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OPINION

Building India’s deep-tech enterprise pipeline: from IP to IPO

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As of March, the Department for Promotion of Industry and Internal Trade had recognized as many as 223,000 startups. (Mint)

SUMMARY

Capital is only one component of enterprise creation. Entrepreneurs need mentors versed in science and markets, industry partners to test technology, specialised labs, help with regulatory approvals and standards, and tech-transfer offices that protect intellectual property (IP).

As entrepreneurial energy plays an ever-larger role in India’s success story, we present a package of weekly opinion articles by members of TiE, a global organization for startups and entrepreneurs. From the rural reach of India’s startup revolution and the easing of capital and compliance challenges to the role of angel investors, how startups and micro, small, and medium enterprises must grow together and how best to track innovation, TiE authors cover a wide spectrum of relevant issues.

India’s startup ecosystem is entering a more challenging phase. The focus is shifting from counting startups, patents or funding rounds to evaluating how many Indian technologies move from lab validation to global markets and become established, publicly accountable enterprises.

Beyond the startup count

India has demonstrated significant progress in fostering startups. As of March, the Department for Promotion of Industry and Internal Trade (DPIIT) had recognized as many as 223,000 startups. Over 13,000 new patent applications were filed by startups, but many were abandoned and only 2,174 were granted. The moot point is that once filed, is the patent for technology differentiation really followed up to create a product for commercialization? Most of these intellectual properties (IPs) are viewed as a “protection” rather than “assets”. And that’s moot in today’s fast-evolving, technology-led world.

Today, nearly 92% of the market capitalization of the S&P 500 is derived from intangible assets—brands, IP, software and data—up from just 17% in 1975. Global spending on intangible investment has crossed $4.7 trillion a year in advanced economies, overtaking investment in physical infrastructure. This is one of the most significant shifts in modern economic history: the countries that lead are no longer those with the largest industrial base, but those that own the world’s most valuable IP and brands. India’s next chapter will therefore be defined not by “Make in India,” but by the ambition to own the world.

India’s real gap is the gap from research to IP, then to products, companies and global scale. Deeptech startups build on scientific breakthroughs in fields like materials, semiconductors, biotech, space, robotics, energy and quantum computing—domains where the IP is not adjacent to the business; it is the business itself. Therefore, the better measure of success is whether a startup becomes a professionally managed enterprise that outlasts its founders.

Deeptech changes the equation

This dynamic creates a fundamentally different development trajectory. Deeptech companies may require several years to transition from laboratory research to commercial scale and face numerous risks. Scientific concepts may not prove viable, and technologies that succeed in laboratory settings can fail in practical applications. Securing regulatory approvals and certifications often requires several years, and customer adoption of new technologies may be slow. These firms typically require multiple funding rounds before generating substantial revenue, thereby increasing capital risk.

Applying expectations of rapid revenue growth, as seen in software companies, can result in premature down-rounds, underinvestment or the abandonment of strategically significant technologies. The implication is evident: deeptech sectors demand not only patient capital but also enduring institutional support, testing facilities, early customers and constant strategic guidance.

What global firms reveal

The most instructive global examples extend beyond narratives of venture funding. They show that deeptech companies are built through coordinated systems spanning research, infrastructure, customer engagement, manufacturing partnerships, long-term technical roadmaps, building talent and, of course, funding.

IBM aims to deliver a large-scale, fault-tolerant quantum computer by 2029 and is pursuing interim demonstrations of quantum advantage. The lesson: breakthrough technologies attract investment when progress is shown as clear, measurable technical milestones, not vague promises of future disruption.

Emerging artificial intelligence (AI) infrastructure firms are commercializing via distribution partnerships. For example, Fundamental raised funding while securing deployment through Amazon Web Services

(AWS) infrastructure and customer channels. For Indian deeptech firms, the central question extends beyond funding. It is critical to understand the need for institutions that can facilitate the achievement of technical, industrial and commercial milestones, and the ways through which they can do so.

The bridge is more than money

Over two decades of India’s startup journey, one lesson is clear: capital is only one component of enterprise creation. Entrepreneurs need mentors versed in science and markets, industry partners to test technology, specialized labs, help with regulatory approvals and standards, and tech-transfer offices that protect IP, forge industrial ties, support spin-outs and negotiate founder-friendly licences—plus early-adopter customers and investors.

India needs to move beyond a narrow focus on patent counts. A patent may be legally valid yet commercially insignificant. For deeptech firms, the most valuable IP often extends beyond the patent itself—to proprietary algorithms, industrial designs, scientific datasets, differentiated know-how and trusted brands. With the rapid technology evolution now underway in the country, these are becoming the defining drivers of enterprise value. At IAN, we go further than backing finished products: we invest in companies that are building IP portfolios where commercialization may come much later. That is not easy. It means evaluating the IP, understanding its potential, being extremely patient, and carrying the risk of returns for far longer than a conventional fund is built to do so. And most importantly, invest time and dedicate focused mental energy.

It is common in these IP-focused startups to see the business fundamentals fail, more often than not. During the due diligence, we sometimes discover that the IP is not assigned to the company, or is not protected at all; that the core technology was developed by consultants, leaving the company without ownership of its own code; or that a name, logo or colour has been chosen so close to a much bigger brand that it could one day wipe the company out. It is critical to get all of these well governed, tracked and monitored. Well-protected IP actually is an asset—it supports international expansion, enables licensing, facilitates technology partnerships and improves confidence in future funding rounds.

This is the bet behind companies such as Nayam, Pandorum and Peptris: the wager is on IP creation and its continuous development. Peptris’s IP, for instance, is focused on compressing the drug-discovery cycle from ten years to four or five—and it is already showing success. If that holds, the economics of the pharmaceutical model will change, reducing both the time and the cost of bringing new drugs to market.

Research must move onto the balance sheet

India’s research spending is rising but remains modest. R&D stood at 0.84% of GDP in 2023–24 and is projected to reach 0.90% in 2025–26, with private industry’s share climbing from 32.2% to 45.2% in three years. The direction is right; the gap is still large. China spends about 2.6% of GDP on R&D, the OECD (Organisation for Economic Co-operation and Development) average is roughly 2.7%, the US 3.7%, South Korea about 5.1%, and Israel leads at 6.3%.

The task, then, is to build a robust public-private partnership. The Research, Development and Innovation (RDI) Scheme is the latest instrument designed to strengthen this partnership by enabling industry and private investors to play a significantly greater role. The startup ecosystem is already leading this shift, investing in companies whose value sits in assets that never appear on a traditional balance sheet: brand equity, proprietary technology, patents, customer trust and differentiated know-how. The task now is to

bring those assets onto the balance sheet, where they become strategic and defensible.

The prize is real. IAN’s first cheque into Uniphore enabled it to buy an IP asset out of a lab; today the company is valued at over $2.5 billion, with capital from Nvidia and OpenAI—and IAN still holds shares! IP and brand are the new wealth creators, with the ability to transcend geographies and generations.

Technical minds on both sides of the table

Deeptech problems are complex, and the questions that matter cannot be asked from a spreadsheet. A flat quarter in a software company usually signals a demand problem. In a deeptech company, it may be a certification cycle, a material qualification or a pilot waiting on a customer’s timeline. An investor who cannot distinguish delay that is tactical from delay that is strategic will read the first as the second, potentially destroying good companies in the process.

This is what makes patience practical rather than rhetorical. It is not a willingness to wait indefinitely, but the judgement to know what is worth waiting for, and—when fundamentals begin to drift—to intervene with the right questions instead of a devaluation round. India’s deeptech funds, therefore, face a hiring question as much as a fundraising one. Investment teams built to evaluate consumer businesses are not equipped to underwrite scientific risk.

Rethinking capital architecture

The expansion of India’s Fund of Funds architecture is significant because it acknowledges that deeptech sectors require longer-duration, higher-risk capital. Startup India Fund of Funds 2.0, with a proposed corpus of ₹10,000 crore, specifically targets deeptech, technology-driven manufacturing and early-growth companies.

The ₹1 trillion RDI Scheme goes further. It offers long-tenure, low-cost capital to technologies that have been validated in the laboratory, through loans running 12–15 years and equity participation, and it has begun disbursing. A 12- to 15-year horizon is longer than the life of a typical Indian venture fund. That is the point. Public capital is now structured to absorb the technology risk that private capital has never been able to take.

It does not reduce the need for equity investors. It changes what they underwrite. What remains is commercial and institutional risk: the first customer, certification, manufacturing partners and eventually the discipline of being a public company. That is the risk early investors are equipped to take.

Whose problems, whose technology

Decolonizing the academic startup ecosystem should not entail rejecting global science, foreign capital, or international collaboration. Instead, it needs to involve constructing innovation systems grounded in India’s unique needs, capabilities and aspirations.

India’s most consequential technologies may arise from challenges that global markets have historically underestimated, such as affordable medical devices, low-cost water purification or cost-effective space and satellite applications. India can turn local solutions into global opportunities by building proprietary technologies and scalable models. However, it must ensure that the value generated by its innovations is captured domestically, and not allow others to commercialise the intellectual property it creates. The core question is economic sovereignty: who owns the technology, who controls the firm, and where the jobs

and manufacturing stay. And, therefore, the role of domestic funding, public or private, extends beyond the financial investment involved—it is the value of sovereignty.

The IPO as institutional maturity

An initial public offering (IPO) is frequently characterized as an exit event. For deeptech companies, it should be seen as more than that—of unleashing domestic monies for building further or creating liquidity for early shareholders. The IPO is not the inevitable destination for every startup; some will be acquired, merged, licensed or remain privately held. Nevertheless, the potential for public-market scale should inform deeptech enterprises’ foundational strategies.

SEDEMAC Mechatronics is instructive. It began in 2007 in an IIT Bombay laboratory, founded by a professor and his students, and listed in March this year—profitable, supplying engine control systems to Tata Motors, Mahindra, Ashok Leyland and TVS. Nineteen years from lab to listing. The offer raised no new capital for the company; every share sold was an existing shareholder’s. The listing was not a fundraising event. It was the point at which a company built on university research became publicly accountable. The benchmark should shift from securing additional funding rounds to becoming a trusted institution within a strategically significant industry.

The pathways still to clear

It would be remiss to suggest that India is already on the perfect path. Several pathways remain to be cleared before IP-led assets create wealth for the country at scale.

Many of the key approval and certification bodies, such as the US Food and Drug Administration (FDA), are based outside India. This can make regulatory approvals more time-consuming and expensive for Indian innovators. India, therefore, must develop globally recognized certification and standards bodies of its own to reduce these barriers and strengthen its ability to commercialize IP-led innovations.

Corporate backing for research remains thin. Funding has begun at the early stage through the RDI scheme and a few venture funds. But beyond the Infosys Prize and the Tata Transformation Prize, India lacks corporate funding and recognition for research on the scale of Samsung’s Ho-Am Prize, the Honda Prize or the L’Oréal awards—some of whose supported scientists have gone on to win Nobel Prizes.

India is also grappling with a missing layer of growth capital. Past the early-stage cheques, India does not yet have enough growth capital for scaling companies. Many therefore raise from overseas investors, which means foreign ownership of part of the enterprise—or, in some cases, a decision to flip out of India altogether.

Further, India’s IPO framework does not allow companies with portfolios of IP, but limited profit history, to list on the traditional profit-based main board with its requisite financial track record. They can use the Innovator Growth Platform (IGP), but it does not yet have merchant bankers that understand such companies, or enough investors in the market who do.

In essence, India’s journey towards building IP-led strategic assets is well underway. However, translating these assets into wealth for the country and achieving genuine economic sovereignty will require sustained effort.

Building the missing bridges

This necessitates a national bridge architecture that connects classrooms to laboratories, laboratories to technology-transfer offices, and technology-transfer offices to capable founders. It must also link founders to industrial partners, industrial pilots to procurement processes, procurement to manufacturing, and manufacturing to export markets. It should establish clear pathways for high-growth companies to access public markets and become globally competitive.

Great companies, like the world’s greatest bridges, often begin with ideas that very few people initially believe in. The task before India is to build the spans that carry its research all the way across—Indian-owned, and global in reach.

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This is the eighth part in the series. Previous part: “Failure is not the problem. Silence after failure is.”