

# Indian Electronics Industry on Fast Growth Trajectory with special reference to Emerging VLSI-Design Services Industry

**Abstract**---*Electronics industry is one of the fastest growing and largest revenue generating industries in the world. The Indian Electronics Industry can become one of the top performing industries based on its persuasive potential towards delivering higher performances. In the year 2015, the size of Indian Electronics Industry is likely to reach USD 94.2 bn (Rs. 5,65,000 Cr) in 2015 with expected growth rate of 9.9% which is more than twice of global electronics market. Currently, Indian Electronics Industry fulfils its 65% of demand from imports. The demand for electronics hardware is expected to reach approximately USD 400 bn (approx. Rs. 24,00,000 Cr), by the year 2020. But, electronics hardware production in the country is projected to touch USD 104 bn mark by the year 2020, creating a massive gap supply-demand gap of approximately USD 296 bn (approx. Rs. 17,76,000 Cr). The Indian semiconductor design industry comprises of Very-Large-Scale-Integration (VLSI) design, embedded software and hardware development. Indian VLSI and design services industry is expected to reach USD 3.02 bn (approx. Rs. 19,200 Cr) by 2017 with a very encouraging CAGR (Compound Annual Growth Rate) of 16.25% during the years 2012-2017. By 2015, VLSI industry will employ about 75,000 workforce to surge forward and compete on global platform. The research paper takes an overview of Indian electronics and VLSI industry and the outcome of this research should be useful for business organizations, industry and government institutions operating in Indian electronics and VLSI industry.*

**Keywords:** *Electronics Industry, VLSI, Semiconductor, Imports, Hardware Production*

## Objectives of the research paper:

The objectives of the research paper are as follows.

1. To conduct brief analysis of Indian Electronics Industry.
2. To conduct SWOT analysis of Indian Electronics Industry.
3. To take an overview of VLSI Industry in India.

### 1] A Brief Analysis of Indian Electronics Industry

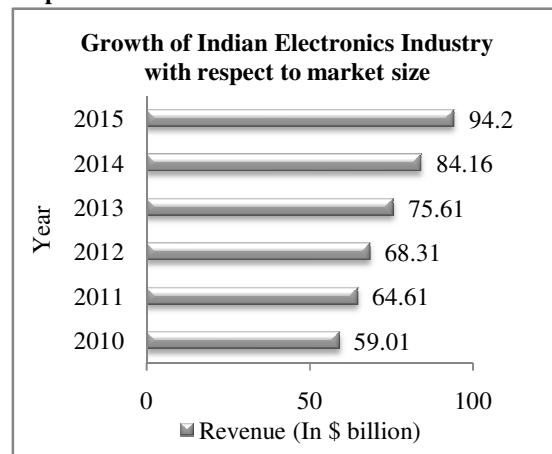
**1.1** Indian Electronics industry is one of the fastest developing industries in the country. Indian Electronics

industry started its functioning from 1960s onwards. The industry is relatively younger industry, and was initiated when Research and Development (R&D) in Germanium (Ge) and Silicon (Si) Technologies was commenced. In those days, electronics industry was restricted only to the development and maintenance of fundamental communication systems. Few Multi-National Companies (MNCs) like Texas Instruments and Indian companies such as British Physical Laboratories Group (BPL) were amongst the opening players in Indian electronics market in the initial stages of Indian electronics industry.

1.2 Today, the Indian electronics industry is divided into sectors such as telecom equipment, automotive electronics, consumer electronics, industrial electronics, medical or healthcare electronics, defence electronics, etc.

The Indian electronics industry was estimated to be at USD 68.31 bn (approx. Rs. 4,10,000 Cr) in 2012. The impressive performances in 2011-12 have registered a CAGR of 9.88%. Moreover, the growth rate is twice the growth rate of global electronics industry. The corresponding size of the industry by 2015 is expected to be USD 94.2 (approx. Rs. 5,65,000 Cr) billion.

**Chart 1: Growth of Indian Electronics Industry with respect to market size**

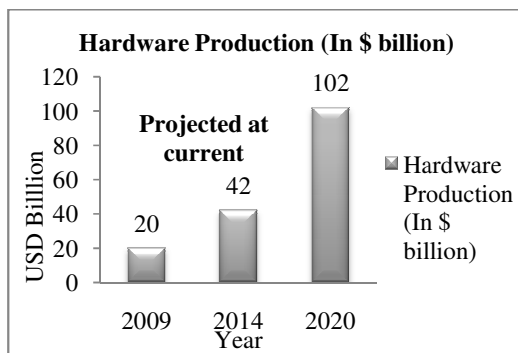


[Source: IESA, Frost & Sullivan Report, Base Year: 2011]

According to market size comparison, India accounts for only 3.5-4% of the global electronics industry with very limited contribution in electronics manufacturing sector.

1.3 Electronics hardware manufacturing in India comprises of manufacturing and production of electronic components, integrated chips, electronic systems, intermediate and certain number of final products in sectors such as telecom equipment, defence sector, industrial and healthcare sector, etc..

**Chart 2: Electronics Hardware Production in India**



[Source: Ministry of Information and Technology, Govt. of India, 2008-09, Annual Report]

## 2] SWOT Analysis of Indian Electronics Industry

SWOT analysis of Indian electronics industry is done as follows.

### 2.1 Strengths:

**A) Vast market consumption and increasing demand:** Indian electronics industry has a huge domestic market with continuously rising demand. Demand for hardware components, intermediate products, high-end technology and automotive products and especially consumer electronics products have registered a significant growth. According to estimates by several government reports, the demand for electronics hardware in the country is projected to increase from USD 45 bn in 2009 to USD 400 bn by the year 2020.

**B) Increasing support for the electronics sector by Government:** Indian Government and Department of Electronics and Information Technology (DeitY) with their strategic vision, have initiated number of farsighted policies, reforms, and incentives, for the growth of Indian Electronics Industry.

**i) National Policy on Electronics (NPE):** Government of India has initialized National Policy on Electronics (NPE), in 2012, with an ambitious vision- "To create a globally competitive electronics design and manufacturing industry to meet the country's needs and serve the international market".

Various objectives set through NPE are:

- To create a sustainable ecosystem for a globally competitive electronics sector by attracting heavy investments of around USD 100 bn.
- To set up semiconductor wafer facilities for the fabrication of electronic chips and chip components.
- To set up 200 Electronic Manufacturing Clusters (EMCs) with world class logistics and Infrastructure as well as easy-to-do business facilities.
- To generate employment of over 28 mn (2.8 Cr) workforce in electronics sector over the next 8 years.

**ii) Electronic Manufacturing Clusters (EMCs):** The schemes under EMCs would aim to support setting Greenfield EMCs (in undeveloped or underdeveloped geographical areas) by assisting them up to 50% and Brownfield EMCs (where significant number of existing electronic market units are located) by assisting them up to 75% of the project cost.

**iii) Semiconductor Fabrication Units:** To promote semiconductor fabrication, various incentives are being offered by the government such as 25% subsidy on capital expenditure and growth capital expenditure, reimbursement on Countervailing Duty (CVD) and excise duty, etc.

**iv) Electronic Development Fund (EDF):** The EDF aims to create a strong ecosystem of Research and Development (R&D) activities in electronics sector in our country which will promote Intellectual Property (IP) generation and large scale indigenous manufacturing while simultaneously exploring the growth of electronics sector through development of Small and Medium-sized Enterprises (SMEs).

### v) Human Resource (HR) Development Initiatives:

a) Under HR initiatives, the government is planning to set up 'Electronics and Telecommunication Skill Development Council'.

b) Special Manpower Development Program - Phase III for VLSI and Chip Design Sector for 10,000 students.

c) The Ph.D Scheme: Large scale Ph.D. scheme has been approved in February 2014 with budget of Rs. 450 Cr to encourage the dedicated research activities in this sector. The scheme will aim to create around 1,500 Ph.D research scholars in coming period of 5-6 years in the electronics sector.

**C) Substantial contribution of global players:** With top 25 global semiconductor companies, top 10 VLSI and embedded systems companies and top 10 cable companies, top working

in some or the way in India, in next few years, India is set to emerge as a new and powerful electronics hub in the world.

### 2.1 Weaknesses:

**A) Limited attention towards indigenous manufacturing:** India's presence in the global manufacturing sector of electronics is very meagre at around 1-2%. Further, the share of electronics sector in Gross Domestic Product (GDP) of India is about 2%.

**B) Infrastructural inadequacies:** Physical infrastructural inadequacies, power shortages, shortages of basic utilities are significantly inhibiting the growth of the electronics industry. Also, these issues are creating hurdles for start-ups to establish, develop and to attract funding and investments.

**C) Supply chain and logistics constraints:** Insufficient or in some places underdeveloped supply-chain and logistics connectivity, high transportation costs, high cost for raw materials are hampering manufacturing capabilities in the industry.

**D) Lack of dedicated research work:** There is a serious lack of dedicated research work at every level of education. Further, Ph.Ds, Post Graduate Programs, value added courses in electronics and its applications are not being encouraged enough. This is getting reflected through lesser number of IP generation and patent holders.

### 2.3 Opportunities:

**A) Farsighted vision set by Government of India:** On the basis of various visionary goals and agendas set by Government of India, it is the time to build 'Brand India' and present it to the world. Some of the policies include 'Digital India', 'Make in India Made for World', 'Make in India' and several plans of developing smart cities offer the huge opportunities for electronics sector. India is targeting a quantum jump of increasing the share of electronics sector from 2% to 10% in India's GDP in near future. Also, increasing digitalized teaching pedagogy is another huge opportunity for Indian manufacturers of consumer electronics products.

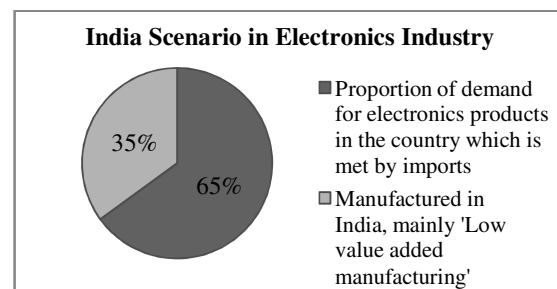
**B) India a strong investment destination:** Several global MNCs are enhancing their plans of heavy investments and are establishing captive tech-centres in our country. As per prime objectives of NPE, investment target of USD 100 bn is to be achieved in near future. Moreover, due to rapidly rising cost of manufacturing and labour in China in last few years, Indian electronics market is budding as an excellent alternative investment destination.

**C) Wide scope for R&D activities:** Existing capabilities of our research activities can be encouraged and enhanced on the platform of several policies in R&D sector which will provide strong support to IP generation in our country. A wide scope is observed to increase the participation of educational institutes and universities to drive industry or demand-oriented research activities.

### 2.4 Threats:

**A) Disappointing heavy import statistics:** Currently, Indian scenario in electronics industry is that, 65% of the demand for electronics products in the country is met by imports.

**Chart 3: India scenario in Electronics Industry**



[Source: 'B' Lore Edu Group Builds a Nest for Startups', The Economic Times, 9<sup>th</sup> July 2014, Page 6.]

According to several studies, the electronics imports bill may surpass fuel oil import bill in next few years.

**B) Possible supply-demand gap:** According to several reports, the demand for electronics hardware in the country is projected to increase from USD 45 bn in 2009 to USD 400 bn by 2020. The estimated production of Indian electronics industry will reach USD 104 bn by the year 2020. This may create massive supply-demand gap of around USD 296 bn (approximate Rs. 17,70,000 Cr).

**C) Tough Competition from Global Players:** The Indian electronics industry possesses major threat of established manufacturing ecosystems in China, Japan, Taiwan, South Korea, etc. Also, the emergence of low cost manufacturing destinations, like Vietnam, has created the tough competition.

**D) Infrastructural inadequacy:** India is lacking in building and developing indigenous manufacturing plants, semiconductor fabrication units, etc. These barriers are diverting the business related to electronics industry to other destinations rather than from India.

### 3] An Overview of VLSI Industry in India

#### 3.1 What is VLSI

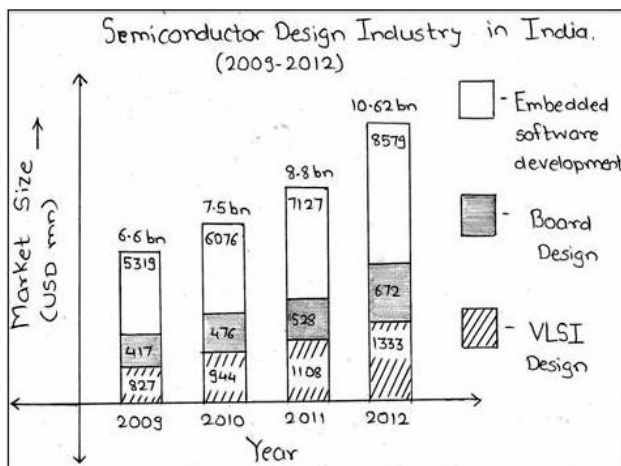
Very Large Scale Integration (VLSI) is the level of computer microchip miniaturization and refers to the microchips containing the thousands of transistors. VLSI can also be explained as; it is a process of creating an integrated circuit (IC) by combining thousands of transistors into a single chip. The development in VLSI technology was initiated in the 1980s.

Indian semiconductor industry is comprised of embedded software, VLSI design and hardware development (or board design). In recent periods, the VLSI design industry has been playing an increasing role in semiconductor industry in India.

#### 3.2 VLSI and Design Services Industry in India

Indian VLSI-design services and manufacturing industry contributed to around 14% of total Indian semiconductor market and stood at USD 1.25 bn (approx. Rs. 7,500 Cr) in the year 2011. In 2012, the total revenue from VLSI industry was estimated at around USD 1.3 bn (approx. Rs. 7,800 Cr).

**Chart 4: Semiconductor Design Industry in India (2009-12)**



[Source: Future of Chip Design Industry, PVG Menon, YOJANA, September 2012.]

Today, Indian VLSI design service market is driven by captive and non-captive design centres. As far as market revenues are concerned, captive design centres contribute major volumes (approx. 70%). Currently, non-captive segment includes some giants like Wipro Technologies, SmartPlay Technologies and Sasken Communication Technologies Limited, etc.

The design centres in India are designing chips for all the major verticals of industry which include telecommunications, networking, consumer, healthcare, industrial and defence electronics, automotive electronics, etc. VLSI designing services are majorly focussed in the area of consumer electronics (approx. 34.2% of the total market revenues). This is followed by networking market segment (approx. 28.1% share). Indian VLSI industry has several local and global companies, with direct or indirect contribution, which include global industry behemoths like AMD, Xilinx, NVIDIA, etc.

Ironically, it is observed that, the global electronics industry giants devote the high-end activities like specification definition and architecture design at their end, whereas the lower-end activities like testing and assembly are assigned at their Indian counter-part.

Following chart depicts the contribution of three major components of semiconductor industry in India.

#### 3.3 Few Interesting facts about VLSI industry and VLSI design services sector in India

1) In last few years, India has become a hub for semiconductor and VLSI design with nearly 2000 chips being designed per year, which are used in several products and electronic systems. Annually, India is generating nearly USD 2 bn (approx. Rs. 12,000 Cr) in revenues from the chip design services.

2) Indian design engineers have proved their ability to handle complex projects by taping out some of the world's best chips used in several devices.

3) Indian companies have designed chips on 28 nm (nanometre) scale that have already been successfully taped out. Further, it is expected that they will graduate to 22 nm scale chips and 3D Chip Designing in the forth-coming years.

4) It is observed that, IP creation in India would generate around 10 times more revenue in the form of royalties than creation costs. If the IP is owned by India, we will be given credit for the full value chain and also earn significantly higher revenues.

5) According Frost & Sullivan, India accounted for less than 1% of global chip IP in 2005 but in 2012 it produced about 5.5%, making our country an emerging player in the electronics world.

### 3.4 VLSI Workforce

By the year, 2011-12, there are around 1,63,000 employees working in the Indian Semiconductor Sector. Out of these, around 20,500 workforce is engaged in VLSI design services. The industry is comprised of a young, energetic workforce with approximately 78% engineering graduates. Surprisingly, only around 8% of the total workforce hold post graduate degrees. Significant shortage of Ph.Ds and quality research projects to drive innovation and R&D in VLSI industry is observed.

### 3.5 Future Scope:

On the strong platform of substantial performance in last decade, rising demands from all over the world, substantial support of Indian electronics industry, availability of expertised and young workforce, VLSI industry in India is advancing towards bright future. According to 6Wresearch,

Indian VLSI design service market is expected to reach USD 3.02 bn (approx. Rs. 19,200 Cr) by 2017, growing at an astounding CAGR of 16.25%. One of the key objectives of National Policy of Electronics is 'to build the emerging chip design and embedded software industry to achieve global leadership in Very Large Scale Integration (VLSI), chip design and other frontier technical areas and to achieve turnover of total USD 55 bn (approx. Rs. 3,30,000 Cr) in 2020 for total semiconductor industry'.

According to National Association of Software and Services Companies (NASSCOM), the VLSI and embedded industry would employ 7,50,000 workforce by 2015 with about 75,000 for VLSI design.

Due to above facts 'embedded and VLSI training' is becoming the first choice for students to pursue a career in the electronics sector.

#### Suggestions

1) As electronics industry is manufacturing industry, it is necessary to provide required infrastructure, ultra-modern technological supplies, power, etc. Cost of raw materials, contribution of taxes and various duties and other constraints should be considered so as to encourage and promote the indigenous manufacturing of electronics components, products and entire product chains.

2) Govt. should encourage small and medium scale enterprises engaged in electronics manufacturing and most importantly assist them with necessary financial aids and subsidies to sustain and grow substantially.

3) It has been observed that very minimal research related to electronics industry is being conducted and the available data is also in un-organized format. There is a need to conduct a comprehensive research in Indian electronics industry.

4) The visibility of Electronics departments (central and state) should be increased to attract the talented young workforce. The Department of Electronics and Information Technology (DeitY) should enhance the awareness towards this sector through various activities like conducting national level essay, project and research paper competitions. These actions should motivate and develop young researchers and scholars in electronics sector.

5) Public Sector Undertakings (PSUs) and Defence organizations in India are facing several challenges in manufacturing process. Only one Navratna Central Public Sector Enterprise (Navratna CPSE), Bharat Electronics Limited (BEL), is actively operating in electronics sector.

6) Top business groups in India like Tata, Reliance, Aditya Birla, Mahindra, Adani etc. should involve, directly or indirectly, in electronics manufacturing industry in a bigger manner.

7) IP creation, increased number of patent holders and ownership of entire product chain should be encouraged which will generate higher revenues and larger employment opportunities.

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