

IT Hardware & Electronics - Executive Summary

IT Hardware & Electronics industry holds a prominent place in the Indian economy given its large contribution to national security and economy. The sector is an employment intensive sector and currently employs around 4.4 million people¹. The sector is also crucial for development of several industrial sectors such as Information Technology sector, Telecommunication sector, Automobiles sector, Electronic appliances sector, Special Medical equipment sector, Aerospace etc. The annual production for IT Hardware & Production sector was more than US\$ 23 billion in 2010-11² has been growing steadily at CAGR of more than 16% since last 5 years.

IT hardware & electronics sector mainly consists of six segments viz. electronic components; communication & broadcast equipment; consumer electronics; IT hardware; industrial electronics and strategic electronics. 'Electronic components' and 'Communication & broadcast equipment' segments have been the engines of growth of the global IT hardware & electronics industry. In terms of global exports, communication & broadcast equipment leads the pack with global exports of around US\$ 580 billion in 2010³ followed by IT Hardware with global exports of around US\$ 545 billion in 2010. The electronic components and integrated circuits segment was close third with global exports of around US\$ 480 billion in 2010. However, electronic components segment showed the highest exports CAGR for 5 year period 2007-11 of 7%. For India, electronic components segment was the highest contributor to total IT hardware & electronics sector exports with contribution of around 37% to the total exports of US\$ 5.46 billion in 2010 followed by communication & broadcast equipment with a contribution of 30% to total sector exports in 2010. In terms of exports growth as well, these segments have witnessed maximum CAGR for a period of 5 years from 2005-10. Communication & broadcast equipment witnessed exhilarating exports' CAGR of 96% for this period while electronic components witnessed exports CAGR of around 24% for the same period. Given the current contribution of these segments and expected growth potential, improvements in these two segments are expected to have far reaching and large impact on overall competitiveness of the Indian IT hardware & electronics industry.

Communication & broadcast equipment and Electronic components segments have four core manufacturing processes viz. Design, Inputs/Components manufacturing, Assembly, and Testing. Within these processes, assembly is already India's strength with maximum Indian companies involved in assembly only. Gross value added is very less in this process because components are mainly imported. Design & component manufacturing are the processes where India is lacking and interventions in these two processes would give impetus to overall competitiveness of the industry.

The world electronic components exports market is primarily dominated by Singapore. Taiwan & China are the other competitive countries, serving some of the major import markets like South America, Hong Kong and Korea. Singapore contributed to 18% of the global electronic component exports of US\$ 479 billion in 2010 and maintained a CAGR of around 10% for the period 2005-10⁴. China contributed around 13% to the world exports closely followed by Taiwan with a contribution of 12% to the world exports for electronic components. China witnessed highest exports' CAGR of 25% for the period 2005-10.

¹ Industry Sources

² Department of IT's Annual Report 2010-11, D&B Analysis

³ WTO world trade statistics, D&B Analysis

⁴ International Trade Centre Trade Statistics, D&B Analysis

The world communication & broadcast equipment exports market is primarily dominated by China. Mexico & Japan are the other competitive countries, serving some of the major import markets like the US, Singapore and Netherlands. China is way ahead of competing countries in communication & broadcast equipment contributing to around 31% to global exports of US\$ 580 billion. Mexico follows suit with contribution of around 7% to global communication & broadcast equipment in 2010. China had exports CAGR of around 14% for the period 2005-10, while Mexico had exports CAGR of 12% for the same period.

China's IT hardware & electronics industry witnessed rapid growth over the last decade, enabling the country to emerge as the largest computer manufacturer in 2004. Several factors have contributed to this achievement including strong domestic demand, foreign investments and supportive government policies. Government's role in the success of the industry has been towards promoting domestic production as well as consumption of computers and attracting foreign capital and advanced technology in return for market access.

Mexico's IT hardware & electronics industry has witnessed a remarkable growth over the last two decades on the back of state reforms involving liberalisation and economic integration into NAFTA. From being a highly protected industry before 1990, today the IT hardware & electronics industry in Mexico is one of the favourite destinations for global IT majors and contributes substantially to exports.

The development of Taiwan's electronics industry can be attributed to the efforts of the Japanese and American governments which focused on Taiwan for off-shoring their manufacturing and assembly of electronic components. Along with the investments and set-ups by the US and Japanese electronics multinationals in Taiwan, the government too aimed to establish domestic electronic plants to undertake subcontract work from companies in other key countries that had not yet started off-shore activity in Taiwan. Thus, Taiwan established a 'Working Group for Planning and Development of the Electronics Industry' and held major exhibitions to bridge and to foster the relationship between foreign investors and local manufacturers.

Singapore's success lies in its ability to attract FDIs by providing adequate support environment. Further, government's focus to make supporting industries available for electronic components manufacturing has paid rich dividends for the industry.

A comparative assessment of Indian IT hardware & electronics goods industry vis-à-vis that of competing countries point out to the following key points:

1. Focused government initiatives have been critical in development of industry

The governments of competing countries have played a major role in facilitating the growth and development of IT hardware and electronics sector. Besides laying down favourable industrial policies for the sector, the state has actively participated in development of the sector either through investment facilitation or through creation of demand in the form of self-consumption. For instance, the Singapore government has not only actively promoted investments in the IT and electronic firms, it has been a key investor in several enterprises. Further, the Singapore government has taken efforts in developing the IT infrastructure in the country; the government offers attractive financial incentives to both adopters and innovators of IT technology. In case of China, the government has facilitated the growth of IT hardware industry not only through its industrial, investment and trade policies but also by serving as a major consumer of IT hardware products. The Japanese government has been supporting the high technology industries for over four decades. Ministry of International Trade and Industry has played a key role in development of all major industries in Japan by

providing protection from import competition, facilitating technological knowhow, and providing assistance in mergers. However several issues in Indian IT hardware & electronics industry like inverted duty structure, lack of purchase preference for Indian manufactured electronic components in government funded projects etc. have impacted the competitiveness of Indian electronic components industry.

2. Favourable foreign investment climate in competing countries has provided technology advantage

India has liberal investment policy with respect to electronics and hardware sector that allows 100% FDI under the automatic route, yet it has not been able to attract huge FDI in the sector as the other Asian countries like Singapore and China. Singapore has been a favourite hub for foreign investments for a long time on the back of strategic advantages such as geographical location, excellent infrastructure, political stability, availability of skilled manpower, favourable tax regime, minimal transaction costs, protection of IPR and supportive government bodies like Singapore Economic Development Board (EDB) and Singapore Trade Development Board (TDB). China too is an attractive destination for foreign investments in the IT hardware and electronics sector due to its low manufacturing costs, attractive tax incentives and investment packages, excellent infrastructure, flexible labour policies and a huge domestic market. Taiwan's success in IT hardware and electronics sector can also be attributed to the huge investments by multinational companies that were attracted by its export processing zones, tax incentives and cheap & un-unionised labour. Mexico's hardware industry has attracted huge FDI as it enjoys competitive edge against competing countries on account of availability of large qualified personnel at low cost, gateway to the Latin American market, and geographic proximity to the US market. The passage of NAFTA has further encouraged foreign companies to supply their Mexican operations from Mexico, rather than bring in parts from Asia. In addition, the short product cycles of the computer industry have forced computer makers serving the U.S. market to shorten their supply chains to improve their speed to market.

The major benefit of foreign investments in these countries has been access to modern technology, which has provided a definite competitive edge to these countries. In case of China, the development of advanced technology in the industry can be attributed to the government's policy of allowing market access to foreign firms only in exchange of bringing foreign capital and transferring technology to domestic firms by forming joint ventures and alliances with them.

3. Tax incentives and subsidies have increased global competitiveness of competing nations

India has a major disadvantage against competing countries in terms of the tax structure. The corporate tax rates are amongst the highest in India and are compounded by multiple indirect taxes. Further, the import duty on IT systems and hardware and electronic components is nil, which has led to high imports and proved detrimental to the growth of domestic IT hardware and electronics industry.

In comparison, tax structure in countries like Singapore, China and Taiwan is more investor friendly. Singapore government has progressively reduced tax and it is currently at just 17%. The government also provides various tax and non-tax incentives. In case of Taiwan, companies in the Hsinchu industrial park enjoy various tax incentives and non-tax subsidies. Companies at the park do not have to pay duties on imported machinery or raw material. Further, companies in this park are offered concessional loans at 2% lower interest rates than in other parts of the city. Consequently, Taiwanese products are rendered highly cost competitive in the global markets. Japan's success in electronic manufacturing can also be attributed to an extent to the subsidies and tax incentives provided by the government under two laws namely the Machinery Industry Law (1956) and the Electronics Industry

Law (1957) that were formulated to promote experimental research and initial production, and also to promote industrial rationalization of machine tools and electronic technologies. Under these laws, subsidies for technology R&D were provided, along with special loans and tax incentives for firms that developed or used advanced production technologies. The central and local governments in China have also played a major role in facilitating growth of IT hardware and electronics industry. The local governments compete with each other in attracting IT manufacturing firms to their region by offering lucrative incentives to the enterprises. The central government too provides several benefits like subsidized bank loans, tax holidays, tax reimbursements and direct investments. Additionally, unlike India most other competing nations provide preferential access to domestic manufacturers of IT products. China and Taiwan have policies wherein locally manufactured IT related strategic products are provided favourable treatment for government procurement.

4. Favourable trade measures are important for maintaining global competitiveness

The most competitive nations in the IT hardware and electronics sector provide several export incentives to the industry and have also invested in development of infrastructure to maintain the global competitiveness. China has been very aggressive in this regard. The government published “Policies for Encouraging the Development of Software and Integrated Circuit Industries” in 2000 and proposed several actions to support the industry, including publicly subsidized bank loans, government investments, tax breaks, and funding for design centres. Additionally, to encourage exports, the government has created export processing zones in which imported materials used in production are free from duties and taxes when exported directly. Singapore has been providing various trade measures to the exporters like: export insurance and guarantees made available from several foreign insurers as well a local company ECICS Ltd; export promotion and marketing assistance provided mainly by IE Singapore, through programmes, such as the Double Tax Deduction Scheme, which allows companies to deduct against their taxable income twice the eligible expenses incurred in activities such as participation in overseas trade fairs, setting up of overseas marketing offices and other investment expansion activities etc. For Mexico, NAFTA provides a ‘zero duty’ environment for its IT hardware & electronics exports to the US, rendering the Mexican exporters competitive against their counterparts from China and other countries, which have to pay import duty. Indian government has also implemented various export promotion schemes and set up various export processing zones and technology parks to boost the exports. However, Indian government does not levy any import duty on the finished electronic goods which is hampering the growth of domestic industry as imported items are more cost effective than the domestic products.

5. Most competing nations have maintained a strong focus on Skill development

The IT hardware and electronics industry requires highly skilled manpower at all levels, who can facilitate research and development to foster innovation and product diversification. Most technologically advanced countries have thus focused on skill development of the industry. For instance, the Taiwanese government has provided huge grants for setting up institutes and departments related to electronics. Further, it has established various agencies and research centres to undertake R&D in the electronics sector. The Hsinchu-based, government-funded Industrial Technology Research Institute hosts several laboratories in which over 5,000 researchers work in co-operation with local companies. Indian government needs to take similar steps to lay a strong foundation for long term development of this potential industry.

6. Costs and availability of critical input material- raw material, manpower and technology

Raw-material costs in India are higher than competing countries and have being the biggest source of disadvantage for Indian firms in Electronic components and Communication & Broadcast Equipment industry. The most critical raw raw-materials i.e. semi-conductors and PCB components are not

available in Indian and hence need to be imported. The domestic manufacturers need to import material from countries such as China, Taiwan and Korea. Further, other critical raw-materials like precious metals, gold & palladium alloys, metals like 99.99% pure aluminium foil, cathode foil, anode foil, electronic chemicals, Putin rubber, high garden tissue paper, tin coated copper leads, copper coated steel wires, single core high temperature cables etc. have to be imported from countries like Germany, U.S., Japan, China etc. which increases the costs by almost 10%. The low production volume of Indian manufacturers inhibits them to negotiate competitive rates from these suppliers, which impacts the cost of production. China's advantage in electronic components & communication & broadcast equipment lies in its local manufacturing capabilities of semi-conductors and other PCB components. This is primarily because boosting semiconductor manufacturing and design is a number one priority for the Chinese government. The China Semiconductor Industry Association (CSIA) estimated that China made an investment of as much as RMB300 billion in the Integrated Circuit industry for development from 2006 to 2010. This allowed home grown IC makers to double their market share. Under the 11th 5 year programme (2006-2010), China established a fund of at least RMB150 million each year to support the home grown IC industry's research and development, offering more favourable tax policies and founding a national technical support centre. Singapore also has special incentives & schemes to make available good supporting industries for semiconductor manufacturing industry. Over the years, Singapore has built up a large base of over 160 local and multinational companies offering equipment, parts, components, materials, gases, chemicals and technical services for semiconductor manufacturing operations.

7. Technological processes and innovation

On comparing India's performance in R&D, technology adoption and innovation as well, it has been observed that India is lagging behind the competing countries. There is very limited innovation and R&D in Indian industry. Almost all the machinery used in production is imported from companies like China, Taiwan, and Japan etc. Further, there has been very limited research to enhance the user industries base for electronic components in India. In terms of standards or certification marks also India lags way behind European, Chinese & Mexican counterparts. There has been limited research to identify and develop intelligent products that are mass consumed. Further, there has been no significant work and effort that has gone into organized reprocessing of electronic components and communication equipment. On the other hand, Chinese companies have benefited a lot from their government's emphasis on indigenous innovation, underlined in the latest five-year plan. Chinese authorities view innovation as critical both to the domestic economy's long-term health and to the global competitiveness of Chinese companies. China has already created the seeds of 22 Silicon Valley-like innovation hubs within the life sciences and biotech industries. In semiconductors, the government has been consolidating innovation clusters to create centres of manufacturing excellence. Further, support was given to indigenous R&D in communication equipment by providing public funding, research grants and cheap loan from state owned bank. Huge amount of money was spent on research and patenting. As a result China succeeded in defining their own 3G standards (TD-SCDMA) and thus developed their own system for manufacturing of network infrastructure and communication devices and equipment. The strong growth of Singapore's electronics industry was enabled through industry transformation. Over the years, the electronics industry has transformed to manufacture higher value-added products and R&D. This is illustrated through two main sectors - semiconductors and data storage. Furthermore, leveraging their established base of electronics manufacturing and IC design capabilities, Singapore's electronics industry has ventured into new growth areas such as Bioelectronics, Green Electronics, Printed Electronics and Security.

Based on analysis of the current status and international norms & standards, the gaps & issues in the Indian IT hardware & electronics industry can be summarised as following:

S.No.	Areas	Issues
1	Scalability	Unlike other Asian countries, India has not been able to attract enough foreign investments to ensure technological development of domestic industry. Inflexible labor laws and high tax regime have restricted foreign investments to reach their potential.
		Lack of economies of scale, due to inability to use our domestic market to get market access and volumes.
2	Cost Efficiency	Poor development of domestic components industry, due to which the industry is largely dependent on imports of the raw material. The low production volume of Indian manufacturers inhibits them to negotiate competitive rates from these suppliers, which impacts the cost of production.
		Inverted duty structure in India. This means that finished products are imported at zero duty while import duty is levied on inputs/raw-materials. This impacts the cost structure of Indian manufacturers.
		Most of the electronic components & communication equipment manufacturing machinery is imported from countries like China, Taiwan & Japan. This imported machinery is expensive and increases the overall cost of production.
		Land locked regions like Pune, Delhi/NCR; Bangalore etc. which contribute majority share of Indian IT hardware & electronics trade incur higher costs of transportation in the form of additional cost burden to transfer goods to the ports.
3	Productivity Optimization	Non-availability of precious metals, gold & palladium alloys, metals like 99.99% pure aluminium foil, cathode foil, anode foil etc.
		Non-availability of other critical components like : electronic chemicals, Putin rubber, high garden tissue paper, tin coated copper leads, copper coated steel wires, single core high temperature cables etc.
		Support skills like Technicians/Engineers for repairs of imported machinery are missing.
		Lack of R&D and innovation in Indian electronic components industry. E.g. Very few companies are able to manufacture newest technologies like Tandem Capacitors, Through-hole components etc.
4	Quality Excellence	Skill gaps exist for CNC trained personnel. Basic knowledge of precision components & their assembly is also lacking in the industry
		Inadequate testing & certifying labs of global standard present in India
		Lack of awareness of global standards like ROHS legislation of EU, CE certification etc.
		No incentives for R&D and development of Indian products and IPR
5	Sustainability	No preferential access to domestic manufacturers of IT hardware & electronics manufacturers for government procurement.
		Very limited companies following Technology Leadership Model, i.e. IPR & Strategic control resides in India
		No efforts on R&D on organized reprocessing of electronic components.

The analysis of various facets of the global and the Indian IT hardware & electronics industry clearly shows that India needs to look at multiple interventions including in the areas of Regulatory framework, Investment policies, Trade policies, Fiscal policies, Infrastructure, R&D, Skill, Financing, Process, Collaboration and Technology. These interventions have been detailed in the main report.

However, recommendations only related to technology and research & development have been detailed which could form part of several schemes undertaken by Department of Science & Industrial Research in this section.

Intervention 1 : Focused scheme to improve raw-material competitiveness	
S.No.	Tasks
1	<p>Focused scheme to induce indigenous production of critical raw-materials like Tin coated copper leads, high temperature single core cables etc. The scheme will supplement aims to bridge the demand-supply gaps in multiple aspects of a business and drive need-based innovation in the industry clusters in a localized manner, by prioritizing the needs of the industry and enable agencies like the Government and others in directing their efforts for increased efficacy. Some of the steps that may be adopted are:</p> <ul style="list-style-type: none"> • Compile a list of critical raw-materials which have enough demand in India but very limited domestic production to match the demand. (Some of the materials include: Putin rubber, high garden tissue paper, tin coated copper leads, copper coated steel wires, single core high temperature cables etc.) • Create a centralized fund for SMEs which could be utilized for acquisition of international companies/assets operating in various raw-material categories. For the same designate an implementing agency to invite, shortlist and grant the funding to the SMEs.
Intervention 2 : Focused scheme for developing domestic champion user industries for electronic components	
S.No.	Tasks
2	<p>Create a national implementing agency to undertake a scheme for identifying at-least 10 champion user categories for electronic components& communication equipment and develop an ecosystem for supporting manufacturing of electronic components for these sectors. Various tasks that may be performed are:</p> <ul style="list-style-type: none"> • Identify ten user categories in India who are heavy users of electronic component and compile their electronic components & communication equipment requirements. (Some of the prospective user categories can be Automobile, Set top box etc.) • Set up incubation centre to develop these components domestically with knowledge partnership with international firms. Further, invite Indian SMEs to develop expertise in these product categories. • Devise a credit scheme so as to encourage Indian firms to set up units for the identified electronic products.
Intervention 3 : Sponsored R&D Programs for research in emerging technologies	
S.No.	Tasks
3	<ul style="list-style-type: none"> • Announce fully sponsored projects for industry for conducting research in emerging technologies. Some of them can be : <ul style="list-style-type: none"> • Surface Mounted Technologies (SMT) • Nanotechnology • PLC & Robots etc. • Create a research fund for concentrated efforts on development of recycled products; and develop an incentive scheme for companies setting up organized recycling units.
Intervention 4 : Database & technology support to domestic firms	
S.No.	Tasks
4	<p>Provide database & technology support to domestic firms in the following areas:</p> <ul style="list-style-type: none"> • Quality standards followed globally for various components & products. • Technology- and innovation-related international journals from major publishers.

	<ul style="list-style-type: none"> • Country wise/OEM wise SOPs for testing the products. • Details of testing infrastructure available in India and globally. The details need to include testing labs availability and tests conducted by them, machinery employed for testing, fees for conducting the tests etc. • Database of industry experts (either retired or from the industry) who can be contacted by domestic firms for any kind of technical support required. For the same, profiles of the experts need to be invited and kept in a repository.
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The interventions mentioned above are further prioritized on the basis of their role in fulfilling various objectives* of the Government of India for the growth of the manufacturing sector. Each intervention is tagged with the objective that it may help achieve. The intervention impacting maximum number of objectives has been prioritized for implementation.

*These objectives have been picked up from “PM’s Group Report on Measures for Ensuring Sustained Growth of The Manufacturing Sector”, “National Manufacturing Policy 2006” and “National Manufacturing Policy 2011”.

Intervention	Government Objectives				
	Employment	Local value addition	Building Strong Capacity & Scale	Skill Development	Technology Adoption
Focused scheme to improve raw-material competitiveness	✓	✓	✓	✓	✓
Focused scheme for developing domestic champion user industries for electronic components	✓	✓	✓	✓	✓
Database & technology support to domestic firms		✓		✓	✓
Sponsored R&D Programs for research in emerging technologies		✓		✓	✓



IT Hardware & Electronics: Innovation Framework

