

Vision 2025:  
Accelerating towards  
a USD 100 billion  
hardware design hub

**April 2021**

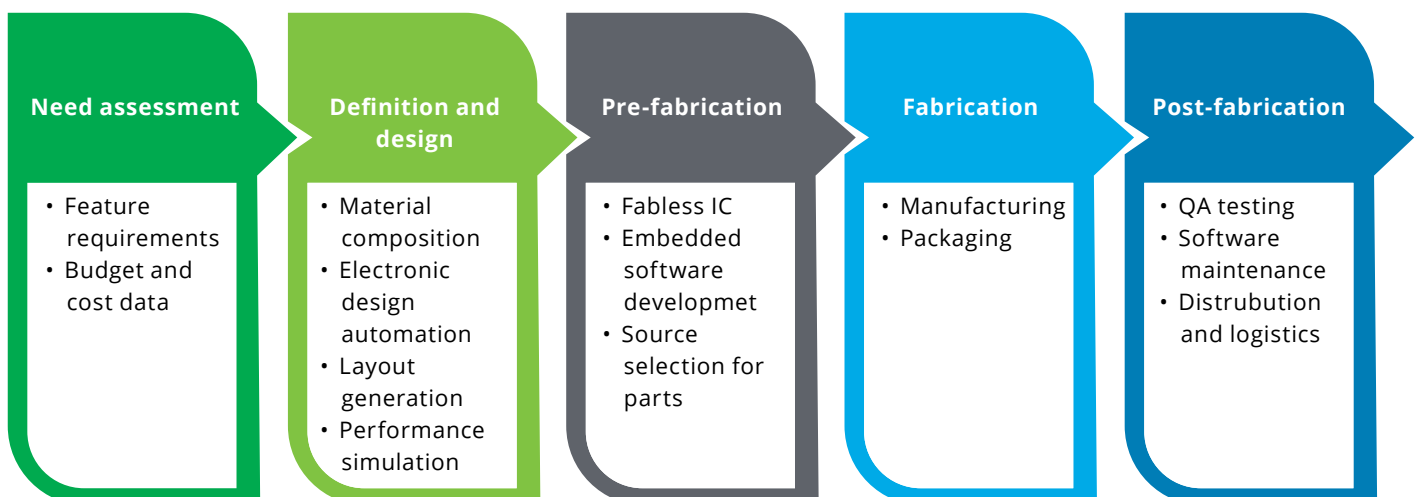
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# 1. State of the ESDM industry

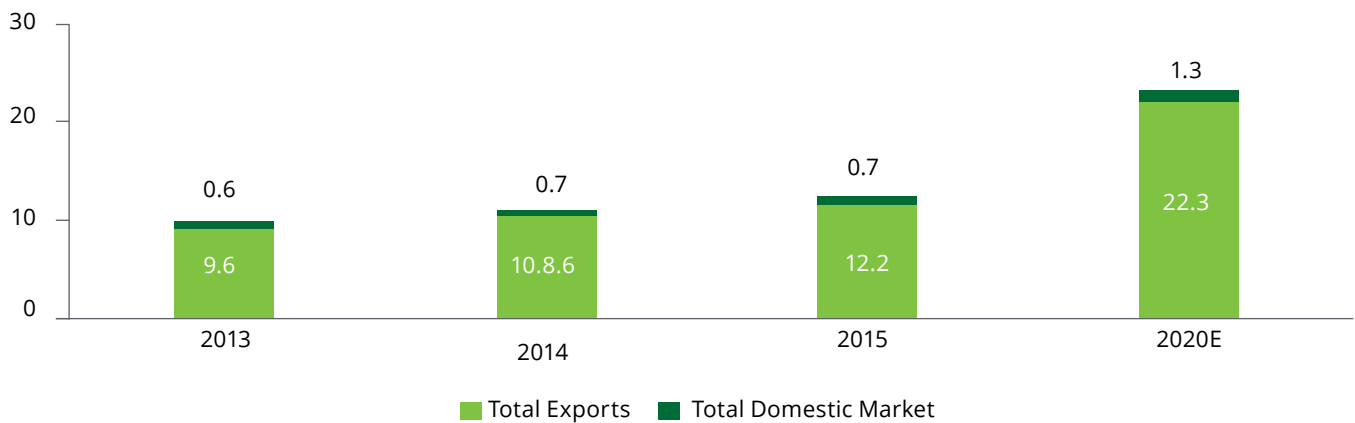
- i. The ESDM sector in India is expected to reach US\$ 220 billion by 2025, growing at a compound annual growth rate (CAGR) of 16 percent between 2019 and 2025. India's share in the global electronics production is about 3 percent.
- ii. **Revenue from electronics design in India is growing at 20 percent, with US\$ 19.8 billion in FY 2019 and expected to grow to ~USD 60 billion in FY 2025.**
- iii. India has become a global hub for electronics design with nearly 2,000 chips being designed every year with around 20,000 engineers working in various aspects of chip design.
- iv. Electronic system design and manufacturing value chain is given below:



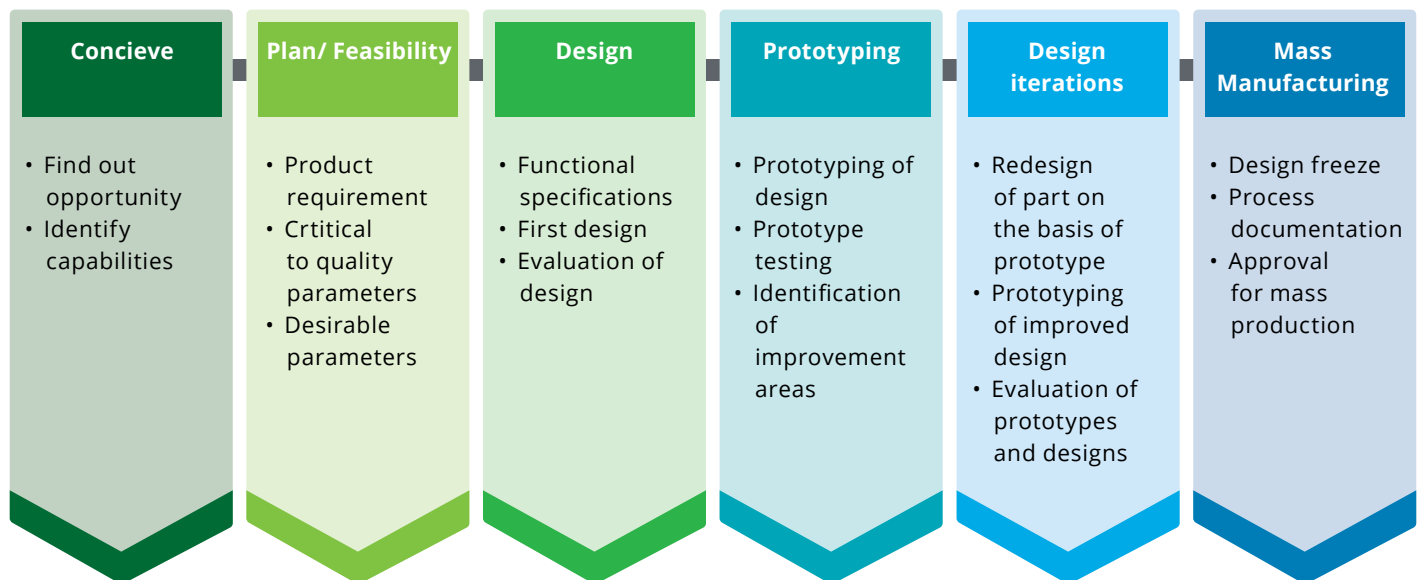
v. Embedded systems are the largest (85 percent share) segment in the design services market. Very Large-Scale Integration (VLSI) and Electronic Design Automation (EDA) make up the biggest chunk of the Indian semiconductor design industry.

vi. Exports comprise about 90 percent of India's design services output. However, in the recent past, a number of organisations in the electronics value chain are planning to relocate their design offices to India.

**Electronic design services in India US\$ B**



#### Design value chain



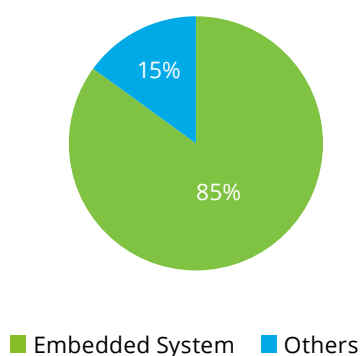


## 2. Why should India aspire to be a Design hub?

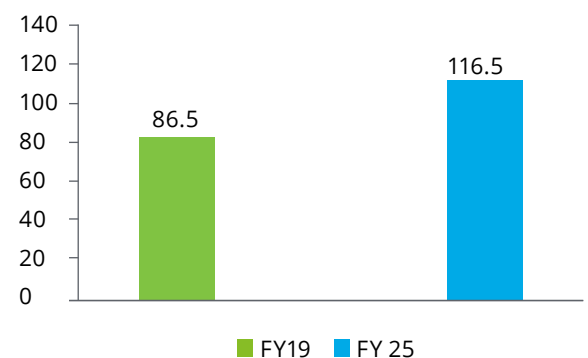
### 1. Leverage strong capabilities in Embedded System Design for global value chain participation

- i. The Global Embedded System market is expected to grow from ~USD 86 billion in 2020 to ~USD 115 billion in 2025, at a CAGR of 6 percent.
- ii. While the Indian Embedded System industry is currently import dependent, domestic design services are a key strength for India. Embedded systems are the largest segment (85 percent revenue share) in the design
- iii. Connectivity, portability, and IoT are the key themes that are driving demand for embedded systems services across verticals such as automotive, consumer electronics, mobile handsets, internet routing hardware, and healthcare.
- iv. This segment can be leveraged further to develop the Electronics Design Industry in the country.

Design service market segments



Global embedded system market US\$ B



## **2. Domestic demand driven by requirements to build I4.0 capabilities**

The IoT market in India was ~USD 15 billion in 2020. It accounts for about 5 percent of the total global market. With the focus on enhancing domestic manufacturing and its competitiveness, this area has significant growth opportunity. The sector is nascent with a significant number of POCs but limited large-scale deployment. Further, the arrival of 5G technology is expected to accelerate the adoption of I4.0. In such a scenario, limitations of hardware design, which would restrict data flow, would impact the widescale adoption of IoT systems and thereby, India's competitiveness in manufacturing.

## **3. Growth opportunities for the ecosystem, including start-ups**

Global companies have started developing innovation labs to provide infrastructure, tools, and mentorship. Venture capital funds are also interested in hardware design start-ups, due to lower capital investments required and attractive growth prospects.

## **4. Talent availability**

Many global corporations have set up their design offices in India, which has resulted in a critical mass of talent required for Electronic Design. The talent can be scaled up significantly to drive employment opportunities in

high value-adding activities. This will also enable India to access a significant part of the value chain as against just specific elements of development.

## **5. Prioritising development of Intellectual Property and moving up the value chain**

The creation of Intellectual Property (Patents) is a high value-addition activity. It helps generate revenue and creates a highly talented workforce. In this regard, it is noteworthy that India had only 2,053 patents in 2019; , which was less than 1 percent of the global filings. On the other hand, China had applied for 58,990 patents in the same year.

## **6. Enabling the Make in India (Atmanirbhar Bharat) programme**

India's policies are focused on attaining self-reliance which has been articulated by production-linked incentive schemes for electronics manufacturing. To enable India to significantly move up the value chain, (i) the model needs to be moved upstream for Electronic Design, and attract investments to build up capabilities, and (ii) it is an opportune moment to focus on building the local ecosystem, preparing it to cater to the large-scale electronics manufacturing and in the process, make India the "go-to" destination.



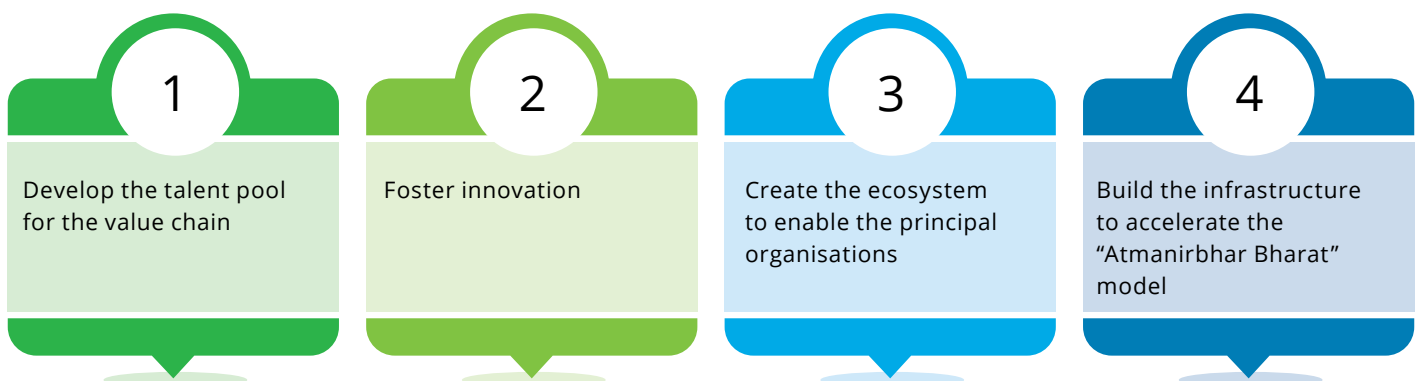


### 3. Vision for India as a hardware design hub: To be a US\$ 100 billion industry by 2025

With the ESDM market in India expected to reach USD 220 billion by 2025, India should aspire to be a USD 100 billion electronics design market, and to be a leading global hardware design hub

(supported by the availability of talent and ecosystem, cost competitiveness, and domestic demand). This will help the country position itself as an attractive investment destination.

To realise the vision of USD 100 billion and be the global hardware design hub, there are four key areas for consideration, as under:





## 4. Recommendations to the government

### i. A multi-point plan

- a. **Emphasising on strategic segments:** Identifying strategic areas within the Electronics Hardware Design space to develop capabilities in the domain needs to be adopted for creating economies of scale and scope. These would be segments of import dependency (e.g., Defense, Telecom and IoT products) and those that are critical for the growth of our economy (e.g., healthcare, automotive, and agriculture).
- b. **Launching a Design-Linked Incentive (DLI) scheme for hardware design:** The Government of India has launched Production-Linked Incentive (PLI) schemes in various sectors to encourage domestic manufacturing and value addition in India. The government may provide similar incentives for Electronic Hardware Design that has Domestic Value Addition (DVA) with associated investments, specific to design and development.

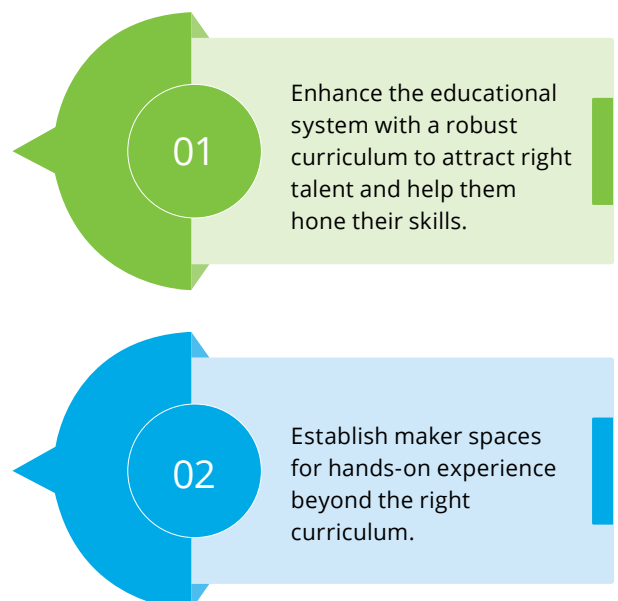
Such an initiative will continue to establish a strong hold for India to cater to the global/export market. The initiative will also be directly beneficial to the domestic market, as it will create Intellectual Property (IP) and higher value addition in the country.

- c. **Initial focus on specific sectors:** Instead of broad basing recommended PLI schemes, initial focus should be on design services related to crucial sectors, such as electronics, healthcare, telecom, and military, and consequent zero rating of design services related to these sectors and/or when provided to publicly funded research institutions.

Depending on the progress and related participation by the public/private sector, further extension of schemes to other sectors (as required) may be considered to consolidate India's status as a design hub.



- d. Developing shared infrastructure:** Hardware design requires access to specialised infrastructure, specifically in areas such as prototyping and testing which may not be financially unviable for individual organisations. Availability of shared infrastructure as facilitation and development centres will enable creation of the ecosystem and drive utilisation. These centres could also provide mentorship and guidance support through experienced professionals to industry participants.
- e. Setting up a nodal body that focuses exclusively on Hardware Design:** India may also consider setting up a nodal body on the lines of the Interuniversity Micro Electronic Centre (IMEC), Belgium. IMEC focuses on research and development in the area of semiconductors and has helped the country build capabilities in cutting-edge technologies. The organisation employs more than 4,000 researchers from 90 countries, including India. It is supervised by a board of directors, including delegates from the industry, universities, and the government.
- f. Recognition of electronic hardware design as a champion sector:** Under the Make in India initiative, the government has identified electronics system design as one of the champion sectors to hand-hold investors and improve India's domestic capabilities. However, a renewed focus is required on electronic hardware design to enable its growth. Also, electronics hardware design activity is aligned with manufacturing. Therefore, for India to emerge as a successful destination for electronics and telecom manufacturing, hardware R&D must be given a manufacturing status
- g. Attracting global design houses and MNCs to India:** The government may provide export incentives (similar to incentives provided by FTP under SEIS Scheme, which provides for a specific percentage of Net Foreign Exchange earnings as duty credit scrips, with FTP 2015-20 being valid only until 30 September 2021) similar to those for products. This would also incentivise firms that have ventured out of India to set up their design centres in the country and export from India.
- h. Protection of IP:** India has been ranked 40th in a list of 53 countries on a global IP index 2020. The Indian IP law is thorough and comparable with European IP law. Hence, enforcement of the IPR laws would be a key enabler of the hardware design industry's growth in India. Also, India filed less than 1 percent of the international patent filings in 2019. A major reason for this is the lack of access to research facilities and high cost incurred in research activities. Towards this, the government needs to foster collaboration amongst research institutions, firms, and academic institutions to accelerate the pace of IP generation.
- i. Incentivising adoption of indigenous hardware designs:** The government may incentivise companies for adopting indigenous designs. At present, the average rate of adoption of IoT systems in large Indian firms is about 30–35 percent, thus providing for a significant scope of growth for firms in India. Further, the government could consider providing export incentives similar to that of product exports.
- j. Creating enabling ecosystem for start-ups (like incubators, start-up program):** The government should focus on aspects that can enable the growth of start-up ecosystems. The firms identified under flagship programmes, such as Startup India, should be onboarded on incubation platforms, to access mentorship from global and Indian industry leaders who have a base in India.
- k. Enabling the design talent pool:** With the objective of enabling and accelerating collaboration between industry and academic institutions to create the talent pool for scale, the government through the recommended nodal body, should identify specific educational institutions in India to focus on electronics hardware design with curricula and internship designed, developed and supported by the industry. In this context, the following is recommended:



- l. Semiconductor fabs:** To become a large-scale player in the space, there is a need to identify key products that will grow the market in India and developing markets. Semiconductor fabs need to be built to support this need. An ecosystem has to develop and that will take time. MEITY's recent EoI to set up or expand existing semiconductor wafer/device fabrication in India or acquisition of semiconductor FABs outside India is a step in the right direction. India needs more such initiatives.
- m. Long-term vision:** The electronics design sector is niche and requires adequate support. The government needs to invest and nurture the space for the next 25 years to develop it to the level of some countries (e.g., Taiwan).
- n. Supplement/use the MSME sector:** The aforesaid initiatives can also be driven with the active involvement/participation of the MSME sector. The same should also be advised and made part of the recommended PLI scheme, which could factor additional incentives for the MSME sector (such as a PLI scheme for the telecom sector, which inter alia provides MSMEs a specific incentive structure and special investment threshold).
- o. Operations through a customs-bonded warehouse:** While there is no clarity on whether facilities/benefits available for manufacturing activities in customs-bonded warehouse can be extended to the service sector, the same may be categorically considered (i.e., duty-free import of raw materials and equipment, for performance of subject design services in customs-bonded warehouse) to provide further impetus to the suggested design sector.
- p. Concessional imports:** Imports duties on raw materials/machines/ equipment/technology may be subsidised/exempted for specific usage towards R&D in the design sector. Such a measure will provide further impetus to entities engaged in or planning to enter the design services sector.
- q. Merging with global supply chains:** This is recommended to resolve the issue of supply chain. Unless a robust infrastructure is put in place that would seamlessly merge with the global supply chain, any amount of incentivising the sector would be of no avail. Therefore, it is imperative for the government to ensure the same so that there would be quick entry into new international markets.
- r. Competitive offerings:** As global supply chains get reorganised in a post-Covid world, India must acknowledge that the void will be filled with countries like Vietnam, Malaysia, Indonesia (given their access to component ecosystems), Romania (focus on innovation and cutting-edge startups), Mexico (access to market). To compete with these countries, India needs to remain competitive



## 5. Case in point: Taiwan

The Government of Taiwan (GoT) has taken several initiatives to enhance the competitiveness and innovation capabilities of businesses engaged in research activities. Some of these measures are outlined below:

- a. Developed the Hsin-chu Science-based Industrial Park (HSIP), following the model of Silicon Valley in the US, for development of high-technology industry.
- b. At an early stage (i.e., in 2002), the GoT offered a major incentive to the semiconductor design industry by launching a Si-Soft project. The project aimed at developing resources to create a skilled workforce for the semiconductor design sector and establishing an IC design park. Under this project, the Nankang IC design science park was initiated in July 2003.
- c. The GoT also provides for zero tax, exemption from import duties, and other specific taxes on products, manufactured for export in similar designated science parks.
- d. The GoT has also established research institutions, such as the Industrial Technology Research Institute (ITRI), with several laboratories that collaborate with the private sector to build their research competitiveness. The National Science and Technology Projects (NSTP) provide financial stability to the ITRI. Some ITRI researchers join private-sector companies, thus increasing R&D capabilities of the private sector.
- e. The GoT enacted the “Statute for Upgrading Industries” in 1990 and amended it in 2003. The statute encourages the hi-technology industry by providing (i) a five-year holiday on corporate income tax, applicable on the entire income for the newly incorporated company, and (ii) on incremental income from new construction or expansion of pre-existing and qualifying companies.
- f. A Taiwan-based company is eligible for a 30 percent credit for R&D expenses against income tax payable for five years, starting from the year in which the company begins R&D activity. If this expenditure exceeds the average of the preceding two years, 50 percent of the excess amount may be offset against income tax payable that year. Further equipment and machinery used for R&D can be depreciated completely over a two-year period.

# Contributors

**Mahesh Jaising**

**P.S. Easwaran**

**Payal Tuli**

**Mamatha Anand**

**Sandeep Mohanty**



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