Role of Startups in India's Ambition to be a Global Semiconductor Powerhouse

India's push to grab a slice of the global semiconductor pie is full of opportunities as well as challenges that need concerted attention from all stakeholders

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India's ambition to become a global semiconductor powerhouse has gained momentum with the government's recent approval of semiconductor proposals and a $15 billion blueprint to develop a robust domestic semiconductor ecosystem. This progress has set the stage for Indian semiconductor startups to emerge as critical players, driving innovation, creating employment, and positioning India in the global market. Their potential is a beacon of hope for the future of the semiconductor industry in India.

With an ever-increasing global demand for semiconductors projected to exceed $1 trillion by 2030, India aims to secure a significant portion of the market, with a $150 billion target. However, despite this ambition and governmental support, India's startups in the semiconductor sector, particularly in silicon product design, face both opportunities and challenges. Understanding the current landscape of semiconductor startups, their contributions to national goals, the challenges they face, and the importance of strategic partnerships is crucial. These partnerships are beneficial and essential for the success of these startups and the growth of the semiconductor industry in India.

SEMICONDUCTOR INDUSTRY IN INDIA

India is home to over 100 semiconductor startups in cities like Hyderabad, Chennai, Pune and mostly concentrated in Bengaluru, the country's technology hub. These startups cover a range of activities, from fabless chip design to embedded systems and AI-driven chip architectures. While India is responsible for 20% of the global semiconductor design talent, its semiconductor startups remain severely underfunded compared to international peers, which hampers their potential to scale and innovate.

Nevertheless, startups in this space are positioned to play a pivotal role in developing silicon products that align with the country's ambitions. By focusing on chip design, R&D, and packaging, these startups can help build the foundation for a self-reliant semiconductor ecosystem. However, the journey to reach global competitiveness requires overcoming critical challenges, especially in terms of funding and infrastructure development.

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HOW STARTUPS CAN HELP INDIA ACHIEVE ITS SEMICONDUCTOR GOALS

Semiconductor startups are pivotal to India's aspirations of becoming a global semiconductor manufacturing and design hub. Their role in driving innovation, creating jobs, and promoting technological self-reliance is crucial for the nation's semiconductor goals. These startups act as engines of innovation, developing advanced silicon designs that cater to emerging technologies such as AI processors, IoT-enabled devices, and 5G/6G chips. By pushing the boundaries of technological advancements, they address domestic needs and global market demand. Their innovation ability positions them as key players in India's efforts to become a global semiconductor industry leader.

In addition to innovation, semiconductor startups play a critical role in employment generation. With India producing a large pool of engineering talent, particularly in chip design and development, these startups are already contributing to job creation. As they scale, the demand for skilled design, testing, and manufacturing engineers will increase substantially. This, in turn, will lead to a significant boost in high-value jobs, further strengthening India's talent pool and supporting the growth of its semiconductor ecosystem. By 2026-27, Semiconductor Industry Association is expecting to create 42,000 regular jobs and an approx. 185,000 temporary jobs linked to fabrication facilities in India.

Furthermore, startups are instrumental in India's pursuit of self-reliance in semiconductor products by focusing on fabless design and intellectual property (IP) development. Reducing the country's reliance on imported technology helps build a more resilient domestic ecosystem. Startups have the agility to develop custom silicon solutions tailored to local needs, while also enabling India to export technology and play a more active role in the global semiconductor supply chain. This fuels economic growth and enhances India's strategic independence in critical tech-

Team of Signalchip, a fabless semiconductor startup, at an event in 2022

nologies, ensuring a secure and promising future for the country's technological landscape.

SUCCESS STORIES: HOW WELL-FUNDED STARTUPS ARE MAKING AN IMPACT

India's semiconductor ecosystem has seen the rise of several well-funded startups that have leveraged financial backing to drive innovation, job creation, and global competitiveness.

Mindgrove Technologies, for example, specialises in System-on-Chip (SoC) design and has received support from government programmes and private investors. With this backing, the company has developed high-performance SoCs for consumer electronics and defense industries, focusing on power-efficient designs for AI and IoT applications. Their success underscores the critical role of targeted R&D funding, which has helped them build proprietary technologies and secure their position as a global competitor in the semiconductor market.

Similarly, InCore Semiconductors has made a name for itself with its RISC-V-based processors, pivotal in edge computing and AI chip design for sectors like automotive and telecommunications. Supported by venture capital and government initiatives, InCore has successfully developed custom silicon solutions using open-source architectures, reducing reliance on expensive proprietary technologies. This highlights how well-directed funding can fuel technological innovation and scalability, enabling startups to compete globally.

Morphing Machines has also distinguished itself in the field of reconfigurable processors, catering to industries such as telecommunications and industrial automation. Their REDEFINE™ technology, a runtime reconfigurable many-core processor, provides real-time flexibility in performance, a critical feature for industries requiring adaptable computing solutions. The company's success in bringing this innovative product to market was made possible through government and private fund-

ing, which enabled advanced R&D and rapid product development.

Another standout in the Indian semiconductor landscape is Saankhya Labs, a Bengaluru-based startup that has excelled in software-defined radios (SDR) and semiconductor design for wireless communication. With strategic investments and government support, Saankhya Labs has developed custom silicon solutions for broadcasting, telecom, and satellite communication applications, positioning itself as a leading player in global telecom markets. Their achievements illustrate the importance of a solid financial foundation in creating scalable, globally competitive products.

Lastly, Signalchip, a fabless semiconductor startup, has gained recognition for developing 4G/LTE and 5G chipsets indigenously, positioning India as a competitor in global telecom infrastructure. With substantial backing from private investors and government initiatives, Signalchip developed a locally sourced 5G solution, reducing India's dependence on imported telecom technology. Their success highlights how

financial support can empower Indian startups to create solutions that not only meet domestic needs but also compete on a global scale.

These success stories demonstrate the transformative power of adequate financial backing, whether through government schemes or private investment. This funding is essential for driving innovation, achieving commercial success, and enhancing global competitiveness within India's semiconductor ecosystem.

CHALLENGES FACED BY SEMICONDUCTOR STARTUPS

Despite the progress made through government initiatives like the Design Linked Incentive (DLI) scheme and the presence of promising success stories in the Indian semiconductor ecosystem, several challenges continue to hinder the growth and scalability of startups. The semiconductor industry is inherently capital-intensive, requiring substantial investments in R&D, prototyping, and EDA tools, which are often beyond the reach of many startups. While policies have been implemented to support innovation, the funding currently avail-

able is insufficient to meet the growing demands of silicon product design.

Moreover, Indian startups are competing against well-established and heavily funded ecosystems in the US, China, Taiwan, and South Korea, where billions have been invested in semiconductor infrastructure. Without access to advanced fabrication technologies, state-of-the-art IP, and domestic manufacturing plants, Indian startups face additional challenges in innovation and scaling. They are often forced to rely on foreign foundries, leading to increased costs, longer timelines, and exposure to geopolitical risks and supply chain disruptions.

The infrastructure gap (landscape of which will change in next half-a-decade) in India for chip design and prototyping further complicates the situation. Advanced semiconductor design demands access to EDA tools, fabrication-ready design kits, and prototyping labs, resources that are both costly and in short supply domestically. As a result, Indian startups must turn to international platforms, which drive up operational costs and extend development timelines.

Additionally, the talent shortage poses a significant challenge. While India produces many engineering graduates, most lack the specialised skills required for high-end semiconductor development. The existing talent pool is often drawn to global giants, which offer more attractive compensation packages and career opportunities, leaving Indian startups at a disadvantage when it comes to attracting and retaining top-tier talent.

These challenges, combined with the brain drain of top Indian talent to more developed semiconductor ecosystems abroad, create a significant barrier to the growth of India's semiconductor startups. Collaborating with academic institutions to develop specialised training programmes, forming global partnerships to access cutting-edge tools, and focusing on talent retention through competitive compensation and career

Image Courtesy: Morphing Machinea

The REDEFINE™ technology of Morphing Machines is a runtime reconfigurable many-core processor
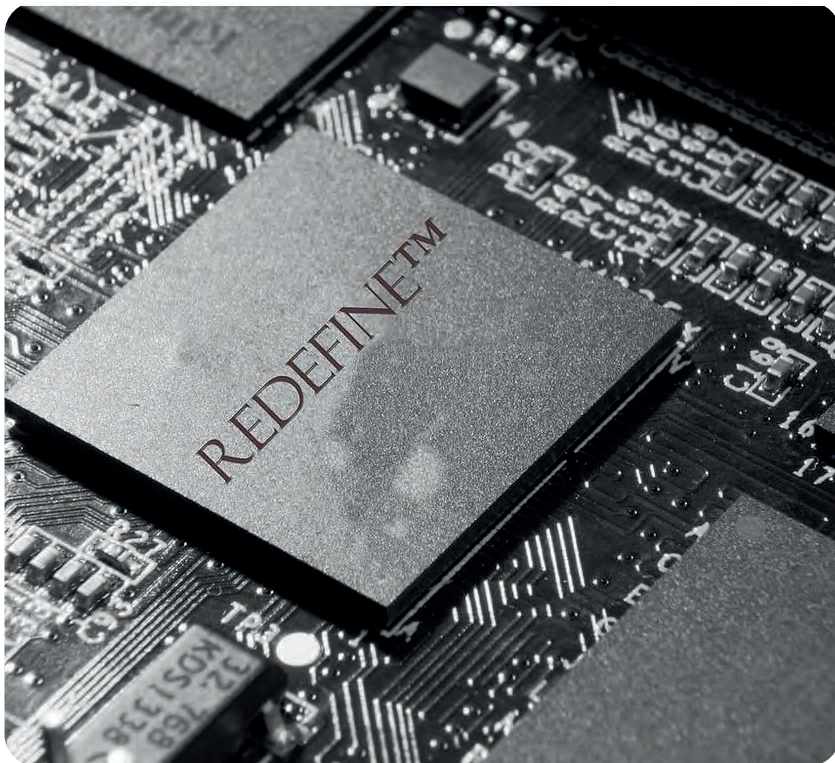
development will be critical in overcoming these hurdles. Without addressing these issues, Indian startups will continue to struggle to scale and compete on the global stage, despite the policy efforts and success stories.

WHAT MORE NEEDS TO BE DONE

To ensure the long-term success of India's semiconductor startups, several critical policy interventions and support mechanisms must be enhanced and expanded:

1. Broaden the Scope of the DLI Scheme

■ The Design Linked Incentive (DLI) scheme has proven to be a positive step, but its reach must be expanded to impact a larger number of startups. This includes increasing the overall funding pool and expanding eligibility to ensure that more promising startups benefit from the programme.

■ Beyond direct financial incentives, the government should prioritise R&D grants and infrastructure support through public-private partnerships, which will help startups overcome the high capital barriers in research, development, and prototyping phases.

2. Boost Private Investment

■ To draw more private investment into the semiconductor sector, the government can introduce tax incentives and risk-sharing mechanisms, reducing the financial risk for venture capitalists and private equity firms. These measures would make semiconductor startups a more attractive investment option, countering the current investor hesitancy due to long development cycles and high capital requirements.

■ Establishing dedicated semiconductor investment funds would also provide a targeted channel for both domestic and international investors, thereby increasing the flow of capital into the sector. This could significantly boost the scale and speed of startup growth in the industry.

3. Facilitate Technology Transfer and Global Partnerships

■ Strengthening international partner-

Snapshot of a semiconductor manufacturing unit in Noida, NCR

Image Courtesy: Shutterstock

ships with semiconductor powerhouses such as Japan, South Korea, and the United States will be essential in providing Indian startups access to advanced technologies, cutting-edge expertise, and best practices. These partnerships can enable joint research initiatives and technology transfer, helping Indian startups leapfrog technical barriers.

■ Bilateral agreements focused on knowledge-sharing, joint R&D, and infrastructure cooperation can equip Indian startups with the tools and global competitiveness needed to excel. Government-backed collaborations with multinational corporations will further enhance these startups' technical capabilities.

4. Foster Talent Development

■ India boasts a large pool of engineering talent, but continuous investment in skill development is critical to ensuring the workforce is prepared for the specialised demands of the semiconductor industry, particularly in silicon product design, chip verification, and testing. Regular investments in training programmes, upskilling initiatives, and internships within startups are vital to nurturing this talent pipeline.

■ Collaboration between academic institutions, industry leaders, and startups should be actively promoted to bridge the gap between theoretical education and real-world industry needs. This can be

achieved by creating industry-focused curricula and research partnerships, ensuring that graduates are equipped with the specialised skills needed to contribute to semiconductor innovation from day one.

In all, India's semiconductor startups hold immense potential to drive technological innovation, create high-value jobs, and contribute significantly to the country's self-reliance in high-tech industries. With the global semiconductor market set to grow rapidly, Indian startups are well-positioned to capture a portion of this market, expected to grow to US$ 100 billion by 2030 and reduce the country's reliance on imports.

However, they continue to face several significant challenges, including funding shortages, which hinder their ability to scale and compete globally. The industry's capital-intensive nature, combined with long development cycles and high-risk investments, makes it difficult for Indian startups to secure the necessary financial backing.

Overcoming these challenges will require a continuous concerted effort from both the government and private sector to provide the necessary support, infrastructure, and investment, allowing India's semiconductor startups to realise their full potential and compete effectively on the global stage.

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