combination of physics-based modelling and machine learning. His idea is that this will make the models more accurate, faster and cheaper.

"We want to create the next generation CAE software merging physics with machine learning to reliably and quickly perform predictions on any engineering system," Dravid says.

In the long run, the lofty aim at Oorja is to "be the Google for engineering analytics". But, to begin with, Dravid and his two co-founders have zeroed in on analytics for designing and developing batteries for the EV (electric vehicles) industry.

With batteries costing as much as 50 percent of an EV, predictive analytics that can improve their designs to mitigate the risk of thermal runaway would be extremely valuable to the entire ecosystem of OEMs in the sector.

Dravid won't take any names, but customers include large OEMs in India and the US and Europe working across domains, four-wheelers, buses, trucks, as well as off-road equipment, he says.

Dravid, Prajakta Sabnis and Prashant Kumar Srivastava started Oorja only in 2022. They've raised about $1.5 million in seed capital and put together a team of about 20 engineers so far. Investors include Micelio, Axilor Ventures, Java Capital and Anicut Ventures.

"Engineering design is getting more complex and time-consuming, leading to long release cycles," Alok Chauhan, principal at Micelio Technology Fund, said in a statement when the venture capital firm led Oorja's seed investment in September 2023. Oorja's product is "an impactful solution that has the potential to be a global category leader in the space", Chauhan added.

With each iteration, Oorja will become easier to use, Dravid says. Today, already, customers can simply download an app and start using it. Often the end-users are highly technically qualified engineers, so Oorja allows them to integrate their own code as well, he says.

In the future, a low-code interface might be in the works, where customers can start mixing and matching interfaces and customise Oorja to match their needs.

$15 billion
Worldwide market for computer-aided engineering software and services

Oorja Energy

FOUNDED: 2022, Bengaluru

FOUNDERS: Vineet Dravid, Prajakta Sabnis, Prashant Kumar Srivastava

CORE FOCUS: Computer Aided Engineering

FUNDING: **$1.5 million**

INVESTORS INCLUDE: Micelio, Axilor Ventures, Java Capital, Anicut Ventures

TEAM: 21

PATH TO COMMERCIALISATION: OEM customers are using the first product

SOURCE Company, Tracxn

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ETHEREAL MACHINES

Precision Machining at Your Service

A problem became an opportunity, and an award-winning CNC machine is at the heart of a manufacturing service that the startup is pioneering from India

Kaushik Mudda and Navin Jain, co-founders of Ethereal Machines, were still in college when they stumbled upon the limitations of a robotic arm they'd built; it led them to the world of computer numerical control (CNC) machining. Long story short, they decided the best way forward was to make their own machines. And when they made the first one, "we realised a problem we were trying to solve for ourselves was also a massive opportunity", Mudda recalls.

Ethereal was started in 2014. As with most such learning journeys, there were at least two more leaps the young entrepreneurs took—or rather one jump and one pivot.

The jump was for the first three or four years, after starting with the simpler three-axis machine, they realised that modern manufacturing required more complex machining as components became more intricate. So, Mudda and Jain made

$67 billion
Worldwide size of CNC machine market in 2023, projected to grow more than 10 percent CAGR through 2030



Kaushik Mudda (left) and Navin Jain, co-founders at Ethereal Machines

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the leap to building their own five-axis machines, which won them an international industry award as well.

However, from their first prototype in 2018, and seed funding of $1 million from Blume Ventures, it took the duo four years to nail down a market-ready machine. That was the second leap. Yet, no one believed a couple of youngsters from India could have built a machine like this. And, over the next four years, even as they continued to incrementally improve their machines and sold a few, including in Japan, customers would often say disheartening things like "we'll use your machine for a year, and they we'll pay you".

The pivot, then, was that they realised that it made more business sense to use their machines to make components for customers around the world, rather than try to sell the machines to them. And so they arrived at their current business model: "Machining as a service",



Ethereal Machines

FOUNDED: 2014, Bengaluru

FOUNDERS: Kaushik Mudda, Navin Jain

CORE FOCUS: Precision hardware engineering

FUNDING: **$23.5 million**

INVESTORS INCLUDE: Peak XV, Steadview Capital, Blume Ventures, Enam Investments

TEAM: 180

PATH TO COMMERCIALISATION: Multinational OEM customers are using the company's machining-as-a-service to shape their products

SOURCE Company, Tracxn

as Mudda described it. "In the last 12 months, our revenues have grown 5x, so now we don't sell our machines," he says.

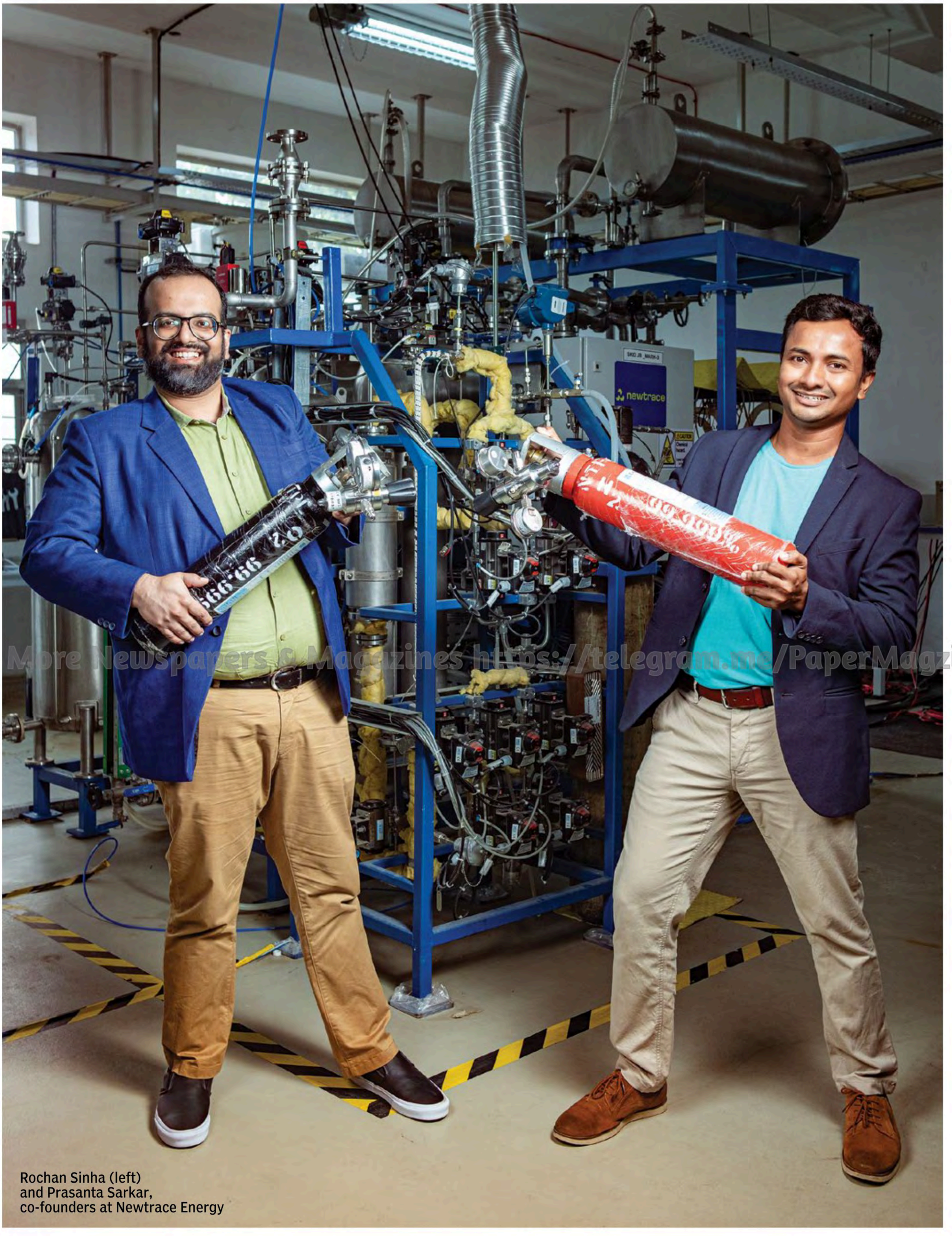
Instead, a growing number of machines are cutting and milling away 24x7 in a "lights-out factory" and more machines are being added every month. Over the next 12 months, Mudda expects sales to jump 10x, albeit on the current modest base.

Ethereal's team has grown to about 180 people. And today the company operates 21 machines. By the end of the current fiscal, they expect to have 75 to 100, and hit between 750 and 1,000 machines in five years.

Aerospace and defence, health care, and consumer electronics are large verticals where Ethereal can tap customers. The company has opened a 50,000 sq ft state-of-the-art facility recently, and "we are servicing marquee customers in the US, Israel, Germany and India, from Bengaluru", he says.

Peak XV and Steadview Capital have stepped in to lead a $13 million Series A investment in the company. That money will help the company build a factory 5x bigger. F

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Rochan Sinha (left) and Prasanta Sarkar, co-founders at Newtrace Energy

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NEWTRACE ENERGY

Deeptech for Green Hydrogen

The deep-science duo of Prasanta Sarkar and Rochan Sinha is developing a technology offered by only three other companies in the world

Prasanta Sarkar and Rochan Sinha co-founded Newtrace Energy in 2020 to develop a new class of "membrane-less" electrolysers to produce green hydrogen for industrial customers. Today, most of the 6 to 7 million tonnes of hydrogen produced in the country annually is from fossil fuels.

The duo met at Entrepreneur First—an international programme that connects startup founders—and they bring many years of experience in areas ranging from aerospace engineering to nanomaterials and electrochemistry.

"There are only three other companies in the world that offer this technology," says Rajan Anandan, managing director at venture capital firm Peak XV, which led the seed investment in Newtrace last year, alongside Aavishkaar Capital.

The membranes used in the industrial-grade electrolysers need to be highly selective for ions like hydrogen and oxygen, while being chemically stable and durable. Materials that meet these criteria, such as specialised polymers or other advanced materials, are costly to manufacture.

Sarkar and Sinha have developed a proprietary technology that does away with the membrane altogether and uses the flow of water to separate the gases. And their product design and manufacturing largely rely on locally available materials and components in India.

They've demonstrated their tech with a near-commercial prototype. Along the way they also decided to focus on higher capacity electrolysers so that they can focus on industrial decarbonisation,which is in large factories like refineries and steel plants.

They've established a technology centre in Bengaluru and are working towards a couple of global partnerships. In July, they will be discussing their technology in Stanford, in the US, and they are also collaborating with the Dutch Institute for Fundamental Energy Research in the Netherlands.

Some imaginative innovation and inventions have gone into Newtrace's first electrolyser. For example, they found a way to collect smaller bubbles of hydrogen and oxygen and make larger ones, which helps in reducing the overall footprint of the system. The oxygen detectors they needed weren't available in the country, so they made their own. Now they are working on hydrogen sensors.

On the commercial front, "we'll establish the 1 megawatt system and we're currently building our order book for it", Sarkar says. Newtrace today has a 20 MW pilot plant that can turn out a few electrolysers. (Electrolyser capacity is typically measured by way of power consumed to generate a kg of hydrogen or other gases).

Sarkar expects the 1 MW electrolyser to hit steady commercialisation by next year. At that point, they plan to design and develop 5 MW and 10 MW capacity products. They'll need more funding to build a full-scale factory. In the long run, they'll need to establish a 500 MW or even a 1 GW capacity factory, which would make a dent in the market.

$150 billion
Projected global investments in hydrogen-related projects by 2030

Newtrace Energy

FOUNDED: 2020, Bengaluru

FOUNDERS: Prasanta Sarkar, Rochan Sinha

CORE FOCUS: Membrane-less electrolysers for green hydrogen

FUNDING: **$6.7 million**

INVESTORS INCLUDE: Peak XV Partners, Aavishkaar Capital, Speciale Invest, Micelio, IKP Knowledge Park

TEAM: 45

PATH TO COMMERCIALISATION: Beginning sales of first product this year

SOURCE Company, Tracxn

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CHARA TECHNOLOGIES

Motors Sans Rare Earth Metals

Three entrepreneurs are developing a class of synchronous reluctance motors that can power EVs to tillers

When Bhaktha Keshavachar, co-founder and CEO of Chara Technologies, sat down with this writer for the first time, last December, it was at a startup conference at the IIM-Ahmedabad's Centre for Innovation Incubation and Entrepreneurship, now referred to as IIMA Ventures. "We are grey-haired or even hairless founders," he joked, referring to how his two fellow founders of the Bengaluru company and himself don't fit the stereotype of two youngsters fresh out of college.

Keshavachar started his career with Sharp Laboratories in the US almost 30 years ago. He spent more than 12 years at Intel before turning serial entrepreneur. His latest venture before Chara was co-founding Ezetap Mobile Solutions, which was acquired by Razorpay.

Ravi Prasad, Chara's co-founder and chief motor designer, was previously head of motor design at Kirloskar Motors and founder of a motor design consultancy that built specialised motors for large multinational customers.

Mahalingam Kaushik, co-founder and CTO, brings his embedded electronics wizardry to Chara and is responsible for much of the intellectual property the startup has generated.

Together, the trio brings a century of deep science and engineering knowledge to the products they are



Bhaktha Keshavachar (right) and Mahalingam Kaushik, co-founders at Chara

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developing—a class of motors called synchronous reluctance motors, often called SynRMs in the industry. An important feature of such motors is that they can be designed to eliminate magnets that need rear earth metals.

Applications of such motors range from electric vehicles (EV) to industrial and HVAC systems, and even household appliances like washing machines. Chara is backed by investors like Exfinity Venture Partners, Kalaari Capital and IIMA Ventures.

Over six months or so, there have been three major developments at the company, Keshavachar says in a recent interview. First, Chara has a dozen customers placing initial orders, mostly for use in electric two-wheelers and three-wheelers. VST Tillers and Tractors, an agri equipment maker, is also interested and, in the defence sector, Chara's motor and the controller that goes with it have caught the attention of Tata Advanced Systems.



Chara Technologies

FOUNDED: 2019, Bengaluru

FOUNDERS: Bhaktha Keshavachar, Ravi Prasad, Mahalingam Kaushik

CORE FOCUS: Synchronous reluctance motors

FUNDING: **$5.7 million**

INVESTORS INCLUDE: Exfinity Venture Partners, Kalaari Capital, IIMA Ventures

TEAM: 75

PATH TO COMMERCIALISATION: Serial production starts in August at a pilot factory with capacity for 500 to 600 motors

SOURCE Company, Tracxn

Other well-known industrial names that are evaluating Chara's first motor include Ingersoll Rand and Lucas TVS. Among startups, "our favourite is one where they are trying to retrofit an autorickshaw with an electric powertrain", he says.

Largescale production is expected to start in August, at a factory in Bengaluru's Peenya industrial area. "We are starting with our pilot production lot and then we will ramp to full capacity of about 500 to 600 motors per month," Kaushik says. This is sufficient for the orders Chara is anticipating over the next 12 months, Keshavachar says. "Going forward, we will either do contract manufacturing or have manufacturing partnerships with large companies," he adds. The company has an internal target to ship 4,000 motors by this fiscal.

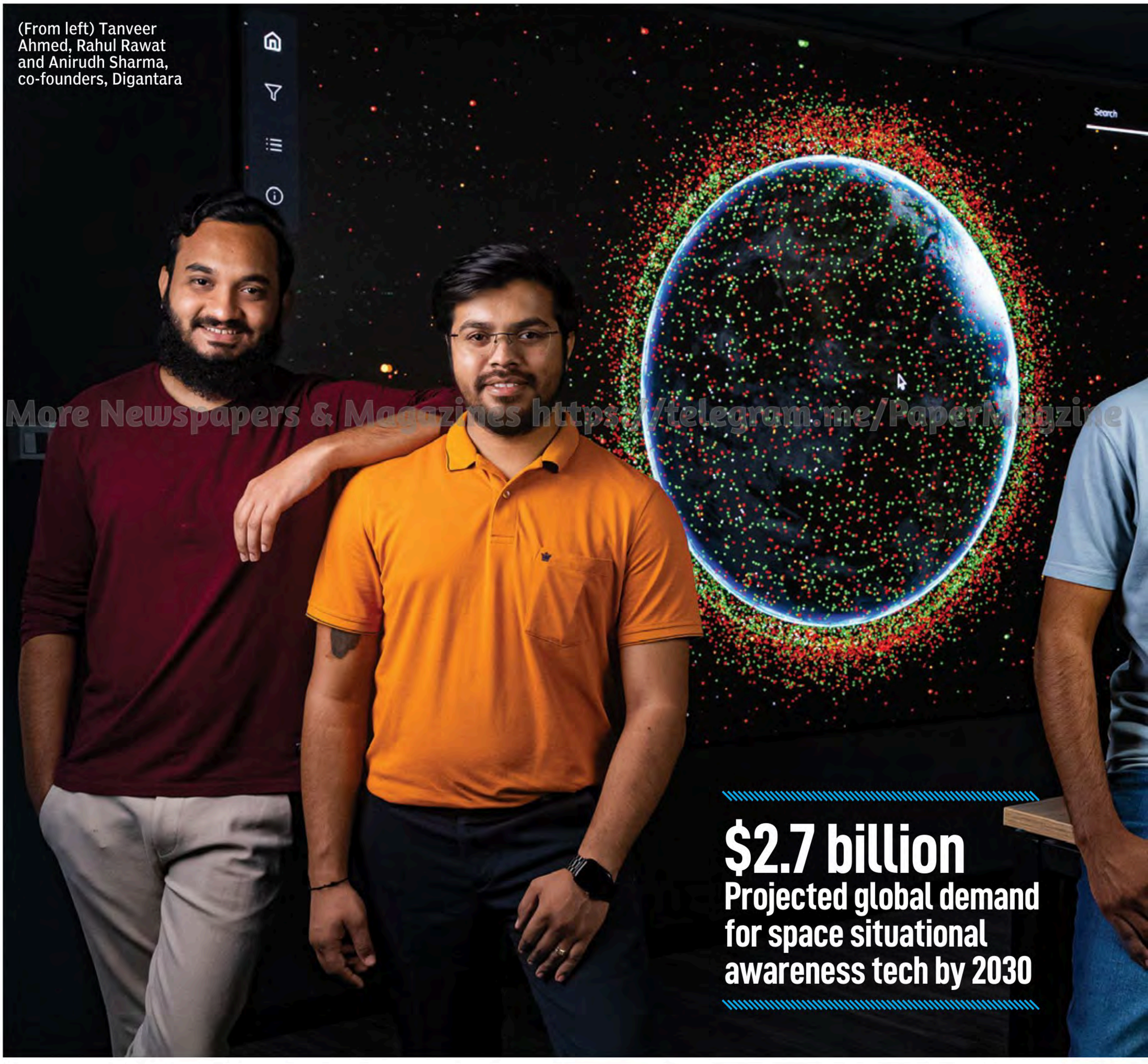
And Chara has started work on developing a motor management platform that can be used to manage motors remotely for diagnostics, predictive maintenance, and remotely updating software.

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DIGANTARA

Charting Strategic Elbow Room in Space

The startup has the ambitious aim of providing both situational awareness for commercial operators and domain intelligence for India's strategic use



(From left) Tanveer Ahmed, Rahul Rawat and Anirudh Sharma, co-founders, Digantara

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The founders of Digantara Research and Technologies describe their venture as a "space situational awareness" company. Anirudh Sharma and Rahul Rawat started tinkering with the idea for it while they were still in college, in Punjab, in 2018, having learnt of a satellite club their friend Tanveer Ahmed was running in Bengaluru.



The trio got into it in real earnest from 2020, having graduated with degrees in engineering, and with incubation and grant support from the IISc. Today, Digantara is evolving into a provider of an important infrastructure layer to not only commercial space economy customers, but also for India's strategic and defence purposes.

"There are over 11,000 active satellites in orbit, and that number will only increase," says Sharma, the CEO. "We need a mechanism to navigate an orbit and understand what's happening. Think of what we're building as Google Maps for space."

The significance of the work being done by companies such as Digantara is that, in aviation or in maritime navigation, there are internationally recognised rules and organisations. "We don't have something similar in space," Sharma adds. Today's geopolitics makes the prospect of such an accord distant.

In addition to "situational awareness", Digantara is also developing technologies for a more ambitious objective—"space domain awareness". This entails understanding of what's going on in space not just from a local perspective, but everything that's happening in the orbit, he says.

The two software platforms the company is developing are Space-MAP (Space Mission Assurance Platform), and STARS (Space Threat Assessment and Response Suite).

Over the last 12 months, Digantara has focussed on a few fundamental blocks of products and services, Sharma says. The first are the electro-optical sensors—the hardware needed to track "resident space objects". As it builds out its infrastructure, the Bengaluru startup will use a combination of space-based sensors and via ground-based telescopic observatories. The first of these observatories is coming up in Ladakh.

Digantara Research and Technologies

FOUNDED: 2018, Bengaluru

FOUNDERS: Anirudh Sharma, Tanveer Ahmed, Rahul Rawat

CORE FOCUS: Space situational awareness technologies

FUNDING: **$14.5 million**

INVESTORS INCLUDE: Kalaari Capital, Peak XV, Global Brain, SIDBI Venture Capital, Naman Finance and Investment, Aditya Birla Ventures

TEAM: 55

PATH TO COMMERCIALISATION: Early commercial contracts signed; partnerships in Singapore, Australia

SOURCE Company, Tracxn

Data from these sensors, and what Digantara also collects from various government agency and commercial sources, will go towards building its own "libraries". Digantara is developing the software to provide analytics using these libraries.

Earlier this year, Digantara inaugurated its 25,000 sq ft state-of-the-art assembly and testing facility in Bengaluru. Among its international customers is Singapore Space and Technology, which uses data sets to train its machine learning algorithms, Sharma says. More recently, Digantara has signed a contract to supply its optical sensors to Space Machines Company, an Australian in-space servicing provider, under the MAITRI initiative (Mission for Australia-India Technology, Research and Innovation), supported by AUD 8.5 million grant from the Australian government.

Digantara expects to offer its software platforms on the cloud. On the commercial front, the medium- to long-term aim is to develop a full-fledged satellite operation management platform that can automate significant parts of those operations for customers. For defence use, version one of STARS has been released, Sharma says.

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INCORE SEMICONDUCTORS

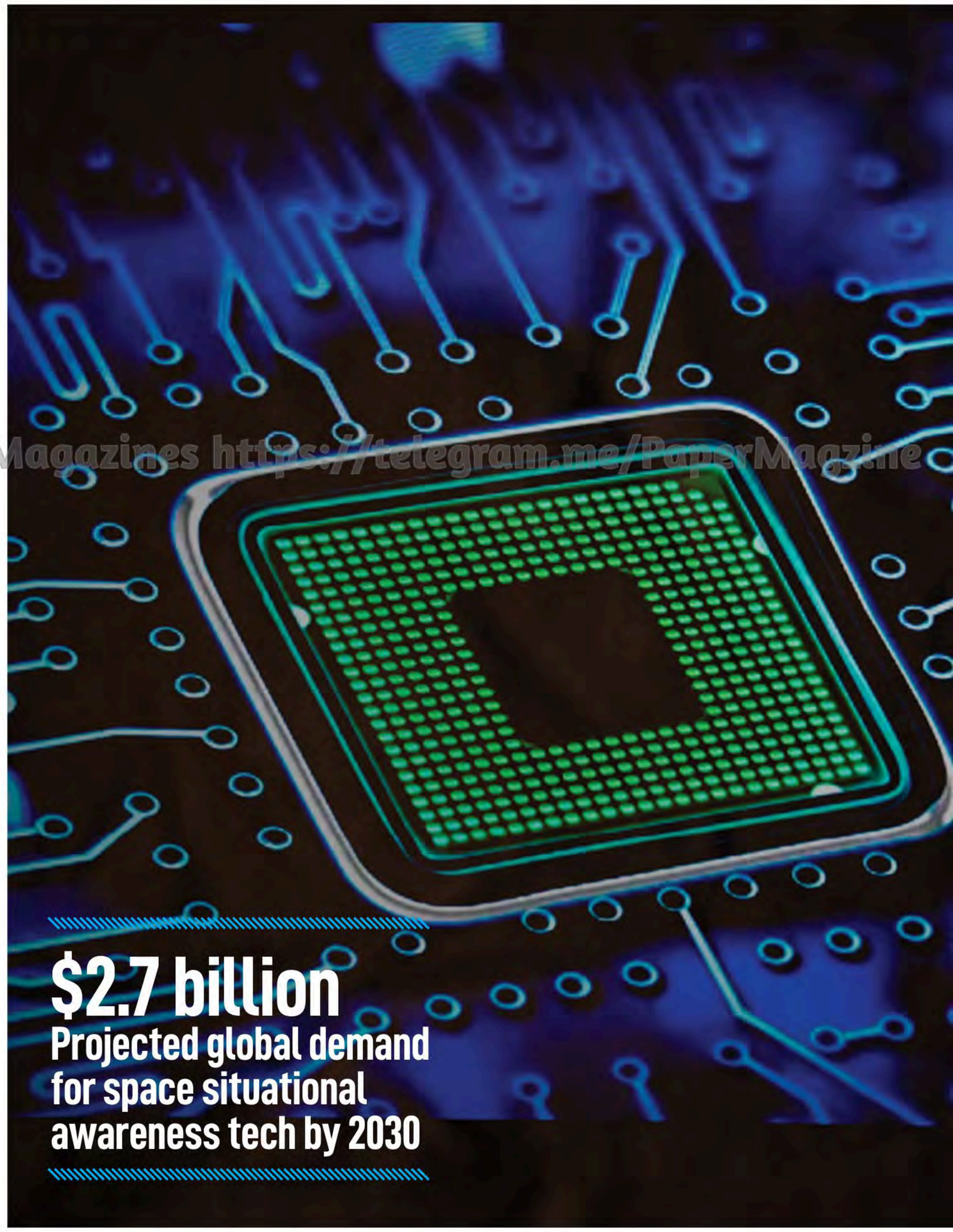
De-RISCing India's Semicon Needs

Starting with embedded processors for everyday appliances, the venture aspires to develop made-in-India chips all the way to high-performance computing

In May 2023, Peak XV (formerly Sequoia Capital's India and Southeast Asia unit) led a $3 million seed round in InCore Semiconductors, incubated at the IIT-Madras. The company is developing semiconductor processors based on RISC-V open source architecture. And made-in-India chips and systems-on chip products based on InCore's platform could one day have a big impact, reducing the country's semiconductor import bill. "Ultimately, in systems, whether it be operating systems or processors, you need to build prototypes," says GS Madhusudan, InCore's co-founder and CEO. "It's an applied field. You can create any kind of theory you want, but something like a Microsoft Windows is bringing together hundreds of theories and practices into a practical system."

That's the aim at InCore, with its open source processors. In short, IIT-Madras started its pioneering semiconductor research work—led by Professor V Kamakoti, currently the director of the institute—around 2007; Madhusudan came on board in 2012 and became part of the work on Shakti—the team's flagship RISC-V platform; and InCore was registered in 2018.

The ambition at InCore is roughly like this: First step, make processors for the embedded applications market, which account for about two-thirds of the processors in everyday electrical and electronic gadgets. "We want to make sure India



$2.7 billion
Projected global demand for space situational awareness tech by 2030

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had complete strategic autonomy on processor IP in this range." Next, target low-to-mid-end PC class and mobile phone type of processors. And finally, make processors for high-performance computers.

In terms of the timeline, "we have achieved goal number one. We are 70 to 80 percent done. We have two processor families that are already shipping to customers", Madhusudan says. A more capable 1.5 GHz version is also expected soon.

InCore represents the entrepreneurial pillar of an entire ecosystem that is gradually taking shape in India where "at least in the embedded sector, other than probably a graphics unit, every other IP that goes into a typical embedded processor is available now", Madhusudan says. The GPUs, the design tools and, of course, the fabrication plants are still from outside the country. However, with projects such as the fab and OSAT (outsourced semiconductor assembly and testing) plants being built by the Tata group and others, those will also begin to be available within India.

GS Madhusudan, founder of Incore Semiconductors

InCore Semiconductors

FOUNDED: 2018, Chennai

FOUNDERS: GS Madhusudan, Neel Gala, Gautam Doshi, Arjun Menon

CORE FOCUS: RISC-V Processor IP

FUNDING: **$3 million**

INVESTORS INCLUDE: Peak XV Partners, Speciale Invest, Whiteboard Capital

TEAM: 25

PATH TO COMMERCIALISATION: Two processor families shipping to customers and a third is expected towards the end of 2024

SOURCE Company, Tracxn

Meanwhile, InCore has struck up partnerships with companies such as HCL and Tessolve to create reference designs for segments like electricity meters, internet protocol cameras, BLDC motor controllers, designing complete parts as references. This would allow InCore's Indian customers to work with fabs and place orders for those chips directly from its partners. "This is getting traction. We're talking to people in about six or seven segments in which there are huge volumes," he says.

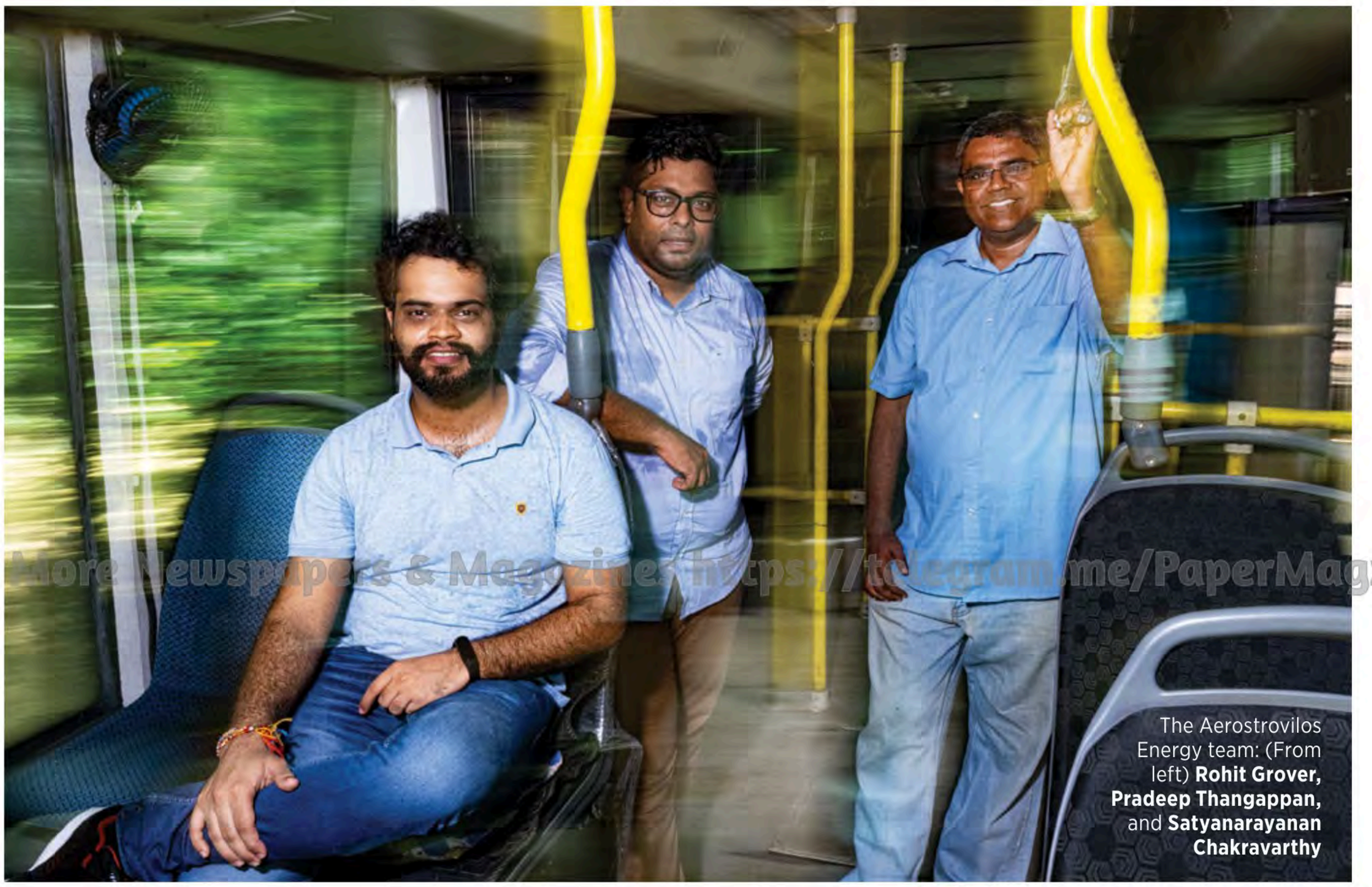
It's a misconception that India doesn't have semiconductor tech, Madhusudan says. "We've been designing chips for others for donkey's years. We can do it for ourselves." What's missing, he says, are the supply chain and the product marketing expertise. Changing that is the long-term effort that India finally seems to be getting a move on. F

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ONE YEAR ON

We asked the startups whose work we spotlighted in our inaugural deeptech issue last year to give us a quick update. Their milestones reflect the growing interest in deeptech in India and validate our argument that they're closer to commercialisation

BY HARICHANDAN ARAKALI



The Aerostrovilos Energy team: (From left) **Rohit Grover, Pradeep Thangappan,** and **Satyanarayanan Chakravarthy**

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AEROSTROVILOS

At Aerostrovilos, which is developing micro gas turbines, "we are pivoting towards a gen-set application right now as gas turbines can use alternative fuels available from various waste sources," co-founder and CEO Rohit Grover says. This cuts down product development time so the company can get its first product out into the market sooner.

The startup was initially building its turbines for applications in the automotive sector, but faced technical challenges. The new design also incorporates various off-the-shelf components for generators, and Grover expects his first market-ready product to be out by the end of the year.

If all goes well with that "minimum viable product", Aerostrovilos can look to scale up sales. From an initial pilot batch, Grover is also dispatching a couple of units to Europe for potential customers there to test the generator.

FOUNDED: 2017, Chennai

FOUNDERS: Rohit Grover, Pradeep Thangappan, Satyanarayanan Chakravarthy

FOCUS AREA: Multi-fuel micro gas turbines

FUNDING: **$0.5 MILLION**

INVESTORS INCLUDE: Tube Investments of India, Mumbai Angels, Polaris Banyan Holding, Purv Flexipack, Karthik Kajaria

SOURCE Company, Tracxn



(From left) **Saurabh Chandra,** CEO, and **Naveen Arulselvan,** CTO, Ati Motors

ATI MOTORS

FOUNDED: 2017, Bengaluru

FOUNDERS: Vinay V*, Saad Nasser*, Saurabh Chandra

FOCUS AREA: Autonomous electric mobile robots for industrial applications

PATH TO COMMERCIALISATION: 100 robots deployed with customers in the US, India and Southeast Asia. Expanding to EU this year

FUNDING: **$15.4 MILLION**

INVESTORS INCLUDE: True Ventures, Athera Venture Partners, Blume Ventures, Exfinity Venture Partners, MEV Partners

*Vinay and Nasser left the company in 2022

SOURCE Company, Tracxn

At Ati Motors, which makes autonomous mobile robots for factories, warehouses and industrial complexes, in the last six months, customers have begun to use the Bengaluru startup's products in every market the venture targeted, including the US, India and Southeast Asia.

"The US traction has especially been very good and we have succeeded in putting a team in place with an office in Detroit," CEO Saurabh Chandra says. Overall, the number of Ati's robots deployed has hit the 100-unit mark.

"The robots are working round the clock in tough factory environments," he says. "Over the next six months our plans include new product launches and market expansion into Europe."

SELVAPRAKASH LAKSHMANAN FOR FORBES INDIA



(From left) **Yashas Karanam,** and **Rohan Ganapathy,** co-founders of Bellatrix Aerospace

BELLATRIX AEROSPACE

FOUNDED: 2015, Bengaluru

FOUNDERS: Rohan Ganapathy, Yashas Karanam

FOCUS AREA: In-space propulsion, mobility, space taxis

PATH TO COMMERCIALISATION: Space qualified two systems—in talks for market entry.

FUNDING: **$11.3 MILLION**

INVESTORS INCLUDE: BASF Venture Capital, Inflexor Ventures, KITVEN, Pavestone Capital, GrowX Ventures

SOURCE Company, Tracxn

At Bellatrix Aerospace, winners of the Forbes India Leadership Awards 2024 in the Emerging Innovator category, founders Rohan Ganapathy and Yashas Karanam are going beyond providing in-space propulsion systems. They're tapping the opportunity to provide what they call satellites-as-a-service and space taxis.

In January, Bellatrix Aerospace achieved a significant milestone with the successful launch of its Arka and Rudra propulsion systems onboard ISRO's PSLV C-58 launch vehicle. Bellatrix is the maker of India's first privately developed Hall Effect Thruster, which it has named Arka.

The Bengaluru company has also developed India's first high-performance green propulsion system, which it has named Rudra. Green propulsion systems can replace hydrazine, the highly toxic propellant currently used. The qualification of these propulsion systems puts Bellatrix on the global map of critical space tech providers.

The entrepreneurs are looking to raise more money as they move to set up a bigger, state-of-the-art factory in Bengaluru. They have developed four classes of engines which can cater to satellites ranging from 10 kg all the way up to 5,000 kg.

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ATI MOTORS: SELVAPRAKASH LAKSHMANAN FOR FORBES INDIA



(From left) BlueJ Aero co-founders **Utham Kumar Dharmapuri** and **Maruthi Amardeep Sri Vatsavaya**

VIKAS CHANDRA PURETI FOR FORBES INDIA

BLUJ AERO

FOUNDED: 2022, Hyderabad

FOUNDERS: Maruthi Amardeep Sri Vatsavaya, Utham Kumar Dharmapuri

FOCUS AREA: Hydrogen fuel cell e-VTOL drones and commercial aircraft

PATH TO COMMERCIALISATION: Full-scale tech demonstrator prototype being tested

FUNDING: **$2.25 MILLION**

INVESTORS INCLUDE: Endiya Partners, Ideaspring Capital, Rainmatter

SOURCE Company, Tracxn

At BluJ Aero, which is developing a large commercial drone as well as cargo aircraft, powered by hydrogen fuel cell engines, "we have completed manufacturing of our full-scale prototype for technology demonstration and internal flight testing is in progress," co-founder and CEO Amardeep Sri Vatsavaya says.

From the point of view of commercialisation, the startup is in the process of signing memoranda of understanding for commercial pilot flights with customers starting in Q1 of 2025. Market entry for the aircraft, named BLUJ REACH, is targeted for Q1 of 2026. The plan for the next 12 months includes flight testing of BluJ's hybrid hydrogen propulsion system, design and manufacture of the commercial version of REACH, Series-A fund raise, and initiation of the certification process with DGCA.

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CYNLR

CynLr, a vision and intelligence tech provider for industrial robotics, reports that it is now running commercial pilots for its "general-purpose visual robotics solution", called CyRo, at General Motors and Denso.

"And a pipeline of automotive OEMs and Tier-1 vendors in the US, EU and Japan are evaluating the same for adoption," co-founder and CEO Nikhil Ramaswamy says. The Bengaluru company has also set up a subsidiary in Switzerland and expects to open an R&D lab there by September, and another in Michigan, in the US by December.

CyRo is designed to take up only about the same space as a human worker. "It can be taught to perform any task on the shop floor that is currently performed by a human, with little to no changes to the processes," Ramaswamy says. What makes this possible is CynLr's proprietary vision and intelligence stack (CLX-01).



Co-founders of CynLr **Nikhil Ramaswamy** (in blue) and **Gokul NA**

SELVAPRAKASH LAKSHMANAN FOR FORBES INDIA

FOUNDED: 2015*, Bengaluru

FOUNDERS: Nikhil Ramaswamy, Gokul NA

FOCUS AREA: Visual robots with human-like manipulation ability, superior alternative to current customisation-intensive models

PATH TO COMMERCIALISATION: Commercial pilots with customers in the US, Japan. Potential customers in EU also evaluating product

FUNDING: **$5.3 MILLION**

INVESTORS INCLUDE: GrowX Ventures, Speciale Invest, Arali Ventures, Anicut Capital

*In 2015, it was registered as Vyuti Systems. CynLr was founded in August 2019 with the first round of funding under the same registered entity.

SOURCE Company, Tracxn

SELVAPRAKASH LAKSHMANAN FOR FORBES INDIA



(From left) **Rajarshi Pal, Jogin Desai and Rajani Battu** of Eyestem

EYESTEM

FOUNDED: 2015, Bengaluru

FOUNDERS: Jogin Desai, Rajani Battu, Rajarshi Pal, Dhruv Sareen

FOCUS AREA: Scalable cell replacement therapies in ophthalmology

PATH TO COMMERCIALISATION: Early commercialisation by 2025-26

FUNDING: **$10 MILLION**

INVESTORS INCLUDE: Endiya Partners, Kotak Mahindra Bank, Alkem Laboratories, Natco Pharma, Biological E, Fastspeed Vanijya, Innovative Quest

SOURCE Company, Tracxn

Eyestem, which is developing a treatment for the dry version of a condition called age-related macular degeneration, was given the regulatory go-ahead for human trials in India in April this year.

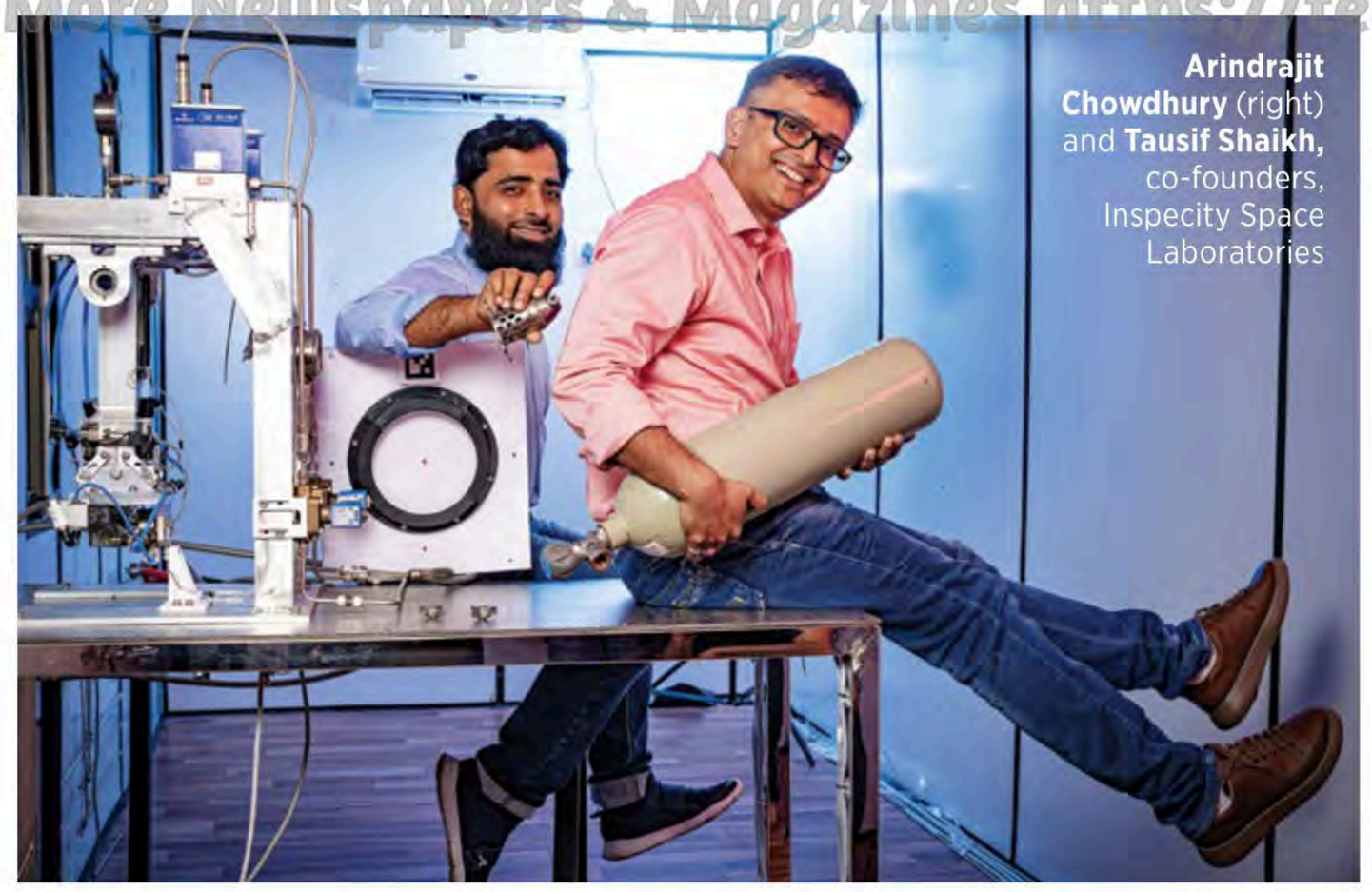
The life sciences startup, incubated at the Centre for Cellular and Molecular Platforms (C-CAMP) in Bengaluru, has teamed up with the LV Prasad Eye Institute to test its proprietary product, named Eyecyte RPE, to see if it can help replace lost or damaged retinal pigment epithelium cells.

"We want to reach a much larger patient base than most cell and gene therapies worldwide," Jogin Desai, founder and CEO of Eyestem, says. The aim is to use this cell therapy platform to develop products for large-scale availability, he says.

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INSPECITY SPACE LABORATORIES

MEXY XAVIER



Arindrajit Chowdhury (right) and **Tausif Shaikh,** co-founders, Inspecity Space Laboratories

FOUNDED: 2022, Mumbai

FOUNDERS: Arindrajit Chowdhury, Tausif Shaikh

FOCUS AREA: Robotic in-space satellite services

PATH TO COMMERCIALISATION: Tech demonstrators currently undergoing qualifications

FUNDING: **$1.5 MILLION**

INVESTORS INCLUDE: Antler, Veda VC, Anicut Capital, Speciale Invest, DeVC, PointOne Capital

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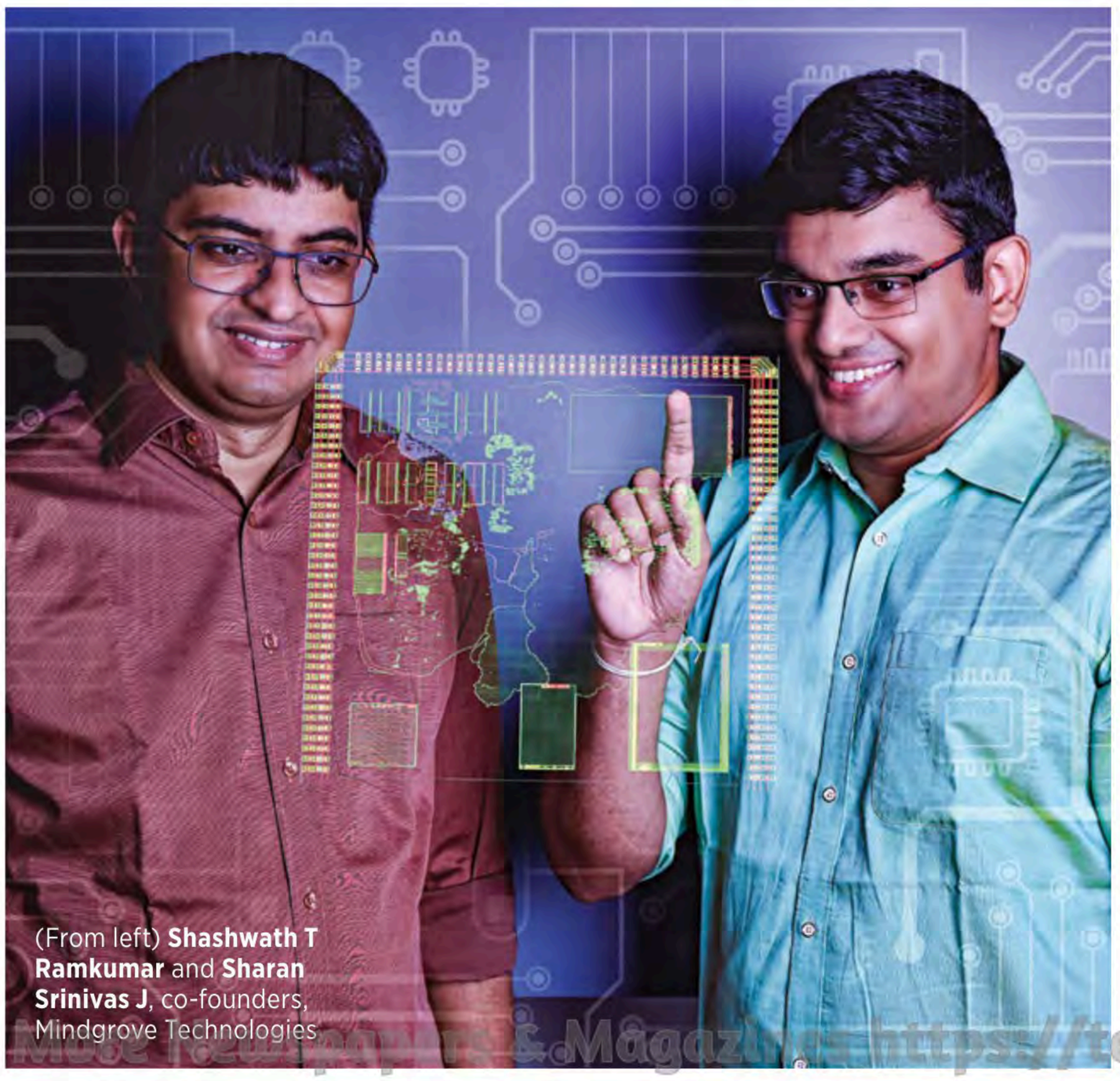
Professor Arindrajit Chowdhury at IIT-Bombay and his student Tausif Shaikh, a propulsion systems expert, started InspeCity in 2022. They dream of playing a role today in humanity's colonisation of space in the future—envisioning entire independent cities floating in deep space.

The company's robotics and sensing team has commissioned a micro-gravity test bed, and assembled and fired up a vision-assisted robotic arm "built from first principles for space," Chowdhury says.

The company is also developing a 1N thruster for in-space applications (N stands for Newton, the unit to measure force). "The team is rapidly advancing up the technology-readiness levels," he adds.

Various pieces of tech as well as the full robotic arm and propulsion system are under significantly more advanced stages of qualification than a year ago—some will also be tested on ISRO's various platforms.

MINDGROVE TECHNOLOGIES



(From left) **Shashwath T Ramkumar** and **Sharan Srinivas J**, co-founders, Mindgrove Technologies

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At Mindgrove, which is developing systems-on-chip (SoC) semiconductor platforms for multiple applications, "we have completed the prototype tape-out of our first chip," co-founder and CEO Shashwath T Ramkumar says.

"Testing is currently underway and to date, all the tests we have run have been successful, and the SoC is performing as per specifications." More tests are in the offing—mainly power and environment-related.

The company's efforts caught global attention when it released its first SoC in May, called MG Secure IoT.

Now that the physical chip is available for potential customers to evaluate, conversations for commercial contracts have stepped up, Ramkumar says. Mindgrove expects to hit a major milestone around mid-2025 when MG Secure IoT will be generally available (meaning, more widely), after initial shipments to anchor customers.

In parallel, the team is also working on the design for the next chip, the first demonstrations of which are expected by end of this year.

FOUNDED: 2021, Chennai

FOUNDERS: Shashwath T Ramkumar, Sharan Srinivas J

FOCUS AREA: Systems-on-chip based on IIT Madras's Shakti processor

PATH TO COMMERCIALISATION: First commercial chip being evaluated by potential customers

FUNDING: **$2.35 MILLION**

INVESTORS INCLUDE: Peak XV, Whiteboard Venture Partners, Speciale Invest, Ashwini Asokan, Nischay Goel

SOURCE Company, Tracxn

UNBOX ROBOTICS

FOUNDED: 2019, Pune

FOUNDERS: Pramod Ghadge, Shahid Memon

FOCUS AREA: Autonomous package sortation robots for warehouses

PATH TO COMMERCIALISATION: Early-stage commercialisation across multiple customers

FUNDING: **$12.2 MILLION**

INVESTORS INCLUDE: 3one4 Capital, Redstart Labs, WEH Ventures, Aureolis Ventures, Entrepreneur First, Navam Capital, Tj Fincorp

SOURCE Company, Tracxn

At Unbox Robotics, "we are rapidly expanding our global footprint," says co-founder Pramod Ghadge. A recent customer



(From left) **Shahid Memon** and **Pramod Ghadge**, co-founders, Unbox Robotics

SHAILENDRA PARDESHI FOR FORBES INDIA

in Europe is a large fashion retailer headquartered in Spain for whom Unbox "scaled up" their system. And they've "deployed a new system in the Netherlands," Ghadge says.

"This quarter, we're excited to go live in the UK, marking another milestone in our international growth," he adds.

In India, Unbox has launched new customer sites in both the south and the northeast regions. Over the next 12 months, the entrepreneur duo is targeting five-fold revenue growth—albeit on the current modest base—with more customer sites expected to go live in India, the EU, Britain and the US.

Existing customers are also looking to add more robots to handle increased volumes through Unbox's system, he says.





Aditya Bhatia, co-founder, Orangewood Labs

MADHU KAPPARATH

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ORANGEWOOD LABS

FOUNDED: Delhi (NOIDA) and San Francisco

FOUNDERS: Abhinav Kumar Das, Aditya Bhatia, Akash Bansal

FOCUS AREA: Programmable robotic arms for industrial applications

PATH TO COMMERCIALISATION: Ten customers are currently using the product

FUNDING: **$3 MILLION**

INVESTORS INCLUDE: Y Combinator, 7percent Ventures, Schox Ventures, KSK Angel Fund

SOURCE Company, Tracxn

At Orangewood Labs, which is developing a programmable robotic arm and a generative AI based software application, "we developed a coffee bot," says co-founder Aditya Bhatia, which, as the name suggests, can pour you a cup of coffee from a vending machine, going through the various steps. And they are integrating RoboGPT, a chat programme they've written to provide natural language commands to the robotic arm, with the coffee bot. Some 10 paying customers are using the robotic arm developed by Orangewood for applications such as pick-and-place, quality inspection, and spray painting, Bhatia says.

The Y Combinator-backed venture has its roots in the problems faced by the founders with furniture design and manufacturing, which led to their earliest prototype. Their plans include robotic solutions for sprayers and sanders for the furniture and related industries.

The entrepreneurs are also working to commercialise RoboGPT. This chat application can help reduce the skill gap between machines and humans resulting in faster deployments, Bhatia says. F

'DEEPTECH IN INDIA WILL BE A MULTI-DECADE JOURNEY'

Foundational support and patience hold the key to seeing large deep science and engineering-based global companies emerge from India in the decades to come, says Rajan Anandan, managing director at venture capital firm Peak XV

BY HARICHANDAN ARAKALI



AMIT VERMA

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Rajan Anandan, managing director at venture capital (VC) firm Peak XV, also leads the VC firm's Surge programme for early and seed investments in startups. In an interview with *Forbes India*, he pointed out that deeptech in India is where software startups were in 2010 to 2012. Edited excerpts:

Q Give us a sense of why you started thinking about deeptech startups in India.

Our primary focus remains identifying exceptional entrepreneurs targeting sizeable markets. Recently, we've witnessed a surge in deeptech startups, reflecting our investment strategy. If you leave aside AI (artificial intelligence), initially, ventures like Log9, in advanced battery tech, and Absolute, in biosciences, stood out. Following a brief hiatus, a new wave of compelling deeptech opportunities emerged about 18 to 24 months ago.

We've since invested in semiconductor innovations, battery recycling, green hydrogen and space technologies. Each venture features founders with profound domain expertise. These startups aren't just ambitious; they're driven by years of technical groundwork, setting them apart in their respective fields.

Moreover, the evolving landscape, in semiconductors, for example, now benefits from a supportive local ecosystem, fostering growth opportunities previously untapped in India. This shift aligns with our strategy to back ventures poised to scale significantly, leveraging India's expanding semiconductor market, projected to grow from $30 billion to $80 billion annually by decade's end.

Q What might have triggered this new wave of deeptech startups?

Let's take spacetech as an example, where we've invested as well. In the last decade, the landscape of India's space technology has transformed dramatically. Initially, there were just a handful of startups in the sector, largely due to the pioneering efforts of Isro and its affordable infrastructure and launch capabilities.

However, the real game-changer was the government's decision to deregulate the space industry. This policy shift opened the door for private enterprises, leading to a surge in innovation and startups like Digantara and Skyroot, the latter founded by former Isro scientists.

Reflecting on this transformation, I see several critical factors driving this growth. First and foremost is the presence of skilled talent, nurtured partly through institutions like IIT-Madras, which invested significantly in semiconductor infrastructure, and IISc and other such top Indian schools of higher learning in science and engineering.

Further, the phenomenal work done by government-funded institutions such as C-CAMP (Centre for Cellular and Molecular Platforms) and departments such as biotechnology has also played an important role. Second, a favourable regulatory environment proved essential, allowing new players to thrive in sectors traditionally dominated by state control, such as defence and space technology.

While acknowledging the nascent stage of deeptech in India compared to established sectors like software-as-a-service (SaaS), I anticipate substantial growth ahead. The IT services sector is now 40 years old, and it's taken years for SaaS companies to proliferate, and they're probably a few years out from emerging as a large sector.

Similarly, deeptech companies are poised to accelerate as foundational investments and expertise continue to mature. Patience remains crucial, as these innovations unfold gradually, shaped by long-term academic and governmental support.

Q Can you talk a bit about what you would consider as a deeptech company in India, and give us some examples of your portfolio investments?

In the realm of deeptech, innovations are rooted in significant scientific advancements and technological breakthroughs, transcending geographical boundaries. At our firm, we categorise deeptech broadly, with AI standing out as a primary focus globally for startups and venture capital.

Beyond AI, we identify several key sectors like semiconductors, drones, space technology, climate tech (including EV ecosystems and new energy solutions), defence and life sciences.

A standout example of deeptech innovation is Metastable's revolutionary approach to lithium-ion battery recycling, which promises a dramatic improvement over traditional methods in terms of efficiency and cost-effectiveness. Similarly, Newtrace, founded by Indian PhD holders with European experience, has pioneered a membrane-less electrolyser for green hydrogen production, setting a new benchmark for performance and cost efficiency in the global market.

Our investment philosophy centres on identifying innovations that offer substantial technological or process improvements. For instance, Ethereal Machines from Bengaluru has developed a unique five-axis CNC machine, crucial for precision engineering in electronics, medical devices and aerospace sectors. Their innovative business model of offering machining services rather than selling machines themselves underscores their strategic approach to market needs.

While acknowledging that the US and China lead in research by decades, we recognise India's competitive edge in specific areas of deeptech, exemplified by companies like Newtrace and Ethereal

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Machines. Our goal is to back technologies with global relevance and potential, ensuring that our investments contribute meaningfully to the evolving landscape of deeptech innovation worldwide.

Q Can you put this in the context of why India needs to encourage deeptech?

Ensuring global competitiveness is paramount in our evaluation of deeptech investments. While India initially serves as the market for many of our ventures, the goal is always to achieve world-class standards. For example, in semiconductors, our long-term aim is self-reliance, acknowledging the multi-decade journey ahead to establish top-tier fabrication capabilities.

This strategic approach extends to sectors like clean energy, where significant strides in solar power position us to exceed global expectations for carbon neutrality well before 2070.

Defence technology also holds strategic importance, given India's substantial defence expenditure, necessitating indigenous technological capabilities. Similarly, space technology remains pivotal, not just for communication but also defence purposes.

Agriculture, crucial for feeding India's growing population, demands transformative technologies like those pioneered by companies such as Absolute, leveraging AI and innovative agricultural practices.

The government's initiatives, such as the Quantum Mission and others focussed on AI and semiconductors, underscore India's commitment to advancing in deeptech sectors. These efforts are critical as we strive to achieve technological independence and global leadership across various strategic domains.

Q At this point what might be the biggest challenges for India's deeptech startups?

Navigating the landscape of deeptech startups involves grappling with several inherent challenges. Firstly, there's significant technology risk: While promising innovations like Metastable's battery recycling or Newtrace's green hydrogen systems show potential, proving scalability from small-scale pilots to industrial levels remains a critical hurdle.

Second, scale-up risk is prominent as ventures transition from lab prototypes to pilot factories and eventually to full-scale production facilities. This progression demands not only technological advancements but also operational capabilities to deliver on initial promises.

Third, regulatory uncertainties, such as those affecting green hydrogen adoption, can profoundly impact market dynamics. For instance, without supportive policies, industries may hesitate to invest in new technologies, stalling their growth.

"Our goal is to back technologies with global relevance and potential, ensuring our investments contribute to the evolving landscape of deeptech innovation worldwide."

Lastly, market timing risk looms large in futuristic sectors like quantum technology, where advancements must align with market readiness. This dual challenge of technological breakthroughs and market acceptance underscores the complexity and risk profile unique to deeptech investments.

As investors, our strategy balances these risks: We're willing to engage with technology risk at manageable stages but prioritise ventures with clear regulatory frameworks and realistic scaling prospects.

Unlike sectors like fintech or AI applications, deeptech ventures necessitate a nuanced approach that accommodates these multidimensional challenges, ensuring prudent investment decisions aligned with the sector's demanding realities.

Q Within the nascent deeptech segments, if you look at the most mature companies, what might be their commercialisation roadmap?

In evaluating say India's top 50 deeptech companies, there's no tech risk per se—it's developed. The emphasis now shifts from technological development to scaling commercialisation efforts. Companies like Absolute, Log9 and Ethereal Machines exemplify this transition—they've moved beyond pure technology risks, now focusing on scaling and expanding their market presence.

These companies face challenges in execution, fundraising and navigating regulatory approvals for scaling operations, such as establishing factories in a particular state, say, which would need approvals at the state level and so on.

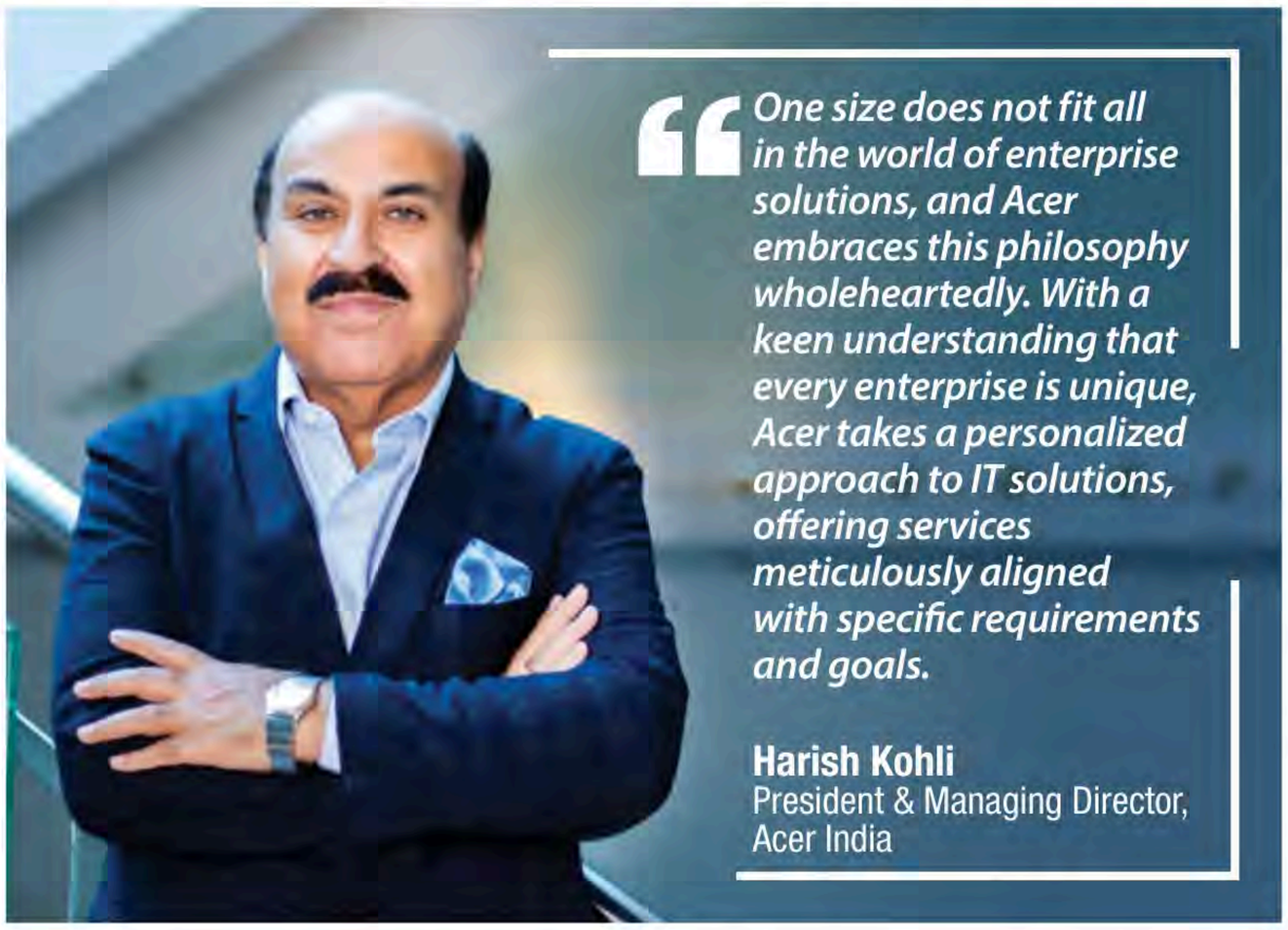
While capital remains a critical need, the immediate focus lies in aiding their commercial expansion rather than overcoming foundational technology risks.

Looking ahead, initiatives like India's quantum mission and advancements in telecom infrastructure, such as 6G, represent pivotal opportunities. These sectors demand foundational support to foster a new wave of entrepreneurs capable of driving substantial growth.

The way I think about it is it's like SaaS in 2010-12.That's where we are with deeptech. From there, it took about six, seven years for it to really see lift off. And six years ago, we had our first SaaS unicorn. Today, we have 23 SaaS unicorns. By 2030, we'll have 100 SaaS unicorns. So this is a multi-decade journey, more so in deeptech than most other things, that we are going to go through.

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At the core of Acer's Enterprise IT Solutions lies a diverse portfolio of products carefully designed to cater to the multifaceted demands of modern enterprises. From the agility of high-performance laptops and tablets catering to mobile professionals to the robustness of workstations and servers driving mission-critical operations, Acer provides a comprehensive suite of hardware solutions aimed at enhancing productivity and efficiency across all levels of an organization. Furthermore, Acer's extensive lineup encompasses desktops, monitors, laptops, projectors, Chromebooks, and electronic accessories, ensuring that every aspect of enterprise IT infrastructure is covered under Acer's umbrella. Our dedication to innovating smart interaction through Interactive Flat Panels distinguishes us and offers an unparalleled level of flexibility that remains unmatched in the industry.

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One size does not fit all in the world of enterprise solutions, and Acer embraces this philosophy wholeheartedly. With a keen understanding that every enterprise is unique, Acer takes a personalized approach to IT solutions, offering services meticulously aligned with specific requirements and goals. From seamless system integration to intricate network optimization and comprehensive IT consulting, Acer offers end-to-end solutions designed to empower enterprises to succeed in competitive environments.

Acer's commitment to customization extends across its range of business desktops, laptops, and workstations, all of which boast environmentally friendly certifications. Serving businesses of all sizes and sectors, Acer provides a wide array of form factors, from sleek business laptops to robust professional workstations. Whether it is a school, bank, or any other enterprise, Acer for business ensures bespoke solutions to address unique needs.

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Choosing Acer as trusted IT solution provider is not just a decision; it's a testament to commitment to excellence. With an unwavering dedication to customer satisfaction, Acer ensures that consumers receive nothing short of the highest quality products and services at competitive prices. Acer's dedicated support team stands ready round-the-clock, ensuring that its customers IT infrastructure operates seamlessly and efficiently at all times. With Acer by side, one can rest assured that their enterprise IT needs are in the hands of seasoned professionals driven by a passion for excellence.

Acer's Enterprise IT Solutions stand as a testament to our unwavering commitment to empowering businesses to thrive amidst the challenges of the digital age. With a comprehensive suite of products, personalized services, and unparalleled support, Acer paves the way for enterprises to unlock their full potential and achieve unprecedented success. Whether it is striving to enhance productivity, optimize performance, or stay ahead of the competition, Acer stands as your trusted ally, ready to chart the course toward a future defined by innovation, growth, and endless possibilities. Choose Acer and embark on a journey towards transformative IT excellence.

'15-YEAR FUNDS HAVE TO EMERGE FOR DEEPTECH IN INDIA'

Even as the next generation of deep science and engineering startups begins to emerge, long-term capital is necessary, says Arpit Agarwal, partner at Blume Ventures

BY HARICHANDAN ARAKALI

Deeptech startups too must face the same litmus test of viability in the market, which means they must deliver serious value to customers at scale. The returns on such companies can be impressive, but the ecosystem will need to find ways to match the money for long-gestation projects with focussed execution, says Arpit Agarwal, partner at Blume Ventures, in an interview to *Forbes India*. Edited excerpts.

Q How did Blume build a deeptech portfolio?

One thing that sets us apart—and probably many other firms too—is our willingness to act decisively without waiting for consensus. For instance, back in 2011-2012, we discovered Carbon Clean, a startup from IIT-Kharagpur dabbling in carbon innovation. They lacked a concrete business plan, but we saw potential and backed them early on.

Over the next five to six years, they refined their model, secured UK government grants, and, today, they're a global leader in industrial-scale carbon capture.

Our approach isn't about having a pre-defined thesis; it's about trusting our instincts and first principles. We foresee needs like carbon capture and invest in motivated teams that align with these future trends. This philosophy underpins our portfolio—from deeptech to electric vehicles (EVs) and SaaS—where we often lead rather than follow, driven by our own convictions.

While not every bet pays off, when it does, it's immensely rewarding—a testament to our approach and belief in backing the right ideas at the right time.

Q How would you define a deeptech company in India?

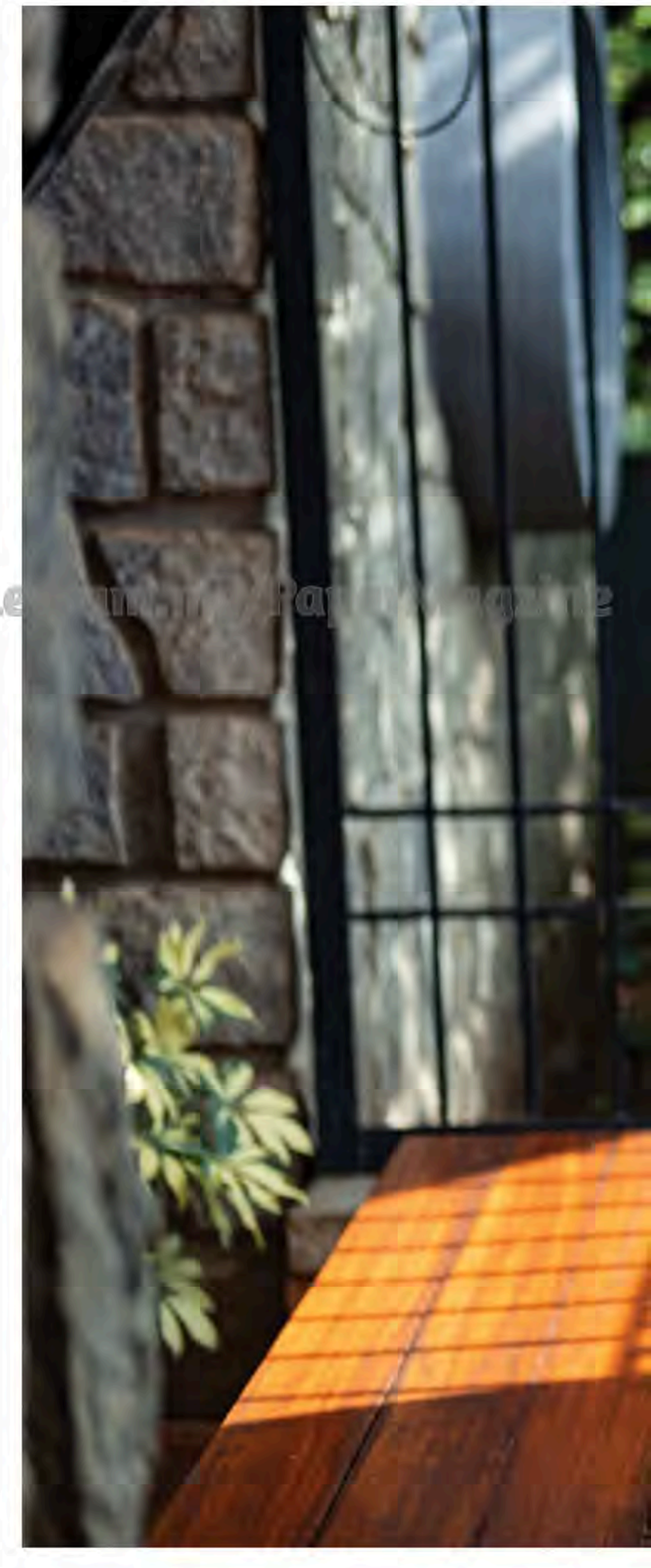
Deeptech, whether in Silicon Valley or in India, revolves around companies that innovate using years of research to develop groundbreaking technologies. Unlike simpler innovations like workflow software or retail storefronts, these ventures delve into globally unique ideas that stem from extensive research and solve complex challenges.

They often originate from India-specific constraints like frugality or leverage cutting-edge technologies necessitated by today's standards.

Fields like biotechnology, med-tech, drones, cybersecurity, and generative artificial intelligence (AI) exemplify this approach, exploring autonomous mobile robots, industrial automation, advanced EV components like new batteries and management systems. These innovations typically undergo years of development before generating revenue, reflecting their deep-rooted technological foundation and potential global impact.

Q As a VC firm, what is the deeptech opportunity you see in India?

Venture capital (VC) is designed for



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companies that initially operate at a loss but have the potential to become highly profitable in the future, making it ideal for deeptech ventures.

Take Ati Motors, a company emerging from IISc research in autonomous mobile robots and factory automation. It invested significantly in R&D for five to six years before gaining traction. Now, with gross margins ranging from 60 to 80 percent and minimal competition due to its unique technology, it exemplifies how sustained investment can lead to substantial returns.

Historically, Indian VC has been cautious with deeptech due to market readiness issues and the necessity to target global markets like the US. Additionally, securing subsequent funding rounds posed challenges. Despite these hurdles, the ecosystem is maturing, evidenced by increasing interest in deeptech investments as of 2024. I foresee significant growth in this sector over the next decade, driven by a more supportive ecosystem and increasing investor confidence.

Q What are the factors coming together in India's deeptech sector?



Arpit Agarwal, partner at Blume Ventures

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Let me illustrate with the example of the biotech sector. In biotech, the journey has been shaped by agencies like BIRAC, which supported numerous early-stage innovations, leading to the creation of hundreds of companies despite many not gaining prominence due to nascent ecosystems and limited investment. However, this era cultivated a deep pool of entrepreneurial talent familiar with scaling companies to a certain level.

Today, these experienced entrepreneurs are progressing to higher aspirations, catalysing the biotech sector's growth from level A to B and beyond. Their maturity and network benefit new startups, accelerating their journey from concept to commercial success. This evolution reflects a cycle: As quality entrepreneurs emerge and succeed, more funding naturally follows, nurturing the ecosystem further.

VC's role is pivotal but cautious, often following trends and waiting for companies to mature before investing significantly. As seed-stage investments grow, so does the pipeline of companies advancing to Series A, B, C, and even IPO stages. This cycle amplifies the confidence and capital flowing into biotech and similar deeptech sectors.

The Indian market's potential to sustain biotech companies domestically is gaining traction, promising faster growth as companies align more closely with local needs. This convergence of talent, capital availability, and market readiness exemplify how ecosystems mature, fostering greater investor interest and expanding opportunities across sectors like autonomous mobile robots and beyond.

Overall, the trajectory shows promise: As ecosystems mature, they attract more investment, nurturing innovation and economic growth in emerging technology fields.

Q Any examples of startups that you'd consider as the next generation of deeptech from India?

I'm incredibly enthusiastic about Yakrit, a company pioneering a groundbreaking machine capable of replicating liver functions for acute liver failure patients, outside the body. This technology is revolutionary for several reasons: It involves billions of live human cells functioning outside the body, a feat never achieved before. The engineering precision ensures the cells remain viable and effective over extended periods, crucial for patient trust and clinical effectiveness.

Similarly, other Indian innovators are pushing boundaries. For instance, a company developing a novel battery anode promises to enhance battery capacity, reduce costs, and extend lifespan through advanced material science. Another exciting development involves bio bots designed to navigate and clean tubules within tooth enamel, a pioneering concept emerging from Indian research labs.

"The Indian market's potential to sustain biotech companies domestically is gaining traction, promising faster growth as companies align more closely with local needs."

These innovations underscore significant advancements in translating cutting-edge research into practical solutions. The journey from lab to market typically spans several years of intensive development and validation, driven by dedicated teams and supported by scientific rigor. The increasing proximity of these innovations to commercialisation is promising, marking a new era of impactful technological advancements emerging from Indian institutes.

Q Any thoughts on the go-to-market aspect of deeptech startups in India?

Successfully navigating the path to commercialisation varies widely across industries like med-tech, EVs, green hydrogen, and more. Each sector presents unique challenges and adoption curves. However, a universal principle remains unchanged: Products must be tailored to meet customer needs and demonstrate immediate value.

Take Ati Motors, for example, whose bots save costs and reduce labour, offering an impressive 18-month payback period in India, making customer adoption straightforward.

Achieving customer value from core product inception often requires extensive iteration and customer engagement over several years. Close customer interaction and continuous product improvement are crucial to demonstrating value early in the process. Moreover, maintaining product quality over time is essential; reliability issues can stem not just from engineering flaws but also from supply chain challenges.

Further, expanding market segments post-initial success is critical yet challenging, requiring deliberate effort and time. Despite these complexities, traditional VC models are proving effective in India, offering potential for venture-class returns within typical fund durations of around 10 years.

However, sectors like life sciences may necessitate longer-term investment horizons, which Indian markets are gradually adapting to accommodate. So, maybe, 15-year funds have to emerge. So far, we haven't seen those happening, which is another reason why life sciences startups continue to struggle in terms of funding raised. But it is a matter of time. We will see a lot more of that happening too. F

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ESYASOFT: CELEBRATING 10 YEARS OF UNPARALLELED DEDICATION, INNOVATION, AND RESILIENCE!

Esyasoft, a global leader in transforming the energy landscape with cutting-edge AI and IoT Technology, proudly celebrated its 10th anniversary in Bangalore, where the whole journey started back in March 2014. This remarkable milestone is a testament to the company's unwavering commitment to excellence, its talented team, and the invaluable support of its esteemed clients. Their unwavering contributions have been instrumental in the company's journey, as they shared the dream of making energy affordable, accessible, and sustainable.

As they honour their past achievements, celebrate present success, and envision an even brighter future, we had the honour of speaking with Bipin Chandra, their charismatic Founder and Group CEO. In the ever-evolving technology landscape, visionary leaders play a crucial role in shaping the industry's future, and Bipin Chandra is no exception. With a profound passion for innovation and a keen sense of business acumen, he has driven Esyasoft to the forefront of the utility industry in the last ten years. From its humble beginnings as a small startup, Esyasoft has grown into a respected industry leader.

Today, the entire team stands tall, celebrating a decade of innovation, growth, and remarkable success worldwide. Reflecting on the past decade of his entrepreneurial journey and humble beginnings in Bangalore, Chandra shared his vision for the upcoming years, filled with a profound sense of pride and excitement for the promising future.

"Esyasoft 2.0 journey demands a paradigm shift in mindset—a transition towards embracing new-age technologies and global perspectives. It is heartening to witness our strides in evolving from a software service provider to a powerhouse of engineering excellence. Reaching



Bipin Chandra,
Founder and Group CEO

> ***Climate policies are taking centre stage, and we are primed to lead the discourse and drive meaningful change. On the other hand, as we expand our global footprint, the opportunities for our employees are boundless.***

version 2.0 is not merely an endpoint but a testament to our ability to continually push the boundaries of what is possible. It signifies the beginning of a new era, where the possibilities are limitless, and the potential for growth and innovation knows no bounds", Chandra is convinced.

Their recent joint ventures, such as Adani Group Company and Landis & Gyr in India or IntelliGrid in the UAE, signify Esyasoft's commitment to becoming a comprehensive product and solution provider. Besides giving them a strong execution edge locally, these joint ventures will undoubtedly open new vistas in international geographies where the smart metering concept is gaining traction and will aggressively pursue such opportunities. Moreover, the foray into upstream technologies and carbon emissions underscores the company's foresight and adaptability. In its ambitious quest to touch 1 billion lives and reduce 10 billion+ tonnes of carbon, Esyasoft recognises the pivotal role of technology and innovation. From electricity to gas and water, its footprint extends across diverse sectors, empowering millions of households worldwide.

Climate policies are taking centre stage, and we are primed to lead the discourse and drive meaningful change. On the other hand, as we expand our global footprint, the opportunities for our employees are boundless. Whether in India, UAE, CIS, SE Asia, Africa, Netherlands, UK, or the Americas, where we are currently present, each member of our team has the chance to contribute to our collective vision and leave a lasting impact on the world.", concludes Chandra.

As technology advances at an unprecedented pace, Bipin Chandra and Esyasoft – a part of an International Holding Company, are poised to remain at the forefront, shaping the future of technology and leaving a lasting legacy of innovation and social responsibility. Chandra continues to inspire aspiring entrepreneurs and tech enthusiasts worldwide through his visionary leadership, showing that one can make a meaningful impact on the world with determination and innovation. This 10-year anniversary heralds the dawn of a new chapter for Esyasoft—one filled with a relentless pursuit of excellence, extraordinary opportunities, groundbreaking achievements, and even greater heights to conquer.

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'WE NEED HIGH-QUALITY PEOPLE & PATIENCE'

Sriram K Rajamani, corporate VP and managing director of Microsoft Research India Lab, reflects on how computer science and engineering research has grown at the centre

BY HARICHANDAN ARAKALI

Lessons from the Microsoft Research India Lab (MSR) that could apply to the broader ecosystem of startups include hiring exceptional people and giving them the elbow room to work their magic. At the same time, ensuring useful feedback from peers within the organisation and the broader scientific community has made the difference, Sriram K Rajamani, corporate VP and managing director, tells *Forbes India*. Edited excerpts:

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Q Give us a sense of the research work that's come out of this centre over the years.

Our research journey has been remarkable. Some of the hypotheses we formulated two decades ago still hold true today, alongside significant refinements and shifts. I can delve into both the constants and changes within our work.

One enduring area of our focus has been the mathematical foundations of computing, particularly algorithms and complex theoretical problems. Since the inception of our lab, we've been deeply engaged in advancing this domain, leveraging India's strong tradition in theoretical computer science.

Our centre has achieved breakthroughs in tackling some long-standing open problems. One example is the work done by Nikhil Srivastava, a former colleague, on the Kadison-Singer Conjecture, bridging the realms of physics and computer science. He's now continuing his career at Berkeley.



Another example involves the elucidation of theoretical properties in k-means clustering, a foundational technique in machine learning. This was led by our colleague Ravi Kannan, who established our theory group. These accomplishments exemplify our lab's intellectual contributions in solving algorithmically challenging problems persisting over decades.

Beyond theoretical foundations, our exploration extended into machine learning, specifically in the field of extreme classification. This research area addresses the classification of vast categories, ranging from documents to advertisements, a feat crucial in diverse applications such as content classification and targeted advertising.

Moreover, we've been at the forefront of addressing contemporary challenges like data privacy regulations through initiatives such as DataMap. This project advanced how we

HARICHANDAN A. ARAKALI

manage and comply with stringent data privacy laws, akin to taking inventory of household belongings to comply with regulations.

Further, our innovations have extended into practical applications like HAMS (harnessing automobiles for safety), where we utilised inexpensive smartphones to enhance road safety monitoring. By integrating video feeds and onboard sensors, we devised a system to assess driver behaviour and adherence to safe driving practices.

In addition to these achievements, our lab has made significant strides in optimising cloud infrastructure efficiency, improving software quality and improving the efficiency of the use of expensive resources such as GPUs for enhanced computational performance.

We have also done work on tuberculosis TB) medication adherence, how to use technology to help manage the treatment of TB for the entire spectrum.

In essence, our research spans a wide spectrum of endeavours, from fundamental theoretical breakthroughs to impactful applications in machine learning, data privacy, road safety, and infrastructure efficiency, each contributing to advancements in their respective fields.

Q Artificial intelligence (AI) is now a household term, since the advent of LLMs generative AI. Can you tell us about work at the centre in some of these areas?

Machine learning and deep learning have been evolving for many decades, but the recent advancements in large language models (LLM) have astonished even experts. Over the past four to five years, the progress has been substantial.

Previously, developing deep learning systems required building separate models for each specific task, whether it was image classification or language translation. The emergence of LLMs, however, has changed the game. These models, pre-trained on vast amounts of internet data, can now tackle multiple problems across various domains simultaneously. This capability represents the core of the current revolution in machine learning.

Before this advancement, implementing machine learning applications required substantial investments in talent, resources, and data collection, limiting accessibility to a select few. LLMs democratise this process by allowing broader access to sophisticated machine learning capabilities.

Now deploying these models for specific applications is more accessible and less resource-intensive. Moreover, interacting with these models has become more intuitive—you can communicate with them directly using natural language, eliminating the need for specialised programming skills.

"Despite the increasing quality of deeptech talent, the quantity remains a challenge relative to India's vast size."

In essence, the advent of LLMs marks a significant shift towards democratising machine learning, making its powerful applications accessible to a wider audience and simplifying its integration into diverse practical scenarios.

Q Can you tell us a bit more about how you'd look at extending the benefits of these more recent advances to non-English-speaking communities?

One fascinating aspect of non-English languages in relation to LLMs is their diversity and multimodality. While major languages like English, German, Spanish and Chinese dominate internet content, Indian languages such as Hindi, Tamil, and Telugu also have significant but varied amounts of content available. Smaller languages like Konkani or Marathi, however, often lack extensive digital content.

LLMs demonstrate the ability to understand and operate across different languages, albeit with varying proficiency depending on data availability. They leverage their training across multiple languages to transfer knowledge effectively, requiring a critical mass of data rather than an equivalent volume to English. This capability is crucial for our lab's efforts in adapting LLMs for Indian languages, ensuring cultural appropriateness and effectiveness.

A notable project we are engaged in, Shiksha copilot, in collaboration with an organisation called Sikshana Foundation, in Bengaluru, exemplifies our focus. This initiative aids government school teachers in creating lesson plans in local languages like Kannada.

By integrating curriculum and textbooks from the Karnataka State Board, we ensure the quality and relevance of generated content while leveraging our expertise in language-specific data requirements and evaluation.

Q In computer science, are there techniques to generate useful content like this, irrespective of the language?

Sure... let me tell you about embeddings. Embeddings are a pivotal concept in today's deep learning landscape, particularly in how they revolutionise information retrieval compared to older methods like inverted indices used in traditional search engines.

In the past, search engines relied on building inverted indices to match specific terms across documents, such as finding documents containing both say, 'Sachin Tendulkar' and 'Mumbai'. However, these methods

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couldn't inherently recognise semantic relationships like 'Mumbai' and 'Bombay' as the same concept.

In contrast, deep neural networks use embeddings, which are internal representations of documents, videos or audio in a high-dimensional space. Each item is mapped to a specific point in this space, with similar items positioned closer together. For example, Mumbai and Bombay would map to nearby points, indicating their semantic equivalence.

Our lab has pioneered advancements in this field through projects like diskANN, a trillion-scale vector index designed to efficiently retrieve embeddings. This technology has been adopted in both academic and industrial circles, including by Microsoft for products like Opus, demonstrating its broad impact and utility in building sophisticated search and retrieval systems.

This work underscores our commitment to advancing the capabilities of deep neural networks in understanding and leveraging semantic relationships across vast datasets, transforming how information is processed and accessed in the modern era of AI and machine learning.

Q What would you consider as deeptech in India?

In India's tech evolution, we initially focussed on service-based solutions using Western technology. However, a significant shift occurred as we began creating startups tailored for our own market needs, innovating technology solutions for our vast population.

Projects like diskANN, originating in our lab, highlight this transformation, where Indian-origin technologies are not only used locally but also globally. This shift signifies India's progression from technology consumers to originators, leveraging our growing expertise in indigenous science and technology.

This evolution marks a pivotal moment where India is increasingly recognised as a global producer of cutting-edge technological solutions.

Q Where would you place the Indian deeptech ecosystem in terms of its capabilities and maturity?

I've witnessed a significant evolution in India's scientific contributions, particularly in deeptech fields. Papers originating from labs like ours, at IISc are now integral to courses at prestigious universities like Stanford and MIT. This shift marks India's emergence as a global idea generator in computing and science. While we celebrate this recognition, the next phase involves translating these ideas into tangible products, either locally or internationally.

"We've learnt that investing time in selecting high-calibre people is vital for long-term success."

In India, unique challenges foster innovation geared towards cost-efficiency and resilience in the face of systemic failures. This approach not only shapes our domestic solutions but also makes them relevant globally. There are significantly many more specialists in deeptech fields in India today than when I returned in 2006. However, despite the increasing quality of deeptech talent, the quantity remains a challenge relative to India's vast size.

We're actively addressing this gap through educational initiatives, PhD supervision, and collaborations across universities, aiming to cultivate a larger pool of skilled professionals capable of driving future advancements in deep tech.

Our commitment to teaching and mentoring reflects our dedication to nurturing a thriving scientific community, essential for realising India's potential as a powerhouse of innovation in the global landscape.

Q What are some of the learnings from the success of MSR India that can be applied to develop the broader deeptech ecosystem in India?

As an organisation, firstly, prioritising the hiring of exceptionally talented individuals has been foundational. We've learnt that investing time in selecting high-calibre people is vital for long-term success. Second, providing these individuals with the autonomy and resources to tackle challenging problems, such as the Kadison-Singer conjecture and extreme classification, has been pivotal.

Initially, the outcomes of these projects were uncertain, but by trusting our team's expertise and passion, we allowed them to drive our research agenda independently.

Fostering an environment of continuous peer feedback has been instrumental. By engaging with both internal colleagues and the global scientific community through publications and collaborations, we ensure rigorous evaluation and improvement of our ideas.

Encouraging our scientists not only to publish papers but also to translate their ideas into practical systems and deploy them in real-world settings has been transformative. This approach has created a feedback loop where innovations are refined based on real-world outcomes, reinforcing our commitment to pushing the boundaries of scientific knowledge and solving significant challenges.

For our community, whether at places like IISc or within startups, the number one thing we need is patience. We need high-quality people and we need patience so that we don't look for what we can just build in three months or six months. If you do that, you will only skim the surface. So we have to give ourselves that grace.

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MS & MR BITCOIN INTERNATIONAL 2024



Step into the future where beauty meets blockchain. The prestigious Ms and Mr Bitcoin International 2024 is set to revolutionize the beauty pageant industry with its cutting-edge decentralized format. This groundbreaking event eliminates traditional national selections, relying instead on the global blockchain community to determine the winners.

Contestants from around the world are invited to compete for the ultimate prize – one bitcoin. The winners, chosen based on their influence, popularity and charisma, will benefit from a fair and transparent selection process. Beyond the monetary reward, this represents an unparalleled opportunity to showcase talent and resilience on an international platform. The journey culminates in fully sponsored trips to esteemed Web3 events worldwide and the International Grand Finals, where contestants will shine alongside blockchain luminaries.

Founded by New Empire and Celebrity Group, with its inaugural season in Association with Web3preneur.com and Hyperlive Entertainment, this international pageant is set to make waves.

The organizing team is poised to introduce a groundbreaking Web3 voting system developed by Web3Preneur.com for the international contest. According to Jagdish Pandya, Founder of Web3Preneur.com, "This cutting-edge system ensures anonymous voting, transparency, and fairness, revolutionizing how contestants interact with their audience. Leveraging blockchain technology, it offers real-time, tamper-proof voting records that users can access, thereby enhancing transparency and trust. Unlike traditional centralized contests, this system allows for auditable and verifiable voting results, ensuring utmost accuracy. Our upcoming collaborative events will further enhance contestant visibility and interaction. This partnership sets a new standard in contest voting, combining advanced technology with enhanced participant engagement and transparency."

For more information and to register for participation, contestants can visit the official website (http://msbitcoin.com).



Dr. Sean Wong
CEO Hyperlive Entertainment

"This unique pageant format transcends national boundaries and aligns perfectly with the decentralized concept of blockchain. We are thrilled to provide a new global platform for young men and women to showcase their talents. Embracing blockchain's core principles of decentralization & transparency, this marks a technological revolution in the beauty pageant industry."

Recognizing that participation in traditional pageants often does not translate into sustainable careers, the organizing team is pioneering the use of non-fungible tokens (NFTs) to empower contestants. Each contestant will have exclusive NFTs that supporters can collect, offering a means of monetization through royalties and a decentralized pathway to build a sustainable career in the industry. Popular contestants may see their NFTs gain value, further democratizing talent management & creating new opportunities for aspiring individuals.

The official launch & press conference for Ms & Mr Bitcoin International 2024 was held at the Connexion Conference & Event Centre at Nexus in Kuala Lumpur. The organizers of the W2140 World Web3 Carnival expressed their honour in hosting this global event, highlighting the importance of blockchain technology & its potential for fostering innovation & industry development.

The W2140 World Web3 Carnival featured experts & practitioners from across the globe, discussing the latest trends & future developments in WEB3 technology. Attendees enjoyed multiple themed forums, roundtable discussions, social gatherings, matchmaking meetings, & various competitions covering technology innovation, industry applications, social activities, & more.



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Amaravati: The Lost City Awaiting Resurrection

Andhra Pradesh CM Chandrababu Naidu's decade-old ambitious plan to build a new capital city is being pulled out of abandonment as he plays kingmaker in the central government

By MANU BALACHANDRAN

It was supposed to be a city of dreams.

A cityscape boasting solar panels on every rooftop, offices on the riverfront, hospitals accessible in less than 10 minutes, water taxis, parks and cycling tracks with shaded walkways for its 3.5 million citizens. The tropical weather may have been a dampener, but the large green cover was likely to make up for it.

At a time when India's metropolises struggle to breathe and population skyrockets, making many of them increasingly unlivable with every passing day, Amaravati, located 300 km from Hyderabad, was being built as a 'happy', 'liveable' and 'sustainable' city for the future. It was the first time in many decades that a city was being built ground up in the country, offering a unique opportunity to address fundamental issues that plague India's metropolises.

There was good reason to pick Amaravati, a fertile land surrounded by hills of the Eastern Ghats, and lying very close to the Krishna river, India's third longest river. For one, water shortages wouldn't pose a concern. The city also lies halfway between Andhra Pradesh's (AP) commercial capital of Vijayawada and the agricultural hub of Guntur, making it accessible by road and rail. Amaravati had, many centuries ago, been a hub of Buddhism and the seat of power for the Satavahana dynasty. It also offered the AP government an opportunity to revive a lost city, as it began scouting for a new capital city after the bifurcation of the state in 2014.

In 2014, the erstwhile state of AP was split into Andhra Pradesh and Telangana, with Hyderabad serving as the common capital until 2024. After this date, it would remain Telangana's lone capital, forcing AP to scout for a new one in 2014.

But a decade since the decision to make the fertile and ancient land into its new capital city, Amaravati remains a dream, having run into issues that plague many Indian cities. The lack of political willpower, shifting priorities and political mudslinging have left it like a ghost city of sorts, with the only functional buildings being the Andhra Pradesh High Court and its legislative assembly. Those too were supposed to be temporary structures with the original plan looking to house the court in a Buddhist stupa-shaped building, while a diamond-shaped building would house the legislative assembly complex.

Today, abandoned half-constructed buildings adorn what was once farmland, where two types of crops were grown a year, while dug-up approach roads lined on either side with weeds and thickets welcome you to the city. There are very few streetlamps, and venturing out in the dark is a scary proposition, even between the functioning court and legislative assembly buildings. After



Abandoned half-constructed buildings adorn what was once farmland in Amaravati

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the new government came to power, many excavators and tractors are working overtime to clear the mess. But roads continue to terminate abruptly and are often filled with slime, making commute an ordeal.

Along the way, on the routes where excavators have cleared the overgrowth, you can spot neatly made drainage systems that are now full of sand and muck, highlighting what seemed like a clear intention to build a well-planned city. "You will see hectic activity as new roads will be laid and transport and other facilities created," said Chandrababu Naidu, the recently returned chief minister (CM) of AP and the mastermind behind Amaravati, on June 15. Naidu, from the Telugu Desam Party (TDP), was sworn in as CM on June 12, in an event attended by Prime Minister (PM) Narendra Modi and Home Minister Amit Shah.

The recent elections made Naidu a kingmaker, where Modi needs Naidu's support to keep his government intact, after the Bharatiya Janata Party (BJP) fell short of an absolute majority in the Lok Sabha. This means Naidu now has the political muscle to restart the shelved project, this time with enough financial support from the central government.

Amaravati's master plan was developed by London-based Foster + Partners and claims to be one of the most sustainable cities in the world. The plan envisages a governmental complex in the city's centre, with a strong urban grid surrounding it. A green patch,



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After the new government came to power, excavators and tractors are working overtime to clear the mess, but roads continue to terminate abruptly. One can spot neatly made drainage systems (right) that are now full of sand and muck

inspired by Lutyens' Delhi and New York's Central Park, runs through its length, with 60 percent of the area occupied by greenery or water.

The city's transportation needs will be met by electric vehicles (EVs), water taxis and dedicated cycle routes, along with shaded streets and squares that will encourage people to walk through the city. Then there are 13 urban plazas, the first of which will be the legislative assembly building, sitting within a large freshwater lake. The city is divided into nine zones, namely government, sports, health, electronics, tourism, knowledge, finance, justice and media city. The city also wants to build an inclusive community that follows a 5-10-15 principle: Five minutes to emergency facilities, 10 minutes to open spaces, and 15 minutes to work.

WHAT HAPPENED TO ALL THIS?

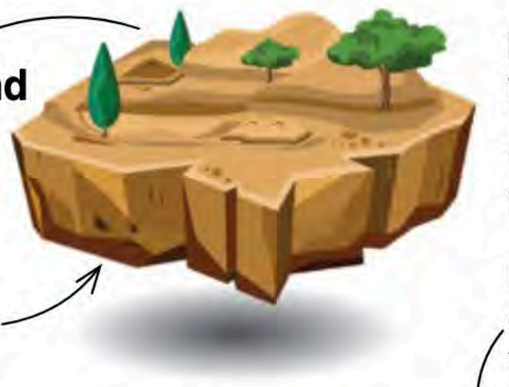
Amaravati was first announced as the capital in 2015, soon after Naidu became CM following TDP's victory in the 2014 AP state elections. The decision was accepted by all political parties in the state, and it only helped that Naidu was also supporting Modi's National Democratic Alliance (NDA) government at the Centre. It was the PM who laid the foundation for the new city and, over the next five years, the state government spent over ₹10,000 crore towards building the city's infrastructure.

More than 34,000 acres of land was collected through a unique land pooling scheme towards setting up what Naidu had called "people's capital"; in all, 29,881 farmers, big and small, parted with their lands. For every acre given to the government under the dry land category, farmers would be reciprocated with 1,000 square yard of residential land with another 250 square yard of commercial land.

Those who donated fertile or irrigated agricultural land would be given 1,000 square yard of residential land and 450 square yard of commercial land once the projects took shape. In all, 20,490 farmers donated land of less than 1 acre, while 5,227 farmers parted with land between 2 and 5 acre. Those who gave away land of more than 5 acre stood at over 800, with 25 farmers giving away more than 25 acre of land.

Additionally, since the farmlands were being taken away, the government also began paying an annuity for lost income that ranged between ₹30,000 and ₹50,000, with a 10 percent enhancement every year. The capital city was to be spread over 216 sq km, and house over 3.5 million people with the completion set for 2029. The Naidu government had anticipated a capital

The Amaravati Dream



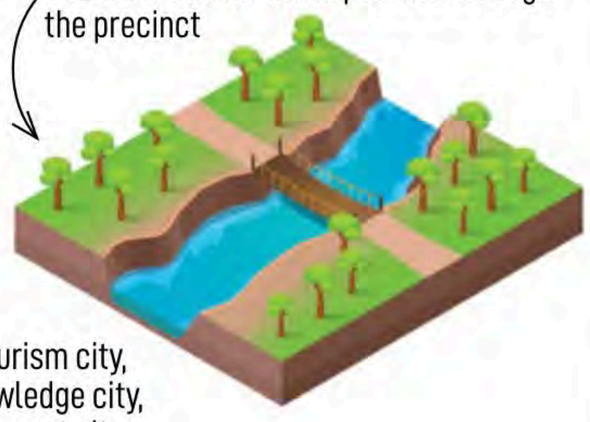
A total of over 34,000 acres of land was collected through a unique landpooling scheme

Fastest land procurement in history:

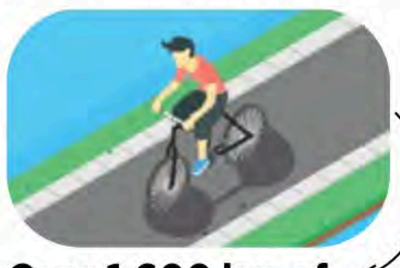
Over 33,008 acres from 26,512 famers within six months

Neighbourhood development plan follows the 5-10-15 principle: Five minutes to emergency facilities, 10 minutes to open spaces, 15 minutes to work

Navigable and recreational canals of over 15 km planned through the precinct



Projections for 2050 include **3.5 million residents, 1.5 million jobs; 90,000 jobs in the first 10 years**



Over 1,600 km of cycle tracks across the city

Nine thematic cities include tourism city, health city, electronic city, knowledge city, finance city, justice city, government city, sports city and cultural city

INFOGRAPHICS: MUKESH SINGH; IMAGES: VIKAS CHANDRA PURETI FOR FORBES INDIA

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Amaravati is currently a ghost city of sorts. The only functional buildings are the Andhra Pradesh High Court and its legislative assembly (right)

expenditure of ₹51,000 crore for the first phase of its development.

The master plan divided the capital region into three areas, a larger Amaravati Capital Region covering the Krishna and Guntur districts, the capital city of Amaravati, and the seed capital area, or the core capital area that would comprise the financial and IT hubs. By October 2015, a Singapore-based consortium of Ascendas Singbridge and Sembcorp Development submitted a proposal to become the master developer of the 6.84 sq km area, which would form the commercial and seed core of Amaravati. The city would also have a 22-km Krishna waterfront, which would house the city's civic core and central business district (CBD).

"The idea was to have 40 percent of the land for infrastructure, roads and greenery, while 60 percent would be given back to the farmers, while another 10,000 acre would remain with the government," G Tirupati Rao, convener of the Amaravati Pariraskshana Samithi (Committee to protect Amaravati), a committee to protect the interests of farmers in Amaravati, tells *Forbes India*. "Even though the Opposition cried foul, in 2018, the National Green Tribunal had also given its go-ahead for the project."

Work began in 2015, and according to the detailed project report, Rao says, the infrastructure cost alone included ₹22,000 crore worth of work, with the Naidu government completing projects worth ₹10,000 crore by the time the state went into polls four years later in 2019. That included roads and new office buildings, while private institutions, including SRM and VIT, were allotted land to set up their facilities.

THE DOWNFALL

In 2019, Naidu lost power in the state, with political rival YS Jagan Mohan Reddy securing a landslide victory in the state elections. The change of guard meant that ongoing projects in Amaravati came to a standstill, with even the World Bank and the Asian Infrastructure Investment Bank (AIIB) announcing their withdrawal from the project. The World Bank had committed a loan of $300 million (₹2,100 crore) while AIIB had promised $200 million (₹1400 crore). The consortium of Ascendas Singbridge and Sembcorp Development also withdrew from the project.

Soon enough, Reddy, the new CM, who had alleged rampant corruption in the Amaravati project, decided to cancel it. He, instead, proposed a three-capital formula: Visakhapatnam as the administrative capital, Kurnool as the judicial capital and Amaravati as the legislative capital.

Reddy's decision to scrap the Amaravati project meant that the farmers who had given up their lands were up in arms, conducting protest marches across the state and even being beaten up by the police. "People of Amaravati believe that Reddy did not want to go ahead with this project because he did not want a project by Naidu to succeed, as it was seen as his pet project," adds Rao, who led the agitation in Amaravati for over 1,600 days.

Finally, in 2022, after various court battles, the AP High Court ruled that the government could not abandon the development of Amaravati, especially since they had signed an agreement, and asked the government to develop it within six months. The High Court also asked the government to develop the nine theme cities, asking them to stick to the capital city's master plan prepared by Naidu.

The Reddy government went to the Supreme Court, which stayed the High Court's decision. "All the materials were being stolen and roads were being dug up," Rao says about Reddy's regime. "There were projects that were 90 percent complete, awaiting electricity and water supply. Those weren't given. In many houses that were built, the Reddy government decided to paint them with their party colours."

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Roads are often filled with slime, making commute an ordeal. You will see hectic activity as new roads will be laid, promised Chandrababu Naidu, who returned as CM of Andhra Pradesh

WHAT HAPPENS NOW?

Since he took charge, Naidu has reiterated his plan to make Amaravati the capital city, debunking Reddy's three-capital plan.

That's precisely why investors are now flocking to Amaravati to pick up whatever land they can grab as expectations remain sky-high about his regime. "Before the elections, you would hardly get a call for a plot of land in the core Amaravati region," says Kolisetty Vamsi Krishna, a real estate developer and a committee member of the National Real Estate Development Council. "Now you are getting over 30 calls a day. The same person [seller] would get at least three calls a day. That's the rush and everyone wants to cash in. As far as prices go, we don't know where the prices will settle."

Sarath, a former journalist from Vijayawada, says that in 2022, a square yard of land in Amaravati was worth ₹15,000, which has since jumped to ₹35,000 since Naidu's party swept the AP elections. Anticipations are also fuelled by the fact that Naidu has full majority in the state, and he remains a key player in national politics. Sarath says: "That number is only expected to grow further once the government is in power."

Naidu's resounding victory—voter turnout was around 82 percent for the state elections held on May 13—was also an indication of people's growing anger with Reddy's government, which was perceived as inaccessible and spending poorly on development, instead relying on direct benefit transfer schemes. "This time, people came from abroad and very far, and some even stood in line until 10 because they were fed up with the government," says Tadi Shakuntala, a former mayor of Vijayawada and a TDP member. "Reddy was not active in developing industry and many investments moved out of the state. Steel and sugar industries suffered as a result."

"Reddy's despise for Amaravati stems from the belief that the Kamma community, to which Naidu belongs, was benefiting from the project," says an independent builder in AP. "It can't be established, although a committee set up by the government had pointed to environmental problems with the Vijayawada-Guntur region, and that it was perhaps not the best location for a capital. So, in that sense, the choice of Amaravati was puzzling to many."

A report of the expert committee headed by former bureaucrat KC Sivaramakrishnan in 2014 to study alternatives for AP's new capital had said that Vijayawada, Guntur and Nellore are especially prone to flooding. "Hence, a cautious choice has to be made around these locations as capital zones," the report had said.

Meanwhile, despite the government's mighty push, a revival of Amaravati isn't going to be an easy affair, even though the Naidu government has set an ambitious target of 30 months to complete projects that were previously 90 percent complete. "Amaravati will be our capital," Naidu said, soon after being sworn-in as CM. "We will pursue constructive politics, and not politics of vendetta. Visakhapatnam will be the commercial capital of the state. We will not play games with people, like trying to have three capitals and such devious activities."

The Naidu government had invited tenders worth ₹48,000 crore during the first phase of the capital city project, and made payments of nearly ₹9,000 crore for the work. "The government will stick to the old master plan designed by Foster + Partners," said P Narayana, who took charge as Minister for Municipal Administration & Urban Development, on June 16.

In the process, though, Amaravati could also pose some trouble for Hyderabad, a city that Naidu had earlier helped build into a global technology hub before the state bifurcation in 2014. "The volume of residential real estate launches in the city may also rationalise as investors and buyers scout for competitive opportunities in AP, which is expected to witness a surge in development along the new growth corridors," says real estate consultancy firm Anarock. "AP's potential development can be a double-edged sword for Hyderabad real estate. However, the overall impact is likely to be positive as AP's growth could spark a ripple effect, attracting businesses and investors to the entire region."

Whether that happens or not, Naidu is most certainly a man on a mission and Amaravati could cement his legacy. In the nearly two millennia that it has existed, Amaravati has seen many kings come and go. Perhaps this time around, it might be gearing up for lost glory, with a kingmaker in charge.

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India Inc & Net Zero: Shall The Twain Meet?

The top 100 companies in India are integrating environment friendly strategies in their business decisions. However, achieving net zero is still a distant dream

By NASRIN SULTANA



CHAITANYA DINESH SURPUR

Between March and May this year, around 60 people lost their lives due to heat-related illnesses in India. With temperatures breaching 50°C in many regions, the country is battling long spells of heatwaves, along with water shortages, damaged crops and food price rise. This, while floods killed 25 people in Assam by mid-June, following heavy rain caused by Cyclone Remal; it has impacted over 4.23 lakh people across 10 districts, and has submerged 459 villages.

Extreme weather conditions that make the world's most populous country vulnerable are increasing by the year. Not only are they wrecking the economy and causing irreversible damage to people, the costs to manage these crises are also mounting. Climate change is one of the key risks that can jeopardise government policies, reforms and investment plans. What is required is a combined effort by all stakeholders, including government regulatory bodies and corporates, to transform into an environment friendly green economy.

The Indian government has set an ambitious target to reach net zero carbon emissions by 2070, but the journey to that destination is still a long one. Carbon emissions and the consumption of water and power are increasing, although companies are gradually switching to greener options and considering climate risk as a pivotal factor in their R&D (research and development) policies or capex investments.

Emerging trends in the responses of businesses to the government's sustainability measures, such as accountability on environmental practices, social initiatives and governance, are encouraging. A *Forbes India* analysis of India's top listed companies' Business Responsibility and Sustainability Reporting (BRSR) disclosures shows that India Inc is integrating environment-friendly strategies in their business decisions. The analysis is based on FY23 BRSR data provided by Prime Database, and considers only the top 100 (by market capitalisation) listed companies. Data related to water, power and carbon emissions have

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been considered for this analysis.

RISING WATER CONSUMPTION

Water consumption by the top 100 companies increased by 4.35 percent to 2.64 billion kilolitre (kl) in FY23, from 2.53 billion kl in FY22. Total water consumption is a measure of water used by an organisation which is no longer available for use by the ecosystem or local community. It also includes water that has been stored during the reporting period for use or discharge in a subsequent reporting period, according to market regulator Securities and Exchange Board of India (Sebi).

Total water withdrawal by these companies rose by 5.9 percent to 12.28 billion kl in FY23. Withdrawal of sea water increased (by 11 percent), while withdrawal of surface water and ground water has remained steady. The analysis shows that 26 of the 100 companies have reduced their water consumption in FY23.

"Several large organisations are proactively addressing water sustainability challenges by implementing water conservation initiatives, adopting water-efficient technologies, and investing in wastewater treatment to mitigate the impact on water resources," says a PwC report in April.

"India's water situation is highly susceptible to climate change. Most of the water is ground and surface water, which is rain dependent. This impacts India Inc as well, and they have recognised it in their disclosures. Water consumption by corporations operating in water-stressed regions increased from 2022 levels. This not only exacerbates existing water scarcity but also poses a risk to operations," says a report by cKinetics, an advisory firm.

Implementing zero liquid discharge (ZLD) can significantly reduce water consumption and dependence on external sources, promote circularity and ensure long-term sustainability, according to cKinetics. With regulatory bodies also becoming increasingly stringent on wastewater discharge, ZLD can help companies comply with regulations and avoid penalties. A ZLD system involves using advanced wastewater treatment technologies to recover, recycle and reuse wastewater to ensure no discharge into the environment.

Sebi made it compulsory for the top 1,000 companies to report BRSR disclosures in their annual reports from FY23 for regulators, investors and stakeholders to assess financial results of a business with their ESG performance.

MORE GHG EMISSIONS

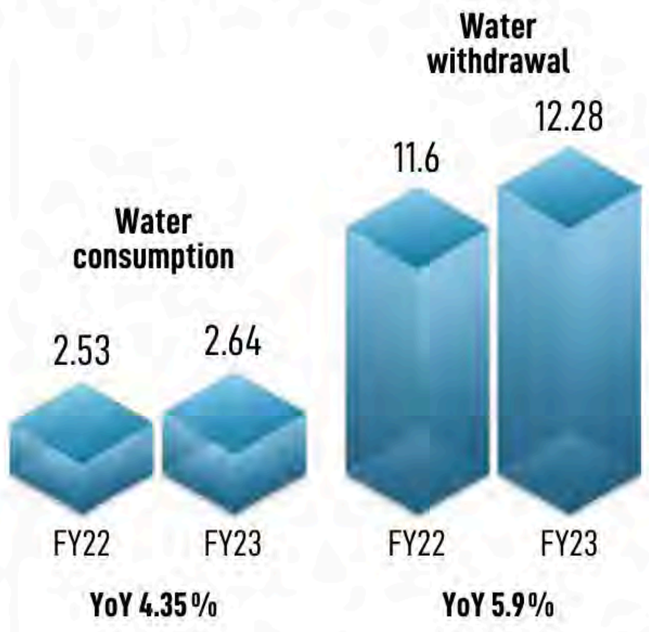
The reduction of greenhouse gas (GHG) emissions is a key strategic priority for countries to combat climate change. GHGs like carbon dioxide, methane, nitrous oxide, hydrofluorocarbons and nitrogen trifluoride can remain in the atmosphere for a few to thousands of years. Reducing GHGs increases energy efficiency, reduces healthcare costs and creates green jobs.

The analysis of data from the top 100 companies shows there was a rise of nearly 6 percent in scope 1 GHG emission in FY23: Total scope 1 GHG was 864 million tonne of carbon dioxide equivalent (CO2e), compared to 815.9 million tonne CO2e in FY22.

Scope 1 emissions are direct GHGs from sources—a physical unit or process—that are owned or controlled by the entity. Emissions that are not physically controlled but result in intentional or unintentional release of GHGs, such as from equipment leakages or methane emissions from coal mines, fall under scope 1 emissions.

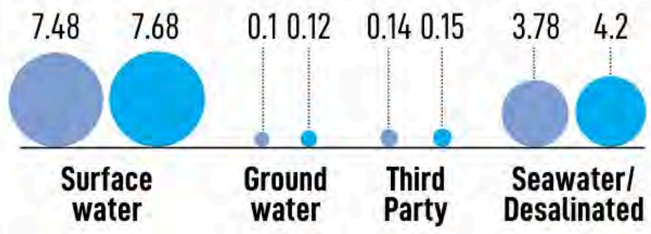
Scope 2 emissions result from the generation of purchased or acquired electricity, heating, cooling and steam consumed by an entity. Scope 3 emissions occur outside of the organisation, including upstream and downstream emissions; upstream categories include purchased

Gulping down water



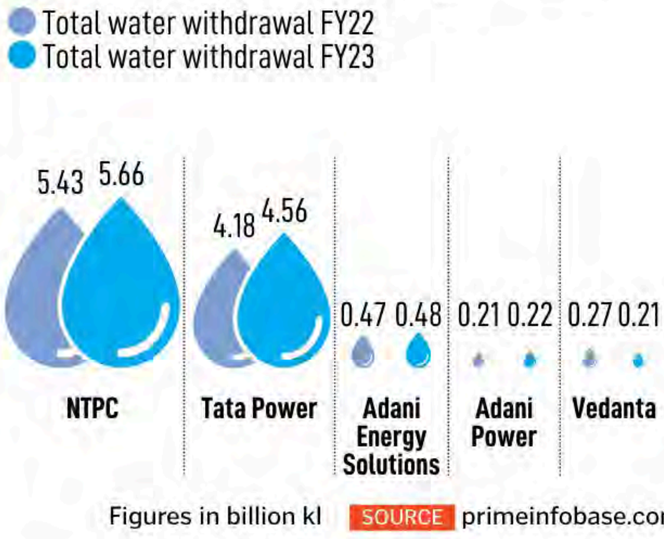
Figures in billion KL
Note: Top 100 companies BRSR data
SOURCE primeinfobase.com

Water withdrawal source



Figures in billion KL

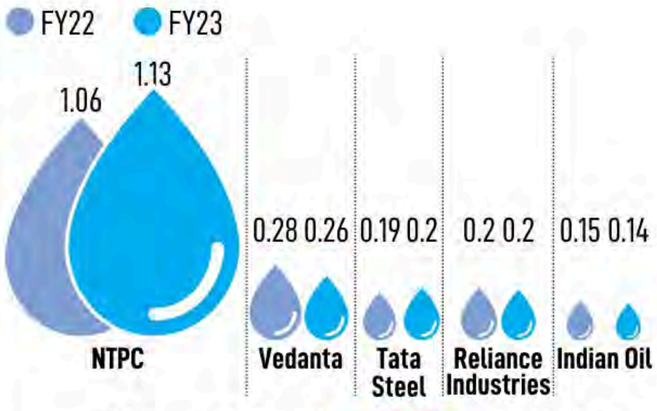
Top companies to withdraw most water in FY23



Figures in billion kl SOURCE primeinfobase.com

Top companies to consume most water in FY23

Total volume of water consumption



Figures in billion kl SOURCE primeinfobase.com

INFOGRAPHICS: MUKESH SINGH

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goods and services, capital goods, transportation and distribution, business travel, etc, while downstream categories include transportation and distribution, processing of sold products, end-of-life treatment, etc.

A significant proportion of global GHG emissions come from industrial activities, with about 79 percent coming from the energy, industry, transport, and construction sectors. Data shows that 34 of the 100 companies have cut their scope 1 emissions, and 29 have reduced their scope 2 emissions. "The key initiatives that led to reduction in emissions include transitioning to energy-efficient technologies such as LEDs, adopting efficient air conditioning, ventilation, and heating systems, shifting to renewable sources for securing energy needs, purchasing carbon offsets, and entering into off-site power purchase agreements," says PwC.

According to PwC, the worst effects of climate change can be mitigated by reducing scope 3 emissions, and integrating them with net zero commitments. Companies may get a better understanding of their carbon footprints, and minimise risks in their value chains, thereby improving their BRSR disclosures, it says. As of FY23, of the top 100 companies, only 51 have disclosed their non-mandatory scope 3 emission data.

IS INDIA INC PREPARED FOR BRSR?

Even as regulatory authorities push for environment friendly business practices, companies have found the switch daunting. Regulators are wary of greenwashing and are on the lookout for inclusive performance frameworks, says Deloitte, in a May 2023 report.

"A key concern for Indian regulators is that of unregulated ESG Ratings Providers [ERPs], and the risk of greenwashing and mis-selling associated with the increasing umbrella of ESG/ sustainability-themed and linked financial instruments," says Deloitte.

According to Anu Chaudhary, partner, global head, ESG Consulting, Uniqus Consultech, Indian companies have taken significant strides, especially since reporting on ESG performance became mandatory in 2023. "However, there is still a journey ahead," she adds.

While some companies are making progress, there needs to be a more deeply ingrained culture of embedding ESG considerations into operational decision-making and compliance. "This is partly due to the relative novelty of these requirements. Furthermore, despite having dedicated sustainability, ESG, or investor relations teams, many large corporations find themselves stretched thin, needing more bandwidth and gravitas to fully integrate and leverage ESG strategies across their operations. Thus, while there is momentum, the road to comprehensive ESG readiness remains work in progress," she explains.

A May 2023 Deloitte survey of 150 companies in India found only 27 percent to be well-prepared to meet ESG requirements. One of the primary issues is the lack of standardised processes and policies to track and collate sustainability-related information. "This challenge was particularly evident during the assurance processes for FY2023-24," Chaudhary adds.

For smaller companies, the task of value chain disclosure is particularly daunting, as it requires extending reporting boundaries to include significant customers and suppliers. "The reliability of this information is often questionable since management needs to have direct control over it, making accurate and comprehensive ESG reporting a complex endeavour," Chaudhary further says.

Just as companies were figuring out ways to meet the Sebi mandate, the regulator expanded the scope of disclosures in 2023. The additional disclosures include a subset of 20 key performance indicator (KPIs), known as BRSR core, and are compulsory for the top 150 (by market capitalisation) listed companies from FY24 onwards.

Pranav Haldea, MD, Prime Database, feels there are major inconsistencies in the BRSR data being reported by companies: "This can be due companies not having complete and correct data, errors while filling, data being reported in different and incomparable units, issues in reporting format design, limitations in the data capturing software, etc." However, he adds that FY23 was the first year of reporting and these issues should get ironed out soon.

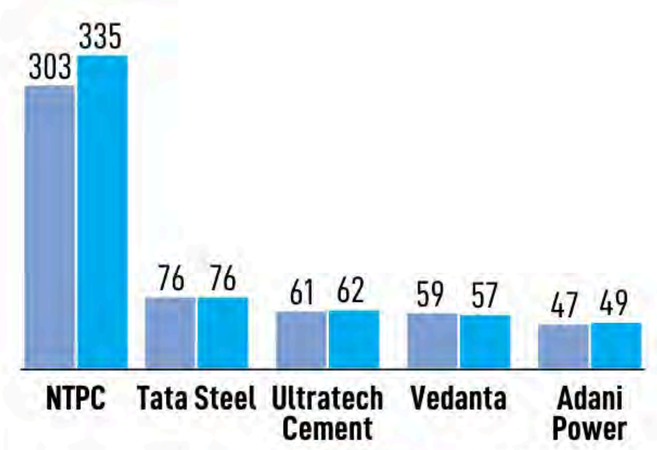
Greenhouse emission

Total Scope 1 emissions in FY23 (million tonnes of CO2e)



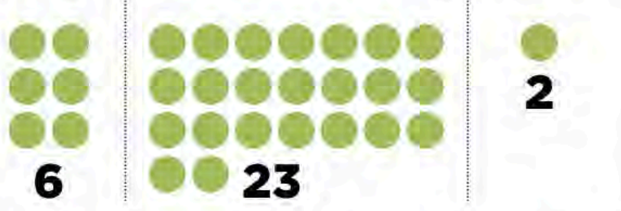
SOURCE primeinfobase.com

Who emits most



SOURCE primeinfobase.com

When will companies hit net zero targets?



31% companies disclosed net zero targets

Note: As per BRSR data in FY23

SOURCE PwC

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A Patient Strategy

Even as its competitors were folding up operations in India, Mercedes Benz persisted. Three decades after it first came to the country, India's largest luxury carmaker is moving from chasing volumes to focusing on top end of the pyramid

By MANU BALACHANDRAN

They say patience is a virtue. And it most certainly has been for German luxury automaker Mercedes Benz in India.

The carmaker is among the oldest in the Indian automobile landscape, having come to Indian shores some 30 years ago, as the country opened up its economy. Mercedes's obvious bet then was to appeal to the monied and newly minted millionaires, who had long been deprived of global luxury cars, having to make do with the likes of Maruti Suzuki and Hindustan Motors' Ambassador.

The Stuttgart-based automaker brought its globally acclaimed W124 in 1994, importing it through a partnership with the Tata Group, and retailed it for around ₹20 lakh.

Decades later, even as other carmakers from the US, Germany, and South Korea, who came to India around the same time as Mercedes, folded up, the German automaker held its ground choosing instead to set up an assembly plant in the country. It's another story that the carmaker's chief rivals, BOMB and Audi, took another decade to understand the growing potential in India before it set foot in the country.

"We use a term called 'strategic patience' and the 30 years in India

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ANIRUDHA KARMARKAR FOR FORBES INDIA

In the driver's seat: Santosh Iyer, MD & CEO, Mercedes-Benz India Pvt. Ltd

is a clear reflection of our strategic patience in India," says Santosh Iyer, the first Indian CEO to head Mercedes Benz India. "We believed in India and between 1994 and 2009, it was more of flat growth. But we invested in our plant and that shows the clear commitment to the market."

The gamble has long paid off and today, Mercedes has emerged as India's largest luxury automaker. In 2023, Mercedes Benz India sold over 18,000 vehicles compared to some 14,000 by BMW and around 8,000 by Audi. "With experience, we have gained a lot of insights into the market and the consumer," Iyer says.

Last month, the company launched two models, the sedan, Mercedes-AMG S63 E Performance 'Edition 1' and the Mercedes-Maybach GLS 600 SUV. The AMG S63 E Performance is priced at ₹3.3 crore, while the GLS is priced at ₹3.35 crore, in a country where the per capita disposable income stands at ₹2.14 lakh or about 1/15th the price. The two launches are part of 12 launches planned for the year, of which more than 50 percent will be in the top-end vehicle segment.

In that also lies the journey of the transition underway at Mercedes, from chasing volumes in the growing luxury segment to focusing on what it likens to tapping the top of an inverted diamond. "The growth over the last 15 years, from 3,000 units to 18,000 has come with a lot of India-specific moves and we are trying to slowly grow and cultivate the market," says Iyer.

In all, Mercedes sells a little over 2 million cars annually, of which India only offers a minuscule fraction. The country is currently the fifth largest in the Asia Pacific region and is expected to emerge as the third largest in the region, overtaking the likes of Turkey and Australia as wealth in the world's fastest-growing economy surges.

"Mercedes has consistently launched new models tailored to Indian preferences and market conditions," says Harshvardhan Sharma, head of auto retail practice, Nomura Research Institute. "The strategic local assembly of key models has made them more affordable. There are also their customer-centric initiatives, such as flexible financing options, buyback schemes, and robust after-sales service that have built strong customer loyalty."

Growth Story

In 2023, Mercedes Benz India sold over 18,000 vehicles
compared to some 14,000 by BMW and around 8,000 by Audi in India

The Indian luxury car market is expected to grow
from $4.14 billion in 2022 to $7.38 billion in 2029

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Mercedes-AMG S63 E Performance 'Edition 1', and the Mercedes-Maybach GLS 600 SUV.
The AMG S63 E Performance is priced at ₹ 3.3 crore, while the GLS is priced at ₹ 3.35 crore



Mercedes's average selling price stood at ₹ 57 lakh pre-Covid-19.
Today the number stands at ₹89 lakh

The E-class is the company's largest-selling vehicle

Mercedes came to India in 1994 with its highly acclaimed W124, importing it through a partnership with the Tata Group, and retailed it for around ₹ 20 lakh

GOING ALL OUT

Since it set foot in India in 1994, Mercedes has seen its fair share of ups and downs.

It dominated the luxury market in the early part of the millennium, largely because foreign luxury brands stayed away from India, and Mercedes remained aspirational for a new generation who had begun to prosper. Then, with the onslaught of BMW and Audi, Mercedes fell far behind in customer preferences. The automaker had fallen to the third spot in the luxury vehicle market in the early part of the last decade. "When I joined this company, we had new rivals in the marketplace and we were slipping and then we slipped to number two and then three," says Iyer, who joined Mercedes in 2009.

He had come to Mercedes after stints at various multinational automakers including Ford, Toyota, and Yamaha. He had also briefly dabbled in an entrepreneurial venture while in Nepal before his return to India. When he joined Mercedes, Iyer was put in charge of marketing functions, a role that he says expanded over the past decade into numerous segments such as spare parts and customer service. In 2023, he was made in charge of

"Mercedes has launched new models tailored to Indian preferences and market conditions. The local assembly of key models has made them more affordable."

HARSHVARDHAN SHARMA,
HEAD OF AUTO RETAIL PRACTICE,
NOMURA RESEARCH INSTITUTE

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INFOGRAPHICS: MUKESHA SINGH

Mercedes Benz India, the first time that an Indian took over the reins of the fabled automaker in the country.

"I don't think I am a CEO for Mercedes Benz India because I'm an Indian," Iyer says. "Nationality brings a lot of local knowledge, but the company believes in meritocracy. Last year more than 50 percent of my attrition was to Mercedes Benz companies, whether it is in Stuttgart, Singapore, Malaysia, or Thailand." Mercedes Benz India operates with over 1,100 employees, which includes workers at the plant in Pune.

Since he joined, Mercedes has seen its sales grow from about 2,800 vehicles per annum to a little over 18,000. At the centre of this surge is the company's decision to focus on India-centric vehicles, in addition to setting up a non-banking financial company, which has played a crucial role in purchases. "So, it's a combination of the car-specific products that we have launched and a combination of unique financial service offerings, a different direct-to-consumer retailing model, and what we are doing in local manufacturing," Iyer says.

And there is still a lot to play for in the Indian market, considering how the luxury market is expected to grow in the next decade. The Indian luxury car market is expected to grow from $4.14 billion in 2022 to $7.38 billion in 2029, growing at a CAGR of 9.74 percent, according to market research firm Mordor Intelligence. Much of this is led by growing urbanisation and changing preferences in the country.

"The Indian luxury car market is estimated to be around 1 percent of the total car market, but it has been growing steadily," says Sharma of Nomura. "The market size is expected to reach around 50,000 units annually soon. With increasing disposable incomes, urbanisation, and a growing appetite for luxury goods among the younger demographic, there is significant growth potential for Mercedes."

THE INDIA TWEAKS

Today, the company's best retailing model is the E-class sedan, a sixth-generation version of the E-class that was introduced in 1953.

Launched in 2017, after 48 months of development, India was the first country where Mercedes offered a long-wheelbase right-hand drive variant. "India has a lot of backseat dedication," Iyer says. "A lot of consumers drive cars on weekends, but on weekdays they still have drivers because of parking issues or long commutes, and we completely recognise that. India was the first and only market in the world to have a right-hand drive, long-wheelbase E-class."

The car is the largest selling in Mercedes Benz India's portfolio and its success is a clear reflection of product strategy influencing sales volume growth. Others, including BMW and Audi, still do not have a similar option.

That apart, the company has also been dabbling with numerous tweaks for the Indian market, including options to switch off its ADAS features, a standard offering globally, considering Indian road and traffic conditions. Mercedes was also the first luxury carmaker to offer connected cars in India, and now boasts some 80,000 such cars on the road.

But a game-changer of sorts has been the financing side. Forty percent of Mercedes Benz cars sold are financed by Mercedes Benz Financial Services. In all 80 percent of the cars sold by Mercedes Benz is through finance. "We have a unique financial product because the customer doesn't have to pay the full price of the car," Iyer says. "We take a residual value guarantee on a portion of the car and only on the balance, the customer pays an equated monthly installment [EMI] for 3 years, and at the end of 3 years there are options for refinancing the car or selling it back to us."

In the process, Mercedes has also been actively playing a role in pushing the price of its second-hand cars in the country. Take, for instance, the Mercedes Benz GLC. In 2020, ahead of Covid-19, the GLC 200 Progressive variant cost ₹52 lakh in New Delhi with the on-road price at around ₹60 lakh. Four years later, the new variant of the GLC costs ₹77 lakh, with on-road prices going up to over ₹90 lakh. That's a price hike of ₹25 lakh in four years.

The rising prices have also meant that those looking to buy an older version of the Mercedes GLC inevitably must cough up similar prices to the selling price in 2020. For the seller, the loss isn't as heavy as it used to be in the past. For instance, on OLX Auto, a 2020 version of the GLC now averages around ₹50 lakh while a 2021 variant now sells for over ₹55 lakh.

"The residual value of a product



The Mercedes Benz E-class is the largest selling car in the company's portfolio in India

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In 2020, the GLC 200 Progressive variant cost ₹60 lakh (on-road) in Delhi. Today, its new variant costs ₹90 lakh (on-road)

is determined by the desirability for the brand and the product," Iyer says. "So, the fundamental responsibility for us is to keep that desirability high for the brand and for the product as well. Secondly, we are not into the discount route. This is a fundamental strategic difference compared to many other players in the market, which also means that you guard the resale value of the customer who is buying the car."

"Higher new car prices can positively impact the residual value of used Mercedes vehicles, making them attractive in the second-hand market," says Sharma of Nomura. "However, it could also push some potential buyers towards certified pre-owned vehicles instead of new purchases."

Over the past few years, the German automaker has moved to a direct-to-consumer sales model that allows customers to buy the cars from the brand rather than from a dealer. This is in stark contrast to the existing system, where car makers sell their products to dealers, who in turn retail the cars to the end consumers.

"The customer doesn't get transparency on price because two dealers in a market can operate at different pricing based on discounts on their targets or their inventory," Iyer says. "This was affecting residual value and purchase experience. What we have done is a paradigm shift."

GROWING WELL

All this means the automaker has had a few good years now. "Our average selling prices have gone up," Iyer says. "We used to operate at an average selling price of ₹57 lakh pre-Covid-19. Today we are at ₹89 lakh, and the most critical aspect is the right mix of cars. The company's current portfolio includes sedans across A, C, E, and S Class while its SUV range boasts the entry-level GLA to the GLS, which starts at ₹1.3 crore. There is also the Maybach, Cabriolets, and Coupes.

"We are selling more top-end vehicles," Iyer says. "Earlier the contribution of top-end vehicles was 15 percent. Today 1/4th of our sales are top-end vehicles, pushing average selling prices higher." SUVs today contribute 55 percent of the brand's total sales, with about 56 percent vehicles sold being diesel. Electric vehicles account for 4 percent with petrol vehicles contributing to the rest.

In the process, the Indian retail price is also inching closer to the global average selling price of a Mercedes which is roughly $105,000, (about ₹89 lakh), pulling India into a mature luxury market. Much of this has been due to the changing demographics with more women and young buyers in the market. "Earlier, 7-8 percent of our sales used to be women," Iyer says. "Now, it's 15 percent. When I look at the salaried class, it used to be 7-8 percent and now it has gone up to 12 percent, which means corporate India is earning and distributing well." Today, the average age of a Mercedes Benz buyer is 38 years.

This year, the company will spend another ₹200 crore on expanding business in India, taking its total investments to ₹3,000 crore so far. It has also decided to follow a tactically flexible approach when it comes to electric vehicles (EVs) as customer preferences and market conditions are likely to determine the pace of transition. The automaker had earlier announced a pullback on its EVs targets globally as rate of growth slows down. EV transition has seen something of a slowdown in India too in the past few months as charging infrastructure struggles to cope while hybrids have begun making inroads.

"From a strategic perspective, it's not the volumes but the quality of the market development that we are very positively happy about," Iyer says. That means focusing heavily on what it calls an inverted diamond. "At the top, it is much bulkier. And as it goes down, it is much more pointed. So that's a global strategy. We are a luxury brand, and we need to behave like one and act like one. Our shareholders expect more value to our consumers with a focus on the top end of the pyramid, the core luxury than on the entry-luxury."

From introducing luxury to upping the game, Mercedes has done it all in India in three decades. If history is anything to go by, it's only likely to remain the gold standard in the Indian luxury automobile world for years to come.

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Unlocking the Secrets that Make Users Tick

Digital brands are counting on behavioural science to figure what customers want, solve their pain points and earn their trust

By VANSHIKA RANDEV

Imagine this: After weeks of back and forth, you're booking a trip, but have to sift through endless stays unsuitable to your budget and preferences. Or it's the morning of an early flight, and you're running late because two cabs cancelled on you. Or you're giving dating apps a try, only to be 'spoilt for choice' with incompatible matches. You picked up your device for a quick-solve, but left feeling frustrated.

Poor design and unnecessary features—among pain points more fundamental to a brand's operating model—can push users away or stop them from coming back. Behind the scenes of a smooth user experience are brands hard at work to understand what makes users tick. They identify challenges and motivators, and ask the question: How do we optimise this product or service for enhanced, lasting engagement?

Prakash Sharma, co-founder of 1001 Stories, a behavioural science and context architecture consultancy, shed light on this. "Here's the guiding principle while designing—provide the right options to the right people at the right time." Highlighting how people disapprove of cluttered interfaces and being bombarded

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BluSmart's strategic approach to attract potential riders is rooted in behavioural insights

with constant notifications, he asked, "Why are we still doing things that our users dislike?"

Another leading behavioural scientist, Anand Damani, adds, "Simplicity is the ultimate sophistication in terms of user experience." He broke down what lay at the core of this journey, explaining that brands need to find the perfect combination of motivation and the ability to act, or ease, to encourage users to take the desired action.

With India witnessing a gradually expanding and evolving market of behavioural science adoption across domains over the last decade, with expectations of growth in the next, let's deep-dive into how different brands and businesses decode user preferences and unlock secrets to retention in an era of both rapidly thriving and declining digital solutions.

COMMUTE: GOING GREEN OR BLU?

Many can instantly recall a frustrating experience with a ride-hailing service. BluSmart, India's first and largest zero emission, all-electric ride-hailing service, was introduced in 2019 as a sustainable, reliable and safe alternative. The brand sought to address some of the challenges plaguing Indian riders, with majority of its audience in the 25 to 45 years age range, primarily including officegoers, as well as pregnant or young mothers booking rentals who plan their office pick-ups and drops alongside school or day care pick-ups.

"At BluSmart, our aim is to design the ride experience in a manner that reduces pain points and creates a more relaxing experience," says Anirudh Arun, co-founder & CEO, BluSmart Fleet. What are these pain points? One that Anirudh stressed on was the unreliable assignment of cars. "On-demand apps would take anywhere from 15 minutes to upwards of 30 minutes to assign a car. There was no predictability in terms of availability and arrival timing."



Ankit Khanna, chief product officer, Hotel, Growth & Emerging Businesses, Makemy Trip

Another was the unwillingness of drivers to fulfil trips due to distance and payment mode. Anirudh also underscores the need for opaque pricing. "Ride-hailing applications have dynamic surge, and pricing is variable dependent on supply and demand factors, which are often not transparently shown. The same route might cost 2x on a rainy day, which is unfair to the user and adds to the cognitive load of checking for pricing."

Further, Anirudh claims that existing ride-hailing cars pay little to no attention to cleanliness. Considering that an average of 60 to 80 minutes is spent travelling daily in cities like Delhi NCR and Bengaluru, he discussed their focus to make the commute easy and hassle-free. BluSmart riders' average trip distance is higher than other players, suggesting that customers travelling long distances prefer using it.

BluSmart's strategic approach to attract potential riders is rooted in behavioural insights. While it boasts India and South Asia's largest electric fleets and noted a growth in eco-conscious customers proactively looking for sustainable travel options, BluSmart did not stop at positioning itself solely as a green option. Instead, it bet on what Indian riders emphasised more: Timeliness, reliability, safety and cleanliness. Anirudh explains, "These insights from existing norms in ride hailing is what BluSmart set out to solve for, introducing industry-first propositions such as zero cancellations, transparent pricing, and before or on-time arrival."

This, however, doesn't mean that it doesn't highlight its sustainability efforts. "With growing concerns of fuel costs and impending effects of climate change and global warming," says Anirudh, "electric vehicles were the right choice to be adopted for a new-age ride-hailing service." Over 90 percent of BluSmart's riders experienced an electric ride for the first time through the company, which has completed 430+ million clean kilometres since inception, touching over 12 lakh unique riders. He also outlined a nudge they developed—a C02 tracker reminding riders of the CO2 and fossil fuel consumption saved after each trip, promoting a 'good deed of the day'.

Over 50 percent of BluSmart's rides are scheduled by the night before. In an era where on-demand options are rampant, Anirudh emphasises how the brand's scheduled travel

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leads to a planned, predictable travel experience. It also offers a 'Recurring Ride' option to schedule a month of commute or airport travel. Airport journeys, which are typically early mornings or late nights, form 20 percent of BluSmart's overall trip mix—which is higher than for other mobility players. The brand also caters to riders needing transport for certain durations, such as to attend meetings or run errands, with its 'Rental' category.

BluSmart doesn't alienate users with unplanned travel needs either. It introduced an 'Express Ride' feature, where cabs arrive in 20 to 30 minutes. This also optimises assignments for driver partners, supporting them with higher trip completion and improved earnings. Apart from regular riders, the brand also engages with corporates, with many opting for emissions-free travel services for their employees. BluSmart's B2B arm has tied up with over 400 multinationals, including Zomato, Apollo Tyres, and more.

Thoughtfulness underlies its innovations—its application interface is practical and intuitive. Further, as a safety measure, its cars deploy telematics with voice alerts notifying driver partners at regular intervals for speeding. The brand's appeal to its audience is evident, with Anirudh noting the average wallet load is 3-4x the amount of an average ride, indicating "the stickiness and long-term intent our customers have in availing our services".



Anirudh Arun is co-founder & CEO, BluSmart Fleet, which has completed 430+ million clean kilometres since inception

TAKING THE PATH MORE TRAVELLED?

The ordeal of travel bookings can be a frustrating process (similar to an endless game of Monopoly). MakeMyTrip aims to make these experiences as simple and stress-free as possible. "With over 24 years in the industry, we've honed our expertise in understanding travellers' needs and anticipating their changing preferences by leveraging our extensive data pool," says Ankit Khanna, chief product officer-hotel, growth & emerging businesses, MakeMyTrip. He highlights their goal to empower customers to make the best decisions for their next adventure through personalised features and thoughtful design choices.

One trend they've kept an eye on is flexibility, which today's fast-paced travellers crave like never before. Recognising that plans can change in the blink of an eye, the brand introduced a 'Book with Zero Payment' feature. "Picture this: You get to lock in a tentative itinerary with confirmed booking without having to shell out money right away or having to worry about cancellation charges." MakeMyTrip also found that the demand for flexibility extended to accommodation, such as accounting for early arrival, which is why it introduced Flexible Check-in.

Khanna also noted how travel behaviour has evolved, especially owing to the pandemic. One immediate shift was in how travellers viewed hotels, "not just as a place to crash, but as destinations in themselves". He adds, "At MakeMyTrip, we were quick to recognise this trend and introduced Staycations, curated selections of nearby properties that cater to the desire for local getaways." Alternative accommodation options—like villas and homestays—also became mainstream options post-pandemic. Additionally, it leveraged the 'domestic discovery' trend with the offering, 'Incredible India Incredible Prices'. This tells travellers when flight fares to destinations of their

BAJIRAO PAWAR FOR FORBES INDIA

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interest, whether wildlife or the mountains, are most economical.

He highlights another transformation they've observed: Now, travel is seen as "essential and to be undertaken at every given opportunity". Exemplifying this, Khanna adds, "Our recent India Travel Trends Report showed a 25 percent increase in the number of Indians taking over three trips in 2023 as compared to 2022." Encouraging this, MakeMyTrip uses AI (artificial intelligence) to curate recommendations and give travellers trip ideas at opportune moments.

When it comes to event-related travel, user behaviour trends during the World Cup and Lollapalooza were also fascinating. "These occasions tend to draw travellers who are meticulous planners, often booking their trips well in advance—sometimes up to a year ahead," Khanna notes. Harnessing data science to deploy predictive models, MakeMyTrip anticipates high-demand periods and nudges customers to book in advance.

It also assesses factors that people consider when deciding where to stay. "We recognise that proximity to prime spots and easy access to transportation are key factors for most," says Khanna, which influenced them to provide distance-related details. It also offers personalised rankings of top properties. Anand highlighted the power of personalised labels, noting how vacation rental companies similarly apply behavioural science principles. "For example, Airbnb uses decision-making shortcuts like 'rare find' to suggest to users that a stay is great. It builds scarcity, and users are likely to feel lucky and also, to an extent, believe that they had some role in 'discovering' the rare find."

"And let's not forget about decision automation," Khanna adds. MakeMyTrip has all-inclusive deals to encourage people to stress less about the details, and label introductions for hotels like 'Preferred by Indians', signalling to travellers that it met other Indian travellers' parameters.

Khanna also emphasises the role of leveraging tech, discussing how analysing consumer behaviour trends have been crucial to shape interventions and improve user experience. "We pay close attention to changes in content consumption. For instance, to adapt to shorter attention spans of consumers, we harnessed the power of Generative AI," by selecting information most critical to the traveller—like details of kid-friendly activities if they are travelling with children. It also utilises AI technology for user accessibility and convenience, especially beyond Tier III cities, such as with its voice-based AI chatbot for flight bookings, which supports multiple languages.

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Behavioural scientist Anand Damani says brands need to find the perfect combination of motivation and the ability to act, to encourage users to take the desired action

MADHU KAPPARATH

SWIPE LEFT, RIGHT, OR UP?

Making meaningful connections online can be tricky, and dating apps come with their unique challenges. "Bumble was founded in 2014 as the solution to what our founder, Whitney Wolfe Herd, believed was broken in relationships," explains Lucille McCart–APAC communications director, Bumble. Wolfe Herd recognised that all the products on the market prior to Bumble were focussed only on the experience of men, leaving room for disruption. Prakash Sharma acknowledged this gap, too. "Dating apps have made it easy for heterosexual men to signal interest using swipes with almost no effort. Women, as a result, are overwhelmed with the choice overload."

With the goal to centre women's experiences, the brand set out to address two fundamental issues: Antiquated gender norms and the disempowerment of women, as well as the toxicity and lack of accountability online. Its features are designed to encourage members to build better profiles and initiate positive conversations, while giving them more control of their experience. Recently, Bumble also introduced an updated compatibility algorithm, 'Opening Moves', as a strategic refresh to lessen the pressure on women, allowing

them to set prompts which men can respond to, starting the conversation. With these steps, Bumble aims to make dating fun again, while creating a world where relationships are safe, healthy and equitable.

The evidence of its effectiveness is in, too: Globally, millions of people have found connections on the app. McCart adds, "We launched Bumble in India in 2019 and since then, we've seen promising growth in key metro cities, including Mumbai, Delhi, Bengaluru and Pune. Post-pandemic, we have witnessed an increased rate of adoption in Chandigarh, Ahmedabad, Chennai, Hyderabad and Kolkata, to name a few."

Bumble also recognised that meaningful connections of all types are essential to a healthy, happy life. Bumble For Friends was introduced after observing that people are using their dating profiles to form non-romantic connections, like finding a roommate or making friends after a move. Bumble Bizz also offers an option for professional networking.

To uncover the nuances of dating in India, the brand also looks to what its users feel. Case in point: Bumble's annual dating trends report found that 65 percent of Indian women surveyed found it a turn off if someone they are dating is not aware of current societal issues, and 69 percent of Indians surveyed are more attracted to someone who actively engages in societal issues. Bumble's features—such as Interest Badges—allow people to declare not just their interests but also what they stand for, and with these interests and values easy to identify, it can make finding compatible connections one step easier. In fact, research suggests this too: Studies suggest that sharing more information on your profile significantly increases your likelihood of finding a match. In particular, adding Interest Badges, sharing details about exercise habits, and more, can boost your match potential by up to 96 percent. More so, completing your bio can lead to a 41 percent increase in monthly average matches.

On dating apps, making the experience smoother for users is also about making it safer. "Safety has always been a top priority for us. We've been deploying machine learning to enhance our focus on user safety for a long time now," McCart says, discussing how the brand's built-in-house AI features enable them to train models on its proprietary data.

It also launched a system to prioritise severe safety reports and shorten response time. Another new feature—Deception Detector™—is a fast, reliable machine learning-based approach to assess the authenticity of connections and tackle online misconduct, including handling inappropriate images. Within its first two months, internal testing noted that this feature reduced reports of spam, scams, and fake accounts by 45 percent—a significant outcome to safeguard users.

"Those not using behavioural science are losing out on powerful psychological techniques that can improve user experience."

THE PULSE ON THE FUTURE

Brands must spearhead efforts to create a seamless user experience to drive user engagement. Behavioural science plays an important role in understanding the pain points and factors that create delight for users, says Anirudh. "Our operations, customer experience, and application development are built upon strong user insights, and behavioral science is integral to our approach of designing an elevated travel experience for both our riders and driver partners." Khanna echoes these sentiments. "Through meticulous analysis, we continuously strive to gain insights, detect patterns, and offer experiences tailored to individual behaviours."

Highlighting a fresh way to look at behaviour change, Sharma discussed his team's concept of 'Fail Thrice', suggesting that it took people overcoming three dips in exercising regularly to identify themselves as someone committed to fitness. This can apply across various domains—and there's immense potential in evaluating behaviour from this lens. "For example, BluSmart can analyse how many rides within what time frame would convert a new user into an advocate, and design interventions towards this goal."

At the same time, Sharma warns against the dangers of applying interventions universally. Taking the example of AI-driven chatbots for customer service, he asks, "When do you think customers prefer chatbots and when would they want a human being instead?" He offers a glimpse into preliminary findings based on his research, suggesting it is not equally welcome everywhere. "A BookMyShow will definitely benefit, but a bank? That remains to be seen." However, he remains optimistic about the growing adoption of behavioural science across fields, from quick commerce and FMCG to BFSI, health care, and edtech.

Commenting on the potential of the sector, Damani discusses how businesses can use behavioural science to get consumers to try (acquisition), buy (retention) and upgrade (upsell) their products and services. "Those not using it are losing out on powerful psychological techniques that can improve user experience, build trust, increase revenues, and improve team member performance and happiness. Not using behavioural science is like not claiming money that's already yours," he says.

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Rocking the Boat

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Battered by the onslaught of a sea of clones, knockoffs and price warriors, homegrown wearables and audio biggie boAt finds itself in choppy waters. Can the leader arrest an alarming slide in its market share?

By RAJIV SINGH

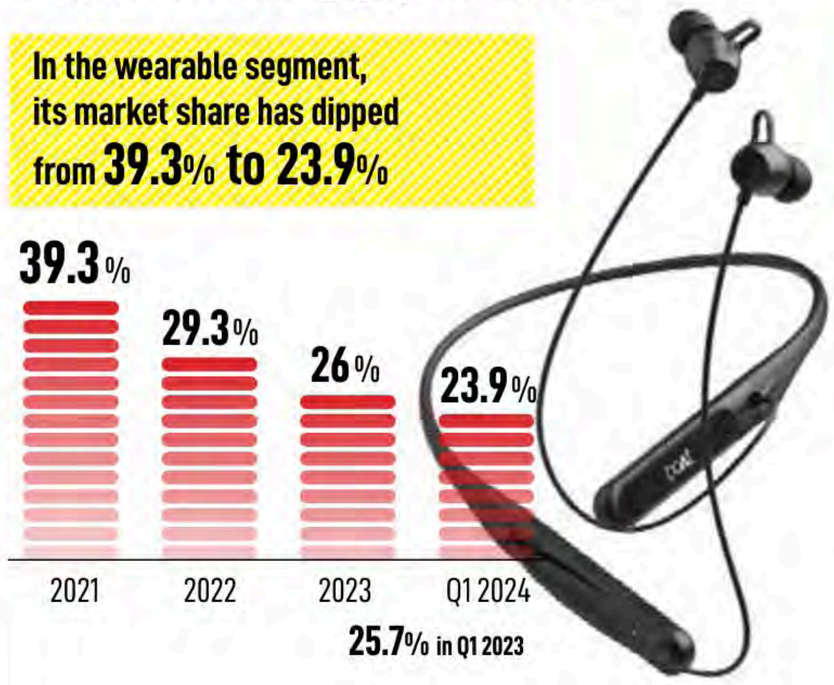
Have you seen *Pirates of the Caribbean*," the seasoned tech analyst posed an intriguing counter-question. "How do you explain the mayhem in the wearables and hearables market in India?" was the original query with which I started the conversation. Can *Pirates of the Caribbean*, I wondered, explain the dramatic crash—over 50 percent—in the prices of smartwatches, truly wireless stereo (TWS) and wearables segments over the last 12 months or so? The analyst, who has been closely tracking the Indian smartphone, smartwatches, and hearables and wearables markets for over a decade, takes us back to 2019.

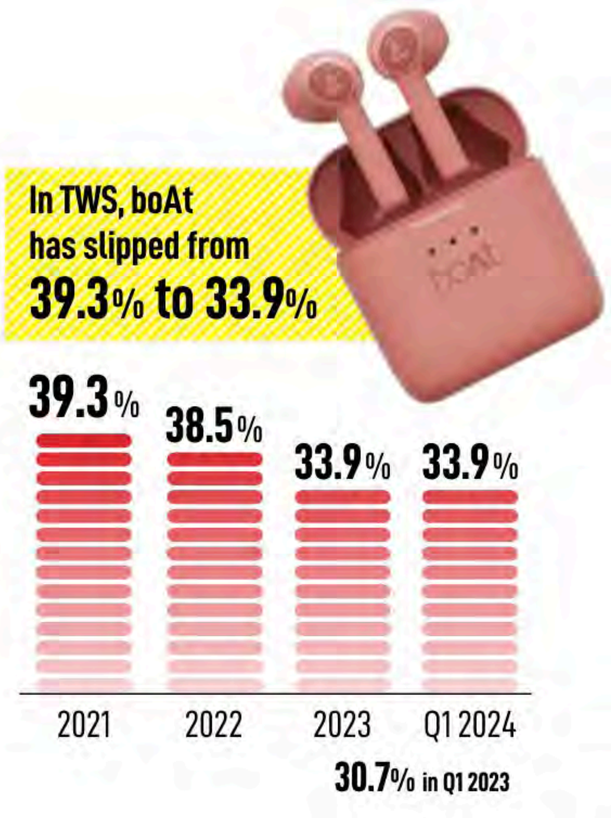
Look at the market share of the three established brands. Apple topped the chart with a thumping 27 percent share in the hearables segment, JBL came third with 8 percent, and South Korean giant Samsung was fourth on the ladder with 7 percent. "The market grew furiously, the leadership stacking was settled, and the Indian market was poised to explode," underlines the expert, requesting anonymity as his job profile with a top-tier consulting firm prevents him from commenting on individual brands. 'The market was set to explode," he says.

And the markets did explode over the next four years. In 2023, the wearables market posted a record growth: 134.2 million units, and a hefty 34 percent growth. Apple lost the crown and doesn't even have a double-digit market share, JBL slipped out of the reckoning, and Samsung is not a force to reckon with. So, what went wrong for the global brands? "Blame it on the 'pirates'," reckons the analyst mentioned above. In 2019, he talks about an upstart that raced ahead of JBL and Samsung to become the second biggest after Apple, and India saw the emergence of a bunch of pirates. "Noise came second with a 12 percent market share," he says, adding that a clutch of homegrown players such as boAt and Noise had stormed the market as price warriors, democratised the segment by making smartwatches,

CHAITANYA DINESH SURPUR

boAt: In Choppy Waters?







wearables and hearables affordable, and quickly displaced the market leaders. "The aggressive new Indian players acted like pirates," he adds.

Fast forward four years. Noise is still the second biggest with a 13.8 percent share in the wearable market (see box). The other four among the top five are boAt, Fire-Boltt, Oppo and Boult Audio. "But now we have a bunch of new and unknown pirates such as Promate, CMF, Hammer, Hapipola and Nu Republic," says the analyst. These insignificant players—most have under 1 percent market share but form a huge chunk when counted together—are doing what once boAt, Noise and others did to Samsung, Apple, JBL and Sony.

The playbook remains the same. Import from China or Taiwan, load the product with basic features—health tracker, calling, music control, voice assistant—and position it as a fashion accessory. The smartwatch, hearables and wearbles market has become a commodity where the cheapest takes the crown. What is turning out to be the bane of the market is a ridiculously low-entry barrier where smartwatches, smart bands and earbuds are available for as low as ₹201.

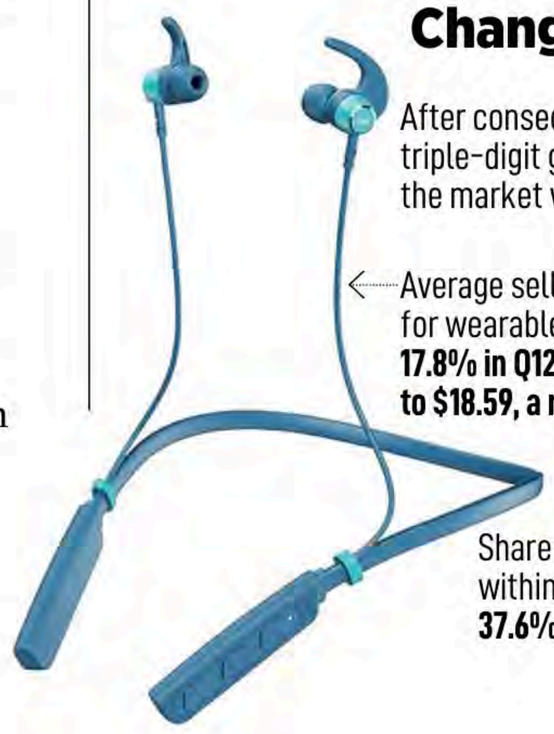
If one wants to buy a smartwatch under ₹1,000, Flipkart offers over 3,363 products. Forget the ASP (average selling price) of a smartwatch, which has tumbled from $42.5 (₹3,548) to $26.1 (₹2,179) during the first quarter of this year. Online marketplaces like Flipkart have smartwatches for as low as ₹201, and brands such as Isa Creators, Tarido, Braton and MVS. No wonder, the share of 'others'—brands under single digit or between 1 percent and 5 percent share—has bloated to over 40 percent (see box).

"boAt has repivoted its strategy towards wearables. Unlike other players, we don't want to play the price and heavy discount game."

GAURAV NAYYAR,
CEO, BOAT

The biggest collateral damage of the surge of 'others' is faced by market leader boAt, which once played the price warrior. Sample this. In October 2020, it launched its first smartwatch for ₹1,999. Now if one contrasts this with the price offered by Samsung and Apple back then—between ₹10,000 and ₹30,000—the Indian upstart did play the price warrior. In 2021, it had an imposing market share of 39.3 percent in the wearables segment. In the first quarter of 2024, the share plunged to 23.9 percent. If one does a likewise quarter-to-quarter comparison, then also there is a fall of 25.7 percent that it posted in the first quarter of 2023.

The fall, though, is steepest in smartwatches: From 25.1 percent in 2021 to 14 percent in 2023, and a new low of 7.3 percent in the first quarter of 2024. The corresponding quarterly



Changing Dynamics of the Wearables Market

After consecutive quarters of double-and triple-digit growth over the past few years, the market was flat in Q12024

Average selling price (ASP) for wearables **declined by 17.8% in Q12024, from $22.62 to $18.59, a record low**

Share of smartwatches within wearables **dropped to 37.6% from 41.4% in Q12023**

Smartwatch ASPs **dropped to $20.65 from $29.24 a year ago**

Share of advanced smartwatches **increased from 2% to 3.2%**

Top three OEMs' combined market share **dropped to 66% from 77% a year ago**



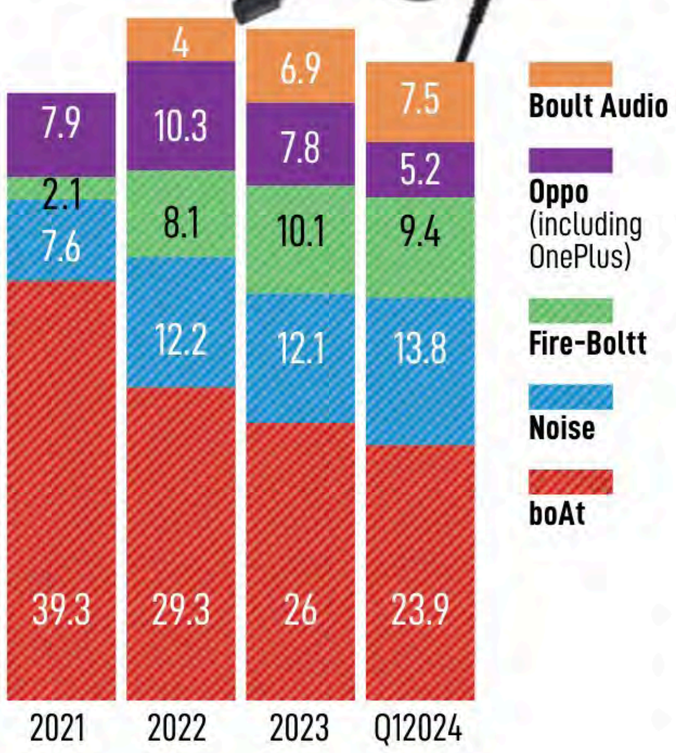
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Top Five Wearables Companies

Market share (%)



number stood at 17.5 percent in 2023.

Experts blame the long tail. "The growing popularity of non-branded watches is impacting the incumbents," underlines Anand Priya Singh, market analyst (wearable devices) at IDC India. They (non-branded products) offer cheap alternatives to popular models, and are bundled with multiple watch straps, explains Singh. The collective share of the top five players—boAt, Noise, Fire-Bolt, Boult, and Oppo—has declined from 63.9 percent to 59.9 percent, and the long tail of smaller vendors has gained share.

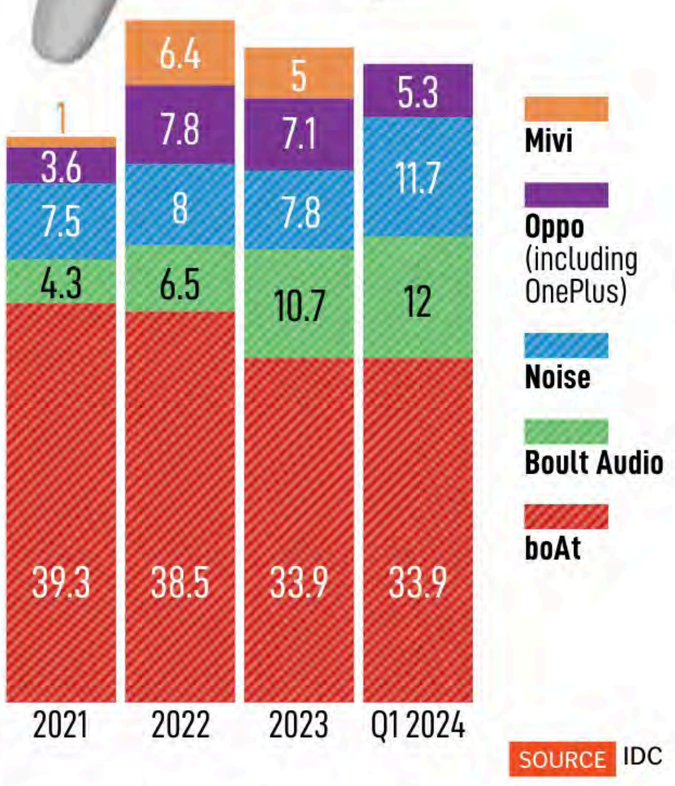
The overall market, registering a double- and triple-digit growth over the last couple of years, remained flat in the first quarter of 2024. Consumers, says Anshika Jain of Counterpoint, are not warming up to buy a new smartwatch or replace an existing one due to low differentiation in terms of features and limited innovation in the market. "The combined market share of the top three players has fallen from 77 percent in Q12023 to 66 percent in Q12024," points out Jain.

Jain explains why boAt is feeling the heat. Its market share in smartwatches has dipped due to aggressive competition at lower price points, and frequent product upgrades done by other brands. There is also a slowdown in consumer demand due to limited differentiation and falling replacement rates, leading to inventory issues and price cuts. "The market is slowly getting saturated with players realigning their strategies towards other product categories," she says, adding that while consumers perceive smartwatches as a fashion accessory, hearables are still perceived as consumer tech products.

The market leader is gearing up to face the threat. "boAt has repivoted its strategy and playbook towards wearables," underlines Gaurav Nayyar, chief operating officer of boAt. "Unlike other players, we don't want to play the price and heavy discount game to retain market share," he reckons, adding that the Indian wearables market has witnessed a massive price crash over the last year.

Top Five Truly Wireless Stereo (TWS) Brands

Market share (%)

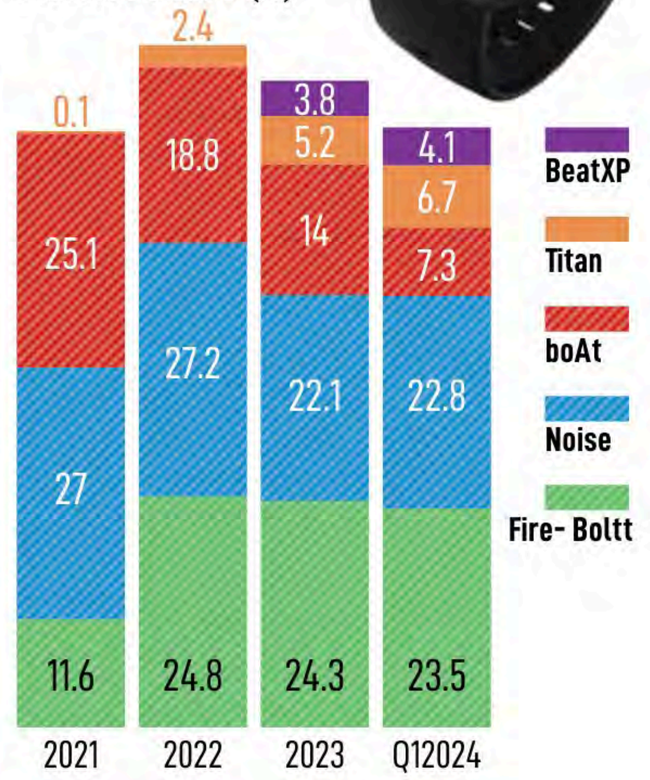


SOURCE IDC



Top Five Smartwatch Brands

Market share (%)



Can boAt navigate the choppy waters? Most of the players, claims Nayyar, are burning money to acquire consumers, which is unsustainable. "We are reassessing our playbook and strategy, and overhauling our approach to wearables," he says.

Nayyar outlines boAt's strategy. "Our focus is to build a software-led ecosystem for smartwatches and provide differentiated experiences and features," he says. The brand is transitioning towards a consumer segment that values superior experiences over price considerations, hardware and advanced algorithms to cater to their discerning preferences. "It is a loss in market share. Over the next couple of quarters, the market will stabilise," he adds.

Nayyar outlines boAt's strategy amid this scenario. "Our focus is to build a software-led ecosystem for smartwatches and provide differentiated experiences and features," he says. Can boAt survive the storm? Well, it all depends on how fierce the 'pirates' are, and how proactive the market leader is in facing the threat. F

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Meat of the Matter

Last October, Popeyes overtook KFC to become the second-biggest fried chicken chain in the US. The upstart has aggressively ramped up its footprint in India over the last two quarters. Can it challenge the might of Colonel Sanders here?

By RAJIV SINGH

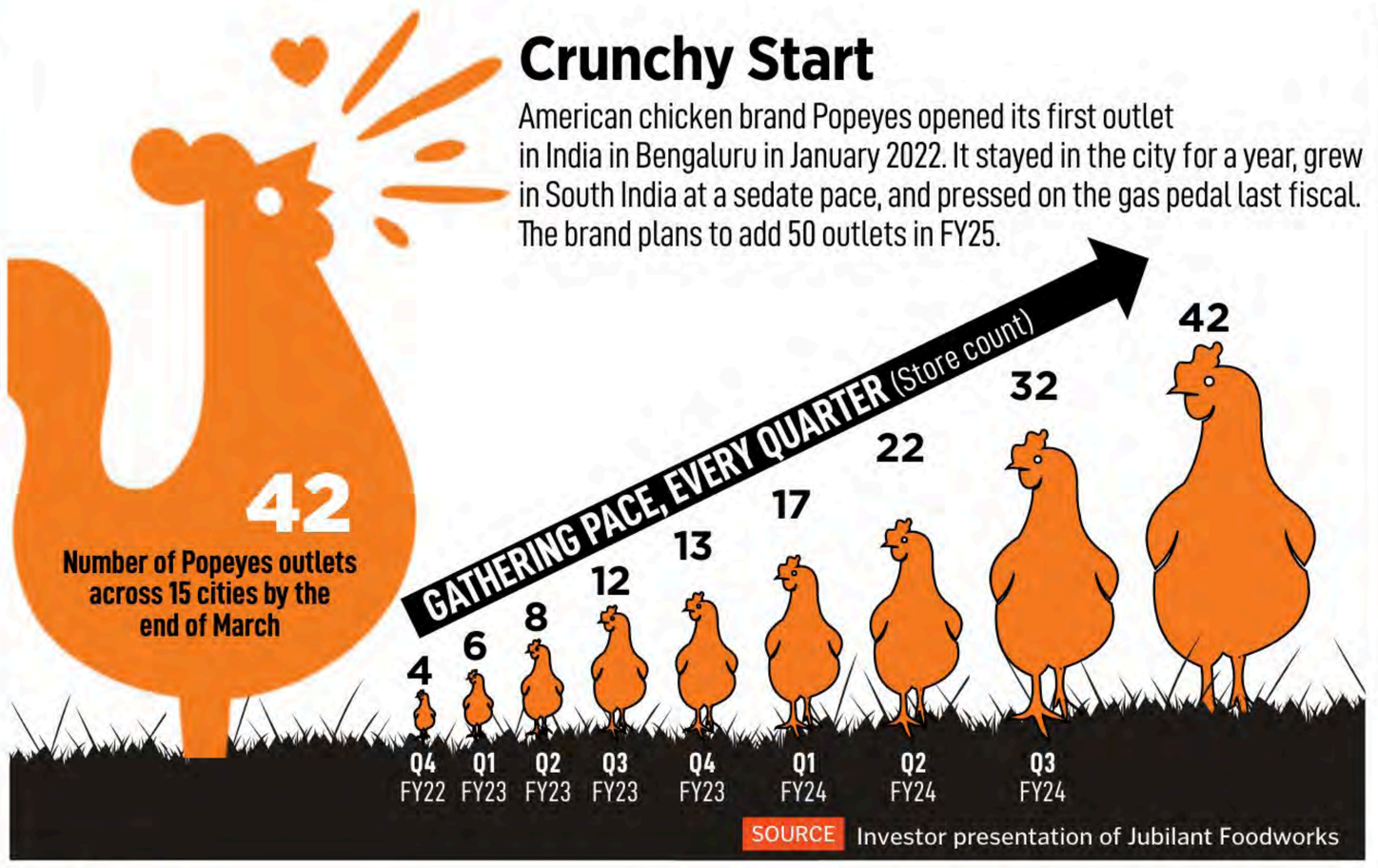
MADHU KAPPARATH

Gaurav Pande starts the 'crunchy' conversation by underlining an elementary rule: Don't count your chickens before they hatch. Interestingly, the executive vice president and business head of Popeyes India counted his chickens for 12 months before deciding to step out of Bengaluru. Launched by Domino's Jubilant FoodWorks—the master franchise of Domino's and Dunkin in India—in January 2022, the Louisiana fried chicken brand remained confined in the QSR capital of India for over a year and then moved into Chennai in February 2023.

Sixteen months later, the second-biggest chicken chain in the US has galloped to 42 outlets across 15 cities. "It takes time to win consumer experience," reckons Pande, who shares a not-so-secret



Gaurav Pande, executive vice president of Jubilant Foodworks and business head of Popeyes India





Popeyes' Global Footprint

Alvin C Copeland Sr opened the first Popeyes in the New Orleans suburb of Arabi in 1972. After a muted response, Copeland reopened his restaurant as "Popeyes" — named for Gene Hackman's police detective Popeye Doyle from the 1971 film The French Connection

Number of Popeyes restaurants globally **4,571+**

With 3,051 outlets, the US is the biggest market for Popeyes **3,051**

343 Canada is the second biggest with 343 outlets

333 Turkey comes third with 333 outlets

SOURCE Investor presentation by Restaurant Brands International February 2024; company

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formula behind the crunchiness of the Louisiana chicken brand. "We marinate chicken for 12 hours," he claims. Chicken, Pande lets on, is marinated in cajun seasoning, hand-battered, and breaded for the perfect shatter crunch. "We offer antibiotic-free, fresh chicken," he claims. "The chicken is marinated for 12 long hours," he reiterates.

Twelve months is what it took for Popeyes to step out of its first city. The sedate innings, however, has gathered pace over the last three quarters, and the brand plans to open 50 more stores in FY25. Interestingly, the medium-term target for store expansion is 250, according to the latest investor presentation by Jubilant FoodWorks. Pande decodes the urgency by explaining why the brand took an inordinate time to expand. "The first year was focussed on perfecting the product," he says, adding that despite being the second biggest in the US—Popeyes overtook KFC to become the second-biggest fried chicken chain in America last October—the brand was entering a new country.

A new country and a new brand needed a fresh approach. Sameer Khetarpal explains the differentiated strategy. "There were broadly four parameters to frame the expansion plan," says Khetarpal, who joined Jubilant FoodWorks as chief executive officer and managing director in September 2022. The first factor is demand. "We need to find if there is a chicken-eating market in that city," he underlined in the Q3FY23 earnings call in January. "So, 70 percent of Indians eat chicken. The proportion is larger in the South as compared to the western parts of India. So, we are aware of how big the market is," he said, alluding to the big opportunity in the fried chicken space. Bengaluru, interestingly, happens to be the biggest market for KFC, Domino's, and a battery of QSR players, including Popeyes, which has 18 outlets in the city. The second factor for

Did You Know



KFC had **7 outlets** in India in 2005

Average daily sales of KFC India is almost **three times** that of Pizza Hut

57.3% of men and 45.1% of women enjoy chicken, fish or other varieties of meat at least once a week, according to the National Family Health Survey 5—2019-21

Last October, Popeyes overtook KFC to become the No 2 fried chicken chain in the US

INFOGRAPHICS: MUKESH SINGH

Khetarpal was the store economics. Return on investment (RoI), the payback period, the discipline of finding a store, and the rental negotiations stepped into the picture.

Next came the ability to serve the consumers. "We are the only player that offers fresh chicken," he claimed. The last factor was the ability to manage the operation. "You need to have a trained crew that knows how to fry, change the oil, and serve the customer," he concluded, highlighting the might of the American brand. "Popeyes is now the No 2 player in the US. So clearly, there is something. The bold cajun flavours lend well to the Indian palates, and we have innovated fast," added Khetarpal.

The opportunity to make a dent in the fried chicken market is massive. The biggest reason is the absence of a strong No 2 pan-India player. With 1,025 outlets, KFC remains the undisputed big daddy of fried chicken in India. And Colonel Sanders has no potential threat from any player. A clutch of brands such as Chick Blast, Wow Chicken, Nothing But Chicken, and American Fried Chicken is too small to take on the biggest in India. Another tailwind for Popeyes is an under-penetration of meat QSR players in India. Look at the numbers.

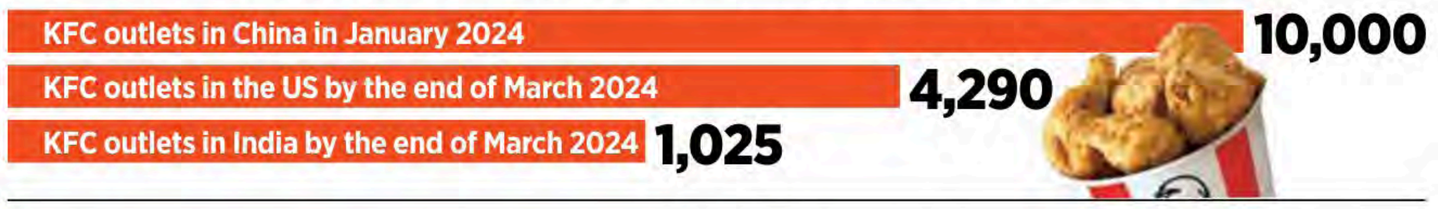
Popeyes stands a meaty chance to ramp up scale in India. Pizza outlets per million population are almost 3.7 times that of fried chicken outlets. Among the top 20 cities in India, penetration of the chicken category is as low as 4.2 stores per million, according to 'Hunger Games', a QSR report by brokerage firm Elara Securities. In contrast, India has an estimated 1,120 fried chicken outlets, highlights the study released in February. "The chicken category—organised as well as unorganised—is buoyant and growing," reckons KS Narayanan, a food and beverage expert. While KFC leads in the organised category, the unorganised segment is dotted by thousands of small, mom-and-pop players who play price warrior and cater to the local palate. "Popeyes stands a good chance to make it big," he reckons, adding that even a burger player like McDonald's was forced to enter the fried chicken segment by rolling out the product in South India. "Popeyes happens to be the right player at the right time to make most of the fried chicken boom in India," he adds. What, though, remains critical for the brand is to ensure profitable growth. "They need to fix the unit economics, and then expand," he sounds a word of caution.

For Popeyes, the big challenge is to ensure scale as well as consistency in the quality of the products. "QSR is a mass game. You need to be aggressive if you want to grow in India," says Ashita Aggarwal, professor of marketing at SP Jain Institute of Management and Research. The brand needs to maintain its promise of selling antibiotic-free and fresh chicken. "It's tough to scale given the constraints of the supply-chain ecosystem in India," she says. Another challenge for the brand would be not to compete with KFC. The brand has been in India for close to three decades. "It takes years to understand the Indian consumer and tailor one's offering," she says.

Khetarpal, for his part, is aware of the challenges. "We have to learn to walk before we can run. And that's what we have done in the last couple of years," he underlined in the Q4FY24 earnings call in May. The brand has had its learnings, has fine-tuned its approach, and partnered with the global team to make an India-centric model. "We are confident of making Popeyes India's fastest QSR to achieve revenue of ₹1,000 crore," he added. F

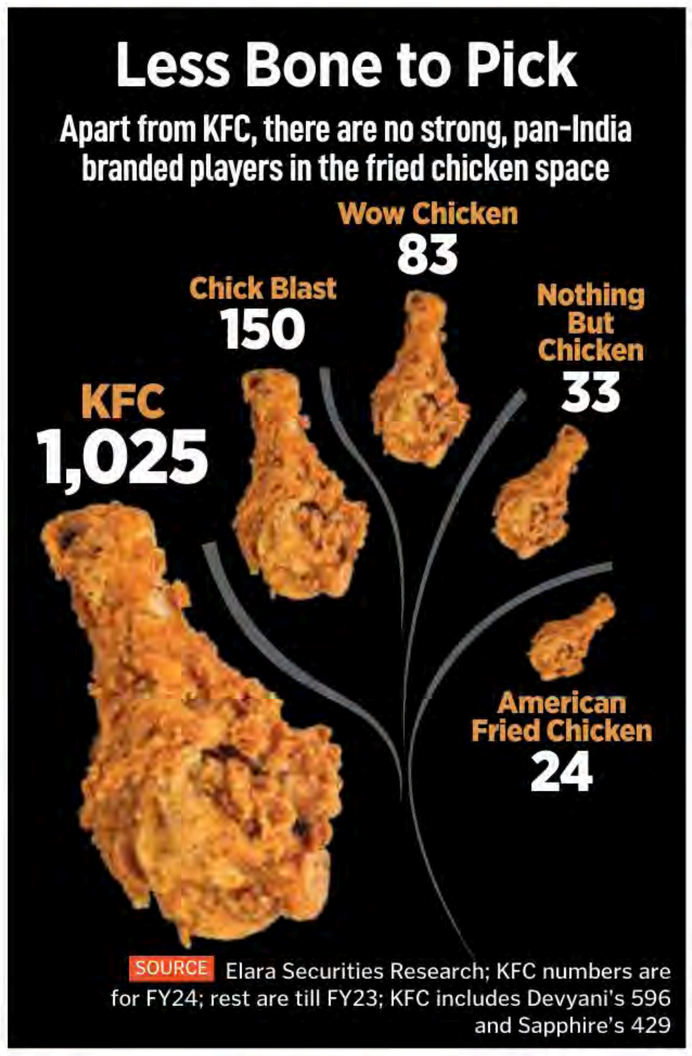
Big Daddy KFC's Footprint

The biggest fried chicken brand in India, the number of KFC outlets are just one-tenth of those in China



Less Bone to Pick

Apart from KFC, there are no strong, pan-India branded players in the fried chicken space



SOURCE Elara Securities Research; KFC numbers are for FY24; rest are till FY23; KFC includes Devyani's 596 and Sapphire's 429

Chicken's Meaty Prospects

Pizza outlets per million population is almost **3.7 times** that of fried chicken outlets per million in India. Among the top **20 cities** in India, penetration of the chicken category is low at **4.2 stores** per million

4,500
Estimated pizza outlets in India



1,120
Estimated fried chicken outlets in India

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Cooking up a Storm

Aditi Dugar's fine-dining space Masque, in Mumbai, has been voted as India's No 1 restaurant thrice over; this year, it debuted on the World's 50 Best Restaurants list at No 78

By KATHAKALI CHANDA & PANKTI MEHTA KADAKIA

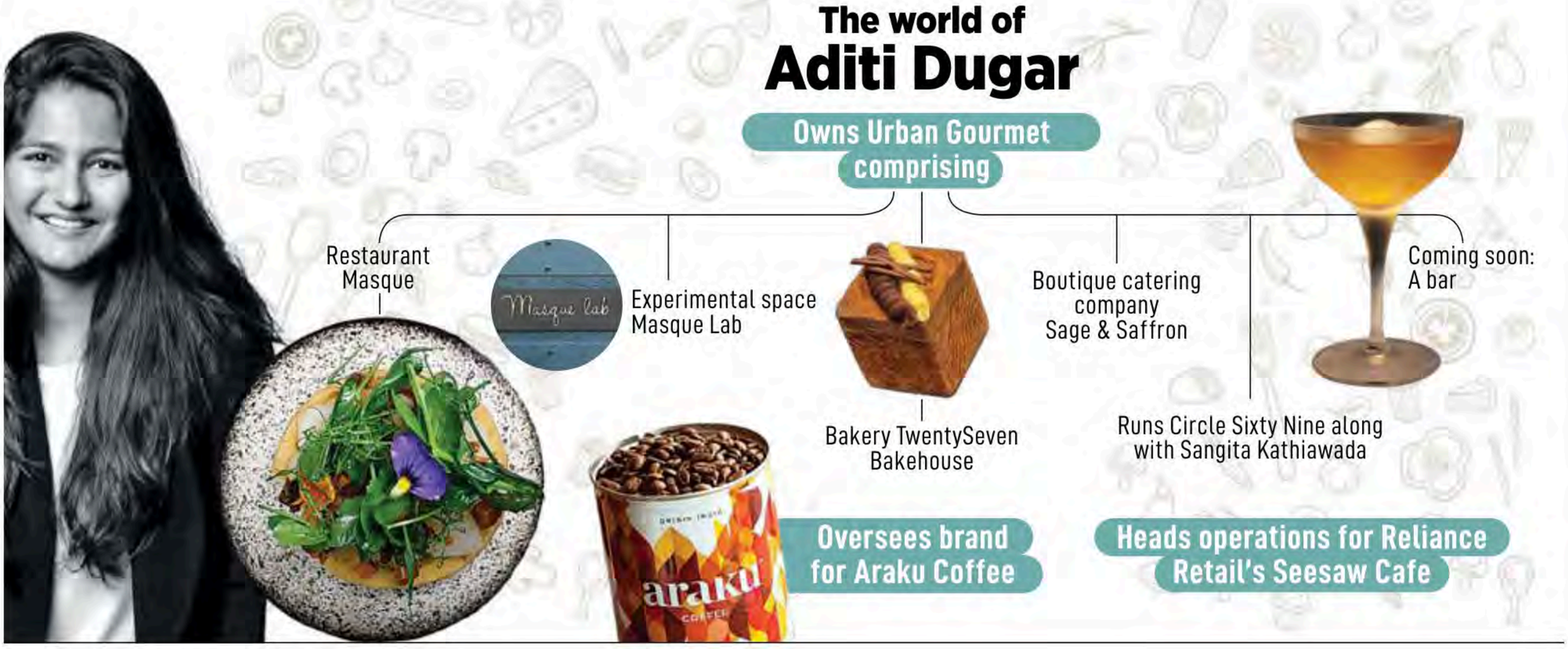
For a year since 2016, when Aditi Dugar launched Masque, a fine-dining restaurant in Mumbai's Mahalaxmi area, her father-in-law wouldn't come in to dine. Dugar was born into a Jain family and married into another, where tradition mandated a strictly vegetarian diet. While the 41-year-old adhered to it (and still does), her restaurant served a robust non-vegetarian menu that would often include zany elements like rabbit and ant, and Dugar Sr registered his disapproval by staying away. "Our families took some convincing but now they're our proudest patrons," says Dugar. "My father-in-law dines here often and brings every guest who comes to visit him in Mumbai."

In many ways, Masque's eight-year journey is symptomatic of Dugar's—of bucking the trend. Among the first restaurants in Mumbai to offer a tasting menu—a multi-course fare of bite-sized portions—it first stirred global conversation in 2020, when it was named as the 'One To Watch' in Asia's 50 Best Restaurants list. The very next year, it took a Himalayan leap, debuting on the list at No 32 as India's second-best restaurant after Indian Accent (at No 18).

For three consecutive years thereafter, Masque has upstaged Indian Accent to be voted as India's best restaurant in Asia's 50 Best list. But its biggest headline-grabbing feat came a few days ago, when it made it to the extended World's 50 Best Restaurants list. At No 78, Masque is the only Indian restaurant to have made it to the list, along with Indian Accent (at No 89). This despite a change of guard, as head chef Prateek Sadhu—he had been with the restaurant since inception, and parted ways in 2022—made way for former commis Varun Totlani. Masque's 10-course degustation menu, priced at ₹5,200 plus taxes per person, has been cited by Asia's 50 Best as "one of India's most forward-thinking fine-dining restaurants" and that "shows off the wealth of India's produce"—forging a melange of, say, cacao and gondhoraj, or strawberry and ponkh.

Through its journey, Masque has also collaborated with award-winning global chefs, like Matt Orlando of Copenhagen's Amass and Daniel Humm, the pathbreaking

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INFOGRAPHICS: MUKESH SINGH

owner and chef of Eleven Madison Park. Says Humm, whose restaurant in New York is frequented by the high society: "Aditi has created a gem of a restaurant in Mumbai. I've visited Masque multiple times, and each time it's evolved and gotten better and better. It's a testament to her leadership, competitiveness and pushing the boundaries."

Meanwhile, Urban Gourmet India Pvt Ltd (UGIPL), its parent company—which houses Masque as the flagship property, experimental space Masque Lab, Dugar's boutique catering company Sage & Saffron, bakery TwentySeven Bakehouse, Circle Sixty Nine, a 32-seater bistro at a private arts and culture space (a shared IP along with Sangita Kathiawada)—has nearly quadrupled revenues from ₹5.16 crore in FY18 to ₹19.63 crore in FY23, and registered profits for two years running, closing FY23 at ₹1.21 crore (according to financial database Tofler). A new addition to the Masque universe is a bar that's coming up soon in the same mill complex—"it's under wraps now, but all I can tell you is it's my husband Aditya's baby", she says.

If her list of engagements was not enough, Dugar also heads operations for Seesaw Cafe that's owned by Reliance Retail and oversees the brand for Araku Coffee India. "I'm a hustler, a workaholic," she confesses.

THE ACCIDENTAL ENTREPRENEUR

Dugar's go-getter attitude afforded her a smorgasbord of experiences through her teens. During her summer holidays in London, where her mother's extended family lived, she temped with In Water, a floral company that worked with the likes of Cartier and Sotheby's, and, at 16, staged in the kitchen of Michel Roux Jr of Le Gavroche, a now-shuttered Michelin-starred restaurant.

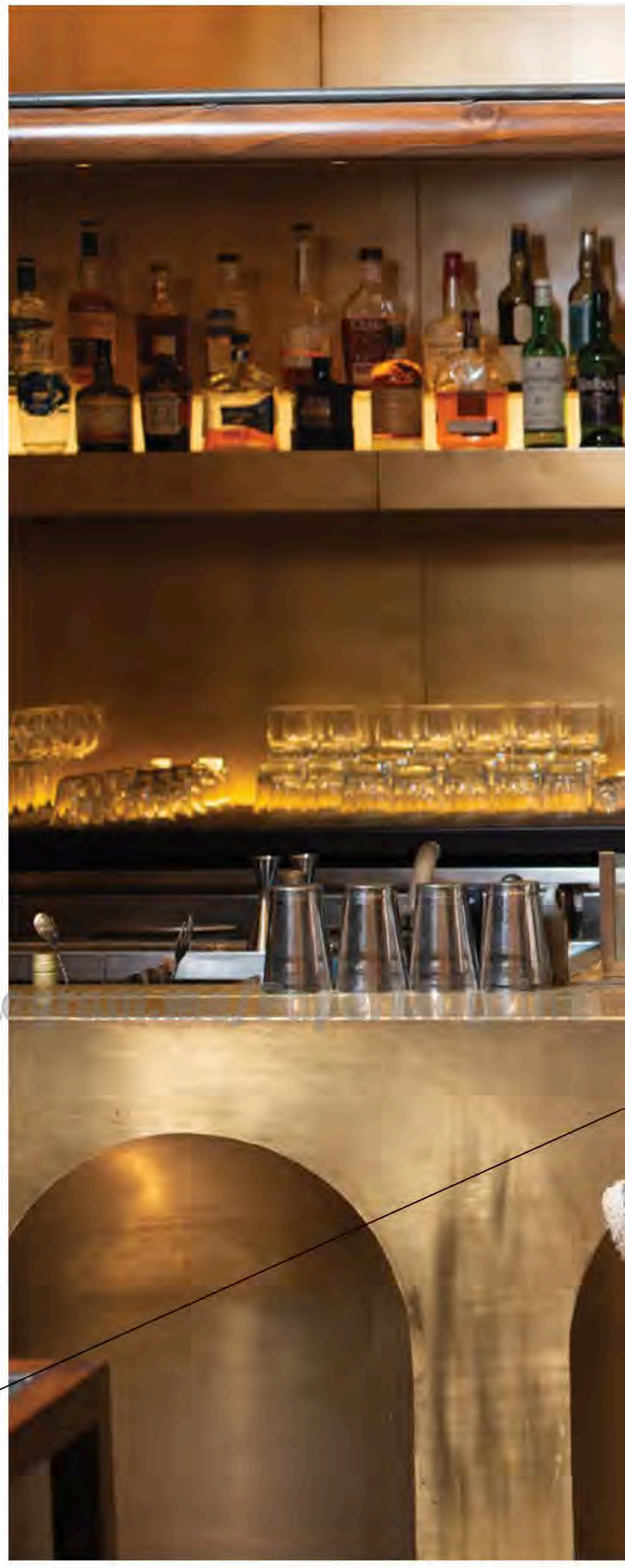
It helped that Dugar was a people's person. "In junior school, I had once voluntarily given out my phone number to the entire class," she guffaws. Through her travels during her growing up years, she would make her way into restaurant kitchens, chat with pastry chefs, what have you, even though she never really set out to be an F&B entrepreneur. While food was always part of the conversation in the joint family that she grew up in, and the one she married into, she applied for an MBA after completing her CFA level 2. "The year I got accepted, I was pregnant with our first child. I deferred my application, and then was pregnant with our second the following year. I put my career in finance on pause and became a full-time tiger mom for four years," she says.

Masque, too, was somewhat an accidental restaurant, as the space inside Mumbai's Laxmi Mills was initially earmarked for Sage & Saffron, her catering venture that started informally from her mum's home just after she had her second kid. At that time, her mother, a cook par excellence, used to run classes for the South Mumbai swish set. "As good a cook as she was, her set-up was not up to scratch," says Dugar. "While helping her out, I realised I was great at packaging and marketing—I could do a quick floral setup to add some pop to the class. That became the seed for Sage & Saffron." Over time, she started innovating on her mother's dishes to widen her catering repertoire and also visited the patrons' homes to help them set up the table.

"Covid gave us clarity. When we reopened, we had re-examined the ways in which our food was rooted in India."

ADITI DUGAR
DIRECTOR AND FOUNDER, MASQUE AND URBAN GOURMET INDIA PVT LTD

What started organically blew up in two years. "I suddenly saw myself catering at Tina Ambani's wedding anniversary," says Dugar. "This was just word of mouth since there was no Instagram back then." The venture, though, was still unstructured, and she would put together a patchwork of teams every time an order would come in.



BAJIRAO PAWAR FOR FORBES INDIA

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On one such assignment, she met Akshat, a student from Mumbai's Sophia College, and hired him to work in the services team for a posh wedding dinner she was catering to. "He became the first permanent employee of UGIPL and is still with us," says Dugar. "He now heads Sage & Saffron."

Through her catering assignments, Dugar met a British home chef with an expat clientele, who offered her a collaboration. It was the first time she saw the clash of the cultures at home as both her parents and in-laws objected to her working shoulder to shoulder with a non-veg chef. "It didn't initially go very well with the families, but my husband Aditya stood behind me like a rock," says Dugar.

"I've never used the word no for her," says Aditya when asked what gave him the gumption to back her. "If you give the right tools to the creative and if you give them the freedom, it's bound to be successful." He would often partner Dugar in

her morning trips to the vegetables and flower market, hunting down students of catering colleges to work at gigs and then returning home to prep for the day's menu. "I've seen her grow the business from doing two people at ₹1,200 a plate to 300 people at up to ₹15,000 a plate from within our home," he says.

Dugar got along with the British chef like a house on fire, and the two rented a 4,000 sq ft space in Laxmi Mills to be their central commissary for their catering, christened Sage & Saffron and registered in 2013. But, within three months, she had to return to the UK with a health problem, and Dugar was stuck with a space and without a plan of action.

COURSE CORRECTION

The idea for Masque came fortuitously to Dugar when she was on a family holiday to San Sebastian, Spain, which opened her eyes to the world of luxury hospitality. "I came back convinced I wanted to do something in the fine-dining space in India," she says. "I also remembered some of my catering clients would ask me if I could replicate a dish from New York's Per Se or the dessert table at Alinea in Chicago. It told me there was a market gap waiting to be addressed." A friend connected her to Sadhu, a Culinary Institute of America alumnus who had stints in acclaimed institutions like Rene Redzepi's Noma. "He started attending some of my caterings, we began to exchange notes, and just like that, over a few coffee meetings, Masque was born," says Dugar. She started with an initial investment of ₹8 crore and Aditya as the partner, and the restaurant still remains self-funded.

Dugar and Sadhu never conceived Masque to be an Indian restaurant, but an experiential dining space putting Indian ingredients in the forefront. Says Totlani, the current head chef: "I never wanted to cook Indian food when I was growing up, but Masque taught me a lot about India and ingredients I never knew existed—sea buckthorn in Ladakh, fiddle head ferns in Uttarakhand. When I joined as a commis chef in 2016, I learnt to take pride in Indian ingredients."

Sadhu invoked his Kashmiri descent as he would frequently go on foraging trips in the Himalayas. Dugar, too, crisscrossed the country in search of quality produce, while Aditya held fort doing the back-end for the restaurant in the early days—and even during the launch, when Dugar delivered her third child ("I went into preterm labour due to stress," she laughs). The duo's travels showed up in the menu with ingredients like sea buckthorn, a berry from the hills, and artisanal chocolate from Mason & Co in Puducherry.

The resultant dish would be a chocolate mousse with a sea buckthorn sorbet on it, high-brow in nomenclature and taste, but without a distinct Indian reference. "2018 onwards, we were at the intersection of two currents—the top 1 percent clientele was bringing in a global audience, signifying Masque as a restaurant where you go to for a special meal, but local diners were confused about what kind of cuisine we served. We were a misfit in terms of positioning. When international guests would come, they would be floored by the experience, but would also say 'wish the meal was more Indian'. We knew we had to rework our strategy."

It was also a period when Indian food was forcing its way into the front and centre. Restaurants like Indian Accent had already won plaudits globally, while those like The Bombay Canteen, with its playful, innovative nuance to local produce and food, became conversation-starters. With an eye on course correction, Dugar and Sadhu set up the Masque Lab in February 2020, just a month before the Covid-induced lockdown began, in the backyard of the restaurant, where they experimented with age-old Indian techniques like pickling and fermenting to extract more out of an ingredient outside its season. And the sea buckthorn came full circle, transitioning into something more Indian, infused into the paani to accompany a beetroot puri, in a portmanteau of Indian and innovative flavours.

And then Covid struck, helping them, serendipitously, validate their conviction. Through the pandemic-induced closure, Masque came down from its culinary high horse, flipping burgers, folding tacos, and organising socially distanced tailgate parties, what have you.

"Masque had never thought it had to be in a box, but Covid made us think of meals in a box," says Dugar. "And the meals had to become more wholesome now because they had to travel well."

Of course, the pandemic hit business as Urban Gourmet suffered losses of ₹1.39 crore in FY21, but Dugar calls Covid a great learning as it spread the Masque brand beyond its niche clientele, with orders pouring in from geographies like Karjat and Pune. "Covid gave us clarity," she says. "When we reopened, we had re-examined the ways in which



"I've visited Masque multiple times, and each time it's evolved and gotten better and better."

DANIEL HUMM,
chef-owner, Eleven Madison Park

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our food was rooted in India."

SEAMLESS CHANGE

But the aftermath of Covid wasn't as smooth as it sounds. In 2022, Sadhu, who had handheld the restaurant to its pole position, left. "We had different visions for what we each wanted to do next, and so we amicably decided to go our own ways," she says.

Did she have jitters about the transition, especially with letting go of the familiar? "I am a mother of three boys. I never get fazed," she laughs.

That the change has been seamless is evident from Masque's grand debut on the World's 50 Best list this year, and its ability to retain its No 1 rank as the country's best restaurant for two years under Totlani. He insists he didn't make any radical changes to the goal or the concept as the restaurant stuck to its ingredient-first philosophy; only his upbringing in Mumbai, as opposed to Sadhu's in North India, influenced the menu. "Mumbai is a melting pot of cultures... I've had every kind of food, from South Indian to Punjabi to Maharashtrian to Marwari, all available at my doorstep," he says. His frequent childhood trips to the South Indian belt in Matunga, for instance, inspired him to serve pasta with rasam.

"Aditi isn't really from the industry, so, along with her, we've all had to evolve and stay flexible," adds Totlani. "I've never referred to her as a boss till now, since she doesn't make you feel that way. All conversations are open and it's not like she wants to have the final word. She gives us direction and she has helped us build relationships, like with Daniel Humm." The team at Masque first met Humm in 2018 and, ever since, Dugar has meticulously stayed in touch with him, travelling with him on foraging trips in India.

Says Humm, who went plant-based after reopening his restaurant post-pandemic: "For me, it was interesting because Aditi is vegetarian, so I loved going around India with her and seeing it through her lens. She lives and breathes our industry."



Dugar's eye for detail and her ability to blend in with the storytelling are highlighted by Manoj Kumar, co-founder and director, Araku Originals and the CEO of the Naandi Foundation. The foundation has, through regenerative agriculture—a process of farming that restores soil fertility and the general health of the ecosystem—alleviated the lives of coffee-growers in the Araku Valley. The coffee is now retailed through Araku Coffee India, a brand that has also opened cafes in cities like Bengaluru and Mumbai. And Dugar is in charge of operations for the restaurants, overseeing everything from the menu to the retail strategy.

"Araku is a uniquely ethical brand where all the food is produced through regenerative, organic agriculture and needs a unique positioning. Aditi has a terrific sense of what the right communication is for city consumers, especially in metros," says Kumar.

"We have a situation, where every single produce we get from the farmers is traceable. When she put this place together, she ensured that the story of every item is similarly told," adds Kumar. "For example, if you look at the napkins, she took pains to locate it to the blind school in Worli, where these napkins are made. What I'm trying to emphasise is the detail to ensure that the brand story is complete, so the customer understands this is a truly ethical brand."

For Dugar, roles as diverse as handling Araku and presenting her blueprint to an elite board—that comprises the likes of Mahindra Group Chairman Anand Mahindra, Infosys co-founder Kris Gopalakrishnan, Satish Reddy of Dr Reddy's Laboratories and Soma Enterprises Chairman Rajendra Prasad Maganti—has tweaked the way she wants to run a business. "It made me realise the difference between building a company and running a brand," she says. "I needed to bring in wealth creation for the employees to turn Urban Gourmet into a legacy brand." The company has now introduced ESOPS for employees, new incentives, and health and life insurance.

While Urban Gourmet remains a zero-debt, self-funded company, Dugar is willing to partner with the right investor to scale up. Masque is doing 70-80 covers every night, about 60 percent of which are local diners. Aditya, who is now investing a lot more time in the F&B business, wants the bakery to grow to five outlets in Mumbai, where it has only one. Masque, of course, isn't a concept that can be replicated frequently but if the right opportunity arises, they are willing to explore options of taking it global.

Dugar, meanwhile, has come a long way from the time some of the top restaurateurs advised her not to waste money on Masque. Little did they know that toeing the line has never been her thing.

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Hooray For Higher Rates!

Wall Street scion Christopher Davis hung tough for 14 years as risk-free borrowing pinched value stocks. Now that money costs money again, he's taking advantage of what he calls "a return to normalcy"

By BOB IVRY

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There's a Mistake Wall in Christopher Davis' office on Fifth Avenue in Manhattan—23 framed stock certificates. They represent the biggest investing blunders committed by Davis Advisors, the family business he took over in 1998, which includes 17 mutual funds and ETFs, with total assets of $23 billion. Each certificate is accompanied by two or three sentences in small type describing what Davis calls "transferable lessons," which mean, if heeded, that the errors won't happen again. Google is on the wall because Davis missed out buying into its 2004 IPO. Waste Management is up there, too, because Davis sold it during a management scandal in 2000, not realising that its business was still humming. "We have a humble culture," he says.

That doesn't mean Davis, 58, has nothing to brag about. His flagship $6.2 billion New York Venture Fund returned 30 percent last year, compared with 26 percent for the S&P 500 Index. The fund has delivered an 11.4 percent average annualised return since it began in 1969. The S&P: 10.2%.

But near-zero interest rates from 2008 to 2022 proved humbling to value investors and those not falling hard for large tech stocks. Davis' undervalued stocks stayed undervalued. Clients bailed. Venture Fund assets fell by 88 percent. "We rarely think we know more than the market, and in those few cases when we think we do, the vast majority of people will think we're wrong," he says. "The difference between conviction and stubbornness is a delicate line."

Few Wall Street pedigrees are as sterling as Davis'. His grandfather, Shelby Cullom Davis, started trading in 1947 with $50,000 and turned it into $900 million, landing him on The Forbes 400 for eight years before his death in 1994. Under the stewardship of Davis' father, Shelby MC Davis, 86, the New York Venture Fund beat the market 16 times in 20 years and firm assets climbed to $3 billion by 1998.

With his unruly graying blonde hair, pullover sweater–and-tie ensemble and an office decorated with what looks like a detonation of paper, a bust of Charlie Munger and a doggie bed for Knick, his four-year-old Kooiker—a Dutch breed, hence the name, short for Knickerbocker—Davis radiates the vibe of a philosophy professor more than that of a Wall Street power player. Davis Advisors is employee-owned; Davis' share is 30 percent, valued at around $100 million, and he has a significant stake in the firm's funds. But his grandfather and father dedicated most of their money to philanthropy, and Davis insists he is not a billionaire.

Still, he formed his investment strategy the old-fashioned way. He inherited it. His firm's approach is similar to Warren Buffett's: Pay reasonable prices for irreplaceable companies that have disciplined leadership and let them ride.

Buying decisions are based on two determinations. First, Davis and his

The Vault

The architect of Omaha



The world lost one of its most famous value investors in November, when Charlie Munger died at 99. "Charlie was the 'architect' of the present Berkshire [Hathaway]," wrote his partner and protégé, Warren Buffett. "I acted as the 'general contractor' to carry out the day-by-day construction of his vision." That not-so-quiet influence was on full display in a 1996 cover story.

For most of the year they are connected only by the telephone wires. In the exchanges carried over those wires, Buffett is the stock picker while Munger is the doubter, the skeptic, the devil's advocate, against whom Buffett tests his ideas. Not that Munger is a sourpuss. Their verbal exchanges are larded with jokes. In a tie vote, Munger says, Buffett wins. After they have kicked around a subject, he is willing to let Buffett make the final decision. "A lot of dominant personalities, like me, can never play the subservient role even to Warren, who is more able and dedicated than I am." —*Forbes*, January 22, 1996



Gospel of Mr. Market Christopher Davis, shown in his Manhattan office, says his brief stint studying for the priesthood has come in handy as he manages billions. "To succeed at investing, you need a philosophy. Then you've got to pray like hell."

team calculate what he calls owner-earnings yield—the cash a business generates after reinvesting enough to maintain its current competitive position divided by the price paid to buy the business. Second, they focus on the opportunities that a company has to reinvest in itself.

"We act as if we are buying the entire business," he says, noting that stock ownership by management is a must. Each year he adds only a few new names to the 40 or so in his mutual funds.

For more than five years, the Venture Fund has been heavily weighted in financial companies, including Berkshire Hathaway and banks such as Capital One and Bank of New York Mellon, which suffered from the Fed's easy-money policy. The absolute returns were fine, Davis says, but there was a widening gap between earnings growth and lagging market caps. "What we had was money flowing to where hype was and not where value was," he says. "It was tied to this bizarre free-money era, this massive distortion."

He can identify the moment he felt he could breathe again: March 16, 2022. That was the day the Federal Reserve started raising rates. Davis calls it a return to normalcy.

Meta became Davis' biggest position, currently at 8.5 percent of the Venture Fund. Davis Advisors already owned some of the stock, but by November 2022, shares had plummeted 76 percent from their peak. Revenue was wilting. Young people were avoiding Facebook while TikTok was eating Instagram's lunch. CEO Mark Zuckerberg was losing billions investing in the metaverse.

Davis held a different view. "Here's a company trading at 14 times earnings, which seems shockingly low with the market at 18 times with companies that barely grow at all," he says. Zuckerberg also recognized that with borrowing costs climbing, Meta needed discipline. Even if his bet on the metaverse failed to pay off, it was the kind of long-range thinking Davis admires. Between September and November 3, 2022, Davis says, he bought nearly 125 million shares of Meta at an average price per share of about $113. The stock now hovers in the vicinity of $500. Davis' 2023 return on Meta: 194 percent.

Financials also buoyed Davis' 2023 returns. Last year, Capital One was up 44 percent, JPMorgan Chase 31 percent and Wells Fargo 23 percent. He still loves financials, which represent nearly 50 percent of his fund, but says he's selectively bullish. Other big holdings include Amazon, Applied Materials and pharma company Viatris.

Is Davis worried that the return to normalcy his firm is counting on will evaporate with lower interest rates? "Our bet is that over the next 15 years, interest rates are on average higher than the last 15, and that's normal," he says. "The free-money era is over." F

PHOTOGRAPH BY ALEKSANDR KARNYUKHIN FOR FORBES

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Biggest Cricket Stadiums

The top 10 cricket grounds—from Mumbai to Melbourne—that have seen some thrilling games over the years

Stadiums are at the heart of cricket, serving as the backdrop for the action on the field. These venues are not just mere structures but also integral to the cricketing experience



1

Narendra Modi Stadium

Location:
Ahmedabad, India
Year Opened: **1982**
It is the world's largest cricket stadium, accommodating an impressive 132,000 spectators. Originally known as the Motera Stadium, it was renamed in honour of Prime Minister Narendra Modi. It hosted the 2023 World Cup final



2

Melbourne Cricket Ground

Location:
Australia
Year Opened: **1853**
Affectionately known as 'The G', it has a seating capacity of 100,024. Established in 1853, this venue has hosted significant sporting events, including the 2006 Commonwealth Games, the 1956 Summer Olympics, and the 1992 and 2015 World Cup finals



3

Eden Gardens

Location:
Kolkata, India
Year Opened: **1864**
This is the home ground for the Kolkata Knight Riders in the Indian Premier League. Known as "cricket's answer to the Colosseum", it can accommodate over a lakh people. It has hosted several big matches, including the 1987 World Cup final and the 2016 World T20 final



4

Shaheed Veer Narayan Singh International Cricket Stadium

Location:
Raipur, India
Year Opened: **2008**
Also known as the Nava Raipur International Cricket Stadium, this is a 65,000-seat venue in Chhattisgarh. This facility became India's 50th international cricket venue in 2023



5

Perth Stadium

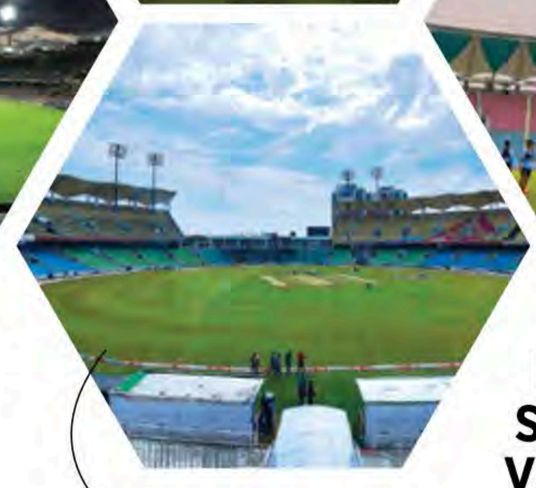
Location:
Australia
Year Opened: **2018**
Toptus Stadium, formerly known as Perth Stadium, is a state-of-the-art, multi-purpose venue in Burswood, Western Australia. Completed in late 2017, the stadium officially opened on January 21, 2018. It ranks as the third-largest stadium in Australia



6

Adelaide Oval

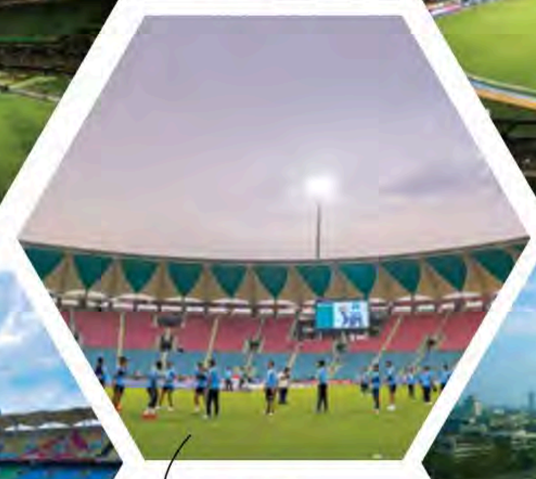
Location:
Australia
Year Opened: **1871**
The Adelaide Oval is a premier sports ground in the picturesque parklands between Adelaide's city centre and North Adelaide. The stadium's record attendance for a cricket match was 55,317, achieved during the second Ashes Test on December 2, 2017



7

Greenfield International Stadium

Location:
Thiruvananthapuram, India
Year Opened: **2015**
The Kariavattom Sports Facilities Limited, a private company, built the stadium in 2014. With a seating capacity of 55,000, it was India's first DBOT model outdoor stadium



8

Bharat Ratna Shri Atal Bihari Vajpayee Ekana Cricket Stadium

Location:
Lucknow, India
Year Opened: **2017**
The Ekana Cricket Stadium has a seating capacity of 50,000, and ranks as the fifth-largest international cricket stadium in the country. The stadium was renamed in 2018 in honour of former Prime Minister, the late Atal Bihari Vajpayee



9

Brabourne Stadium

Location:
Mumbai, India
Year Opened: **1937**
The ground is owned by the Cricket Club of India and has a seating capacity of 50,000. It hosted the ICC Champions Trophy in 2006 and the first T20 international in India in 2007



10

Docklands Stadium

Location:
Melbourne, Australia
Year Opened: **2000**
Docklands Stadium, known as Marvel Stadium, is a versatile multi-purpose sports and entertainment venue. It proudly features a retractable roof and can be converted from an oval to a rectangular configuration for different sports. Docklands was rated Australia's most entertaining venue for T20 cricket

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