



The Indian Journal for Research in Law and Management

Open Access Law Journal – Copyright © 2025

Editor-in-Chief – Dr. Muktai Deb Chavan; Publisher – Alden Vas; ISSN: 2583-9896

This is an Open Access article distributed under the terms of the Creative Commons Attribution-Non-Commercial-Share Alike 4.0 International (CC-BY-NC-SA 4.0) License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium provided the original work is properly cited.

FROM DEPENDENCY TO DOMINANCE: INDIA'S SEMICONDUCTOR MISSION 2025 AND THE QUEST FOR TECHNOLOGICAL SOVEREIGNTY

~ *Arya Verma*

In September 2025, Prime Minister Narendra Modi signalled a defining moment in India's technological trajectory by unveiling the country's first fully "Made-in-India" semiconductor chip at [SEMICON India 2025](#).

Under the [India Semiconductor Mission](#) (ISM), the country is boldly reimagining its role not just as a large consumer of chips, but as a designer, manufacturer, and innovator in the global semiconductor value chain. This article explores that evolution the mission's origins and objectives, partnerships with global players, the growing emphasis on indigenous innovation, and the strategic dilemma facing India between dependence and sovereignty.

Vision of Chip Sovereignty

Launched in December 2021, the India Semiconductor Mission was announced with an initial financial outlay of ₹76,000 crore. The mission's stated objective is to build a "robust semiconductor and display ecosystem" that will establish India as a global hub for electronics manufacturing and design.

In short, its agenda covers the entire gamut of semiconductor value chain activities: chip design, manufacturing (fabs), assembly, testing, packaging, and the supporting high-tech equipment ecosystem. Experts say ISM aims to achieve "full ownership" of the entire infrastructure, from design to packaging. In his speech at the 2025 conference, Prime Minister Modi emphasized:

"We are building a semiconductor ecosystem that will make India self-reliant and globally competitive... The day is not far when India's smallest chip will lay the foundation for the world's biggest transformation." It is this idea of technological sovereignty, ownership not only

of production lines but also of intellectual property, design capability, and raw material inputs, that marks a shift from earlier dependency-oriented industrial strategies.

Expansion: Manufacturing Footprint and Investments

A tangible sign of ISM's ambition is the spate of project approvals. On August 12, 2025, the Cabinet approved four new semiconductor manufacturing projects in the states of Odisha, Punjab, and Andhra Pradesh, bringing the total number of projects approved under ISM to ten, with a total investment of approximately ₹1.60 trillion.

Additionally, market analysts estimate that India's domestic semiconductor market (which was approximately US\$38 billion in 2023) is projected to grow to US\$45-50 billion by the end of 2025 and approximately US\$100-110 billion by 2030.

These expenditures and market projections imply that India is setting itself up for both domestic production and export-focused international alliances. According to one observer, "India's semiconductor mission is transforming India from an aspiring nation to a global powerhouse."

However, the task remains enormous: building a fab requires vast infrastructure (power, water, ultra-clean rooms, logistics) and long-term commitments. According to industry analysts in [Bloomberg \(2025\)](#), India is "in a position similar to where China was 15 or 20 years ago."

Global Partnerships and Integration into Value Chains

The growth of India's semiconductor sector is primarily driven by strategic partnerships with global companies. Major international companies such as Micron Technology, Samsung Electronics, Intel Corporation, and AMD Inc. (although India-specific announcements vary) are expanding their operations or planning investments in India. For example, [Micron has committed to investing approximately ₹22,516 crore \(US\\$2.71 billion\)](#) for a large assembly, testing, and packaging facility in Gujarat.

These foreign collaborations offer key benefits technology transfer, design and manufacturing know-how, access to global supply chains, and credibility in attracting further investment. They also support India's ambition to "expand rapidly" building world-class factories alone without external partners is much more difficult.

Still, this model raises deeper questions: Will India become a private manufacturing hub for global companies (working according to others' designs), or will it develop independent design and IP capabilities? This takes us to the next dimension.

Indigenous Innovation: Building a Domestic Ecosystem

Considering the above risks, the 2025 policy update deliberately emphasizes indigenous innovation not just manufacturing imported designs, but also designing in India, developing intellectual property in India, and enabling startups. At Semicon India 2025, the government announced a Deep Tech Investment Alliance with investments of over US\$1 billion for Indian deep-tech startups working on semiconductors, quantum computing, and clean technology.

A concrete symbol of this shift is the unveiling of the Vikram 3201 (colloquially "Vikram") chip (a 32-bit RISC-V microprocessor designed for space-grade applications.), India's first fully indigenous 32-bit microprocessor, developed by the Indian Space Research Organization (ISRO) in collaboration with the Chandigarh-based Semiconductor Laboratory for space and defense applications.

As one review puts it:

"India's semiconductor mission aims to ensure complete ownership of this stack... The mission aims to enable domestic capabilities in chip design, manufacturing, assembly, and packaging."

The policy environment now includes design-related incentive schemes, plans to modernize national laboratories, startup funding, and skills development programs. Thus, the narrative is shifting from "Make in India" to "Design in India." In effect, India is attempting a dual path: developing its indigenous innovation engine while attracting global manufacturing investment.

Strategic Dilemma: Dependence vs. Sovereignty

This dual emphasis presents a structural conundrum: how to strike a balance between foreign partnerships (for scale, speed, and access) and domestic innovation (for autonomy, intellectual property, and long-term sovereignty).

On the one hand, India needs global technology, global capital, and global markets; on the other, it does not want to repeat old models where the country remained a mere production hub without design autonomy.

Critics warn: "Without suppliers of gases and chemicals, without companies that make Molds for chip packaging, without universities that produce skilled engineers... India's ambitions risk being limited to mere declarations."

Furthermore, despite the surge in projects, many challenges remain complex manufacturing supply chains, a lack of advanced process technologies domestically, regulatory and infrastructure hurdles, and global competition for skilled talent.

Therefore, it is not a matter of choosing between foreign collaboration or indigenous innovation but of effectively managing both. India's policymakers are signalling this building co-development models instead of pure imports; establishing design centres, training programs, and linking public procurement to domestic capacity. The real test will be how effective the convergence of policy, funding, industry, and academia will be.

Towards “Silicon India”

India is at a crucial juncture as its first "Made-in-India" chips roll off pilot production lines and semiconductor manufacturing approvals advance. The country's future role in the global semiconductor ecosystem whether as a manufacturing export hub for international firms or as an innovation hub advancing technological independence in the Global South will depend on how effectively various elements are integrated. A coherent industrial policy, comprised of fiscal incentives, stable regulation, and robust infrastructure, must be aligned with a robust intellectual property and design ecosystem that encourages indigenous chip innovation and domestic value chains in packaging, testing, and equipment supply. Equally important are strategic partnerships that balance foreign capital and technology transfer with meaningful domestic influence in skills, design rights, and local enterprise development. A vibrant talent and research environment connecting universities, start-ups, and R&D centres must transform academic knowledge into commercial semiconductor solutions. Finally, geopolitical, and strategic considerations, such as securing critical minerals, rare earths, and defense-related semiconductor capabilities, embodied in India's "National Critical Minerals Mission," will strengthen supply chain resilience and national security. All these dimensions indicate that the semiconductor mission goes beyond industrial policy it represents a constitutional and economic vision that aims to combine global integration with national self-reliance, where the chip symbolizes India's pursuit of technological sovereignty.

Conclusion

The India Semiconductor Mission marks a decisive shift in India's digital-industrial strategy an aspiration to become a major hub of design, manufacturing, and innovation in the global semiconductor ecosystem, from a large market and assembly base. The unveiling of the first

indigenous chip, a wave of manufacturing approvals, and the intensive development of startup and innovation programs are emblematic of this ambition.

Still, the road ahead is long and complex. Building a complete semiconductor ecosystem takes decades, and simply approving fabs is not enough. The most critical aspect will be whether India can internalize designs, build intellectual property, create domestic supply chains (for chemicals, gases, equipment), and retain value and innovation domestically rather than exporting high-value addition.

India will face a strategic conundrum as it pursues this transformation: utilizing international alliances to increase size and exports quickly while simultaneously encouraging indigenous innovation and independence. India's success will be measured not only by the number of chips it produces, but also by the number of designs it creates, the number of upscale manufacturing facilities it runs, the number of startups it supports, and the number of patents it owns.

In short: moving from dependence to dominance is not just a matter of quantity, but of capability, autonomy, and the ability to define the technology of the future not just consume it. India's semiconductor mission is now a test of the country's technological, economic, and constitutional vision for the 21st century.

References

1. Ministry of Electronics & IT (MeitY) – “*India Semiconductor Mission (ISM): Policy Framework and Guidelines*” (Revised, 2024).
2. Semicon India 2025 Conference Report, Government of India (2025).
3. Micron Technology Press Release – “*Micron to Invest \$2.75 Billion in India Semiconductor Facility*” (2023).
4. NITI Aayog, “*Building India’s Semiconductor Ecosystem: Challenges and Roadmap*” (2024).
5. World Economic Forum (2024) – “*Semiconductors and the Global South: Strategic Opportunities for India.*”
6. Harvard Kennedy School Policy Paper (2024) – “*India’s Technological Sovereignty in the Age of Chips.*”

7. OECD Science, Technology, and Industry Outlook (2024) – Chapters on semiconductor supply chains.
8. ET Government or Business Standard Reports (2025) – For the latest project announcements and Modi’s speech excerpts.
9. S. Saran & A. Tripathi (2024) – “*Industrial Policy, Tech Nationalism, and Semiconductor Strategy: India’s Emerging Playbook,*” *Indian Journal of Industrial Policy*.
10. CSET (Centre for Security and Emerging Technology, Georgetown) – “*Global Semiconductor Supply Chains: Strategic Dependencies and Opportunities for India*” (2023).